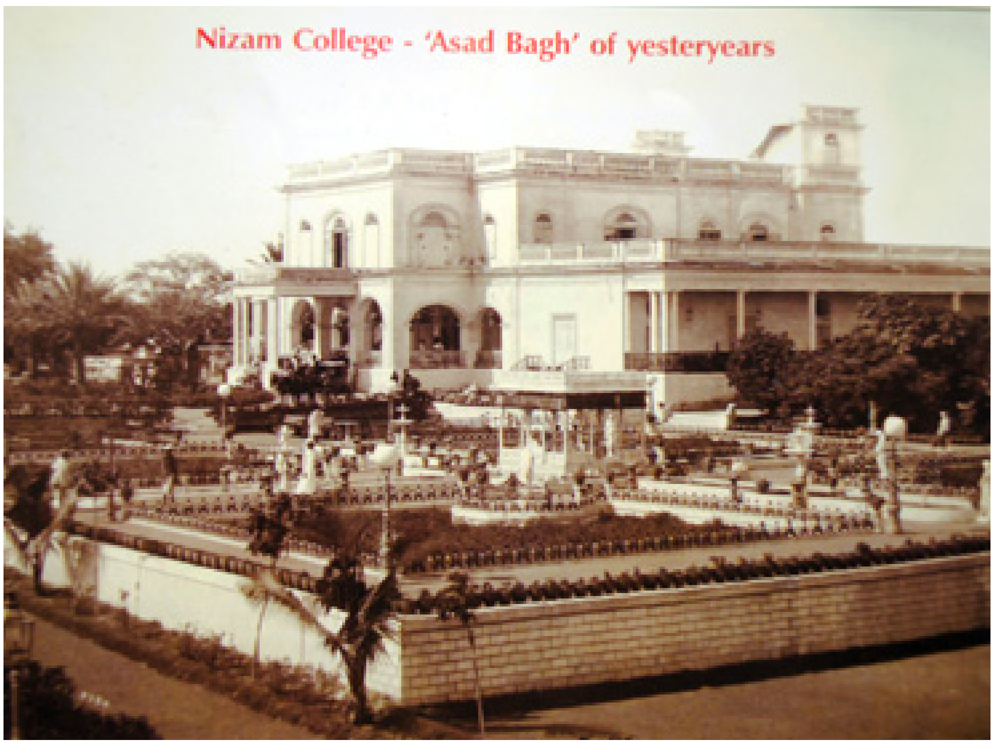
NEET CHEMISTRY



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PREFACE

Taking competitive examinations has became the order of the day for any educated young man who is desirous of seeking any coveted job, a seat in any prestigious college. The approach required for such competitive examination is different from that of taking an academic examination.

It was observed that most of the minority candidates do not fare well at these competitive examinations not because they lack in talents but because they can neither afford to join the private coaching centres nor could purchase the required study material.

In order to improve the participation and performance of the candidates belonging to minorities in such competitive examinations, the Minorities Welfare Department, State Government sponsored a project to Osmania University. The University in turn established Centre for Educational Development of Minorities (CEDM) in 1994 in Nizam College. Since then, the Centre has been offering free coaching for the benefit of candidates belonging to minority communities appearing for various job seeking and admission seeking competitive examinations at Hyderabad and other minority concentrated districts of the state. In respect of job-seeking examinations, the Centre is providing free coaching and study material for TS TRT, TS TET etc. and for admission oriented examinations such as NEET, EAMCET, ICET, ECET, EdCET, DEECET and POLYCET etc. In addition to these coaching programmes, the Centre is also providing free coaching and study material to X class Urdu medium minority students in minority concentrated districts of the state to strengthen their educational foundation and to improve their performance in SSC Public Examination.

We wish to place on record the pains the compilers have taken to summarize and arrange the important questions. The Centre gratefully acknowledges their services.

If these study materials are of any help to the candidates, we feel immensely rewarded for the humble efforts we have put in.

Hyderabad
April 2024

Prof. S. A. Shukoor,
D I R E C T O R

CONTENT

First Year

Second Year

SOME BASIC CONCEPTS OF CHEMISTRY (STOICHIOMETRY)

EXERCISE -I

1. Chemical equation is balanced according to the law of

   1) Multiple proportion 2) Reciprocal proportion

   3) Conservation of mass 4) Definite proportions

2. Which of the following pairs can be cited as an example to illustrate the law of multiple proportion?

   1) Na_2O, K_2O 2) CaO,MgO 3) Al_2O_3, Cr_2O_3 4) CO, CO_2

3. Percentage of copper and oxygen in samples of CuO obtained by different methods were found to be the same. This proves the law of

   1) Constant proportions 2) Reciprocal proportions

   3) Multiple proportions 4) Conservation of mass

4. The law of conservation of mass holds good for all of the following except

   1) All chemical reactions 2) Nuclear reactions

   3) Endothermic reactions 4) Exothermic reactions

5. Law of combining volumes was proposed by

   1) Lavoisier 2) Gay Lussac 3) Avogadro 4) Dalton

6. In the reaction Hydrogen (g)+Oxygen(g) $\rightarrow$ water vapour, the ratio of volumes is 2:1:2. This illustrates the law of

   1) conservation of mass 2) combining weights

   3) combining volumes 4) all the above

7. In compound A, 1.00 g nitrogen combines with 0.57 g oxygen. In compound B, 2.00g nitrogen combines with 2.24 g oxygen. In compound C, 3.00 g nitrogen combines with 5.11 g oxygen. These results obey the following law.

   1) Law of constant proportion 2) Law of multiple proportion

   3) Law of reciprocal proportion 4) Dalton's law of partial pressure

8. The law of multiple proportions is ilustrated by the two compounds

   1) Sodium chloride and sodium bromide 2) Ordinary water and heavy water

   3) Caustic soda and caustic potash 4) Sulphur dioxide and sulphur trioxide.

9. Two samples of lead oxide were separately reduced to metallic lead by heating in a current of hydrogen. The weight of lead from oneoxide was half the weight of lead obtained from the other oxide. The data illustrates.

   1) Law of reciprocal proportions 2) Law of constant proportions

   3) Law of multiple proportions 4) Law of equivalent proportions

10.

LIST - 1	LIST - 2
A) Law of conservation of Mass	1) $\frac{V_1}{V_2}=\frac{n_1}{n_2}$
B) Avogadro's Law	2) $2H_{2(s)} + O_{2(g)} \rightarrow 2H_2O_{(s)}$
C) Gay-Lussac's Law of combining volumes	3) 12g of C + 32g of O_2 = 44g CO_2
D) Law of conservation of Energy	4) $H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_{(g)}$

5) $H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_{(g)}, \Delta H = -184.6 kJ$

The correct match is

	A	B	C	D		A	B	C	D
1)	3	1	4	5	2)	3	1	5	4
3)	3	1	2	5	4)	1	2	4	5

11. A sample of pure carbon dioxide, irrespective of its source contains 27.27% carbon and 72.73% oxygen. The data support

1) Law of constant composition
2) Law of conservtion of mass
3) Law of reciprocal proportions
4) Law of multiple proportions

12. Carbon and oxygen combine to form two oxides, carbon monoxide and carbon dioxide in which the ratio of the weights of carbon and oxygen is respectively 12:16 and 12:32 These figures illustrate the

1) Law of multiple proportions
2) Law of reciprocal proportions
3) Law of conservation of mass
4) Law of constant proportions

13. The molar volume of any gas at STP is

1) 1 litre
2) 22.414 lit
3) 6.02×10^{23} lit
4) 22.414 ml

14. 1 gram - atom of oxygen is

1) 1 g of oxygen
2) 16g of oxygen
3) 22.4 g of oxygen
4) 8g of oxygen

15. One gram molecule of oxygen is

1) 16 gms of oxygen
2) 32 gms of oxygen
3) 8gms of oxygen
4) 1gm of oxygen

16. A mole is

1) The amount of substance containing the same number of chemical units as the number of atoms in exactly 12g of C^{12}.
2) The amount of substance containing Avogadro number of chemical units.
3) The unit for expressing amount of a substance
4) all the above

17. The mass of a mole of hydrogen atoms is

1) 1.008 g
2) 2.016g
3) 6.02×10^{23}g
4) 1.008 amu

18. The molar mass of hydrogen is

1) 1.008 g
2) 2.016 g
3) 6.02×10^{23} g
4) 2.016 amu

19. One mole of atoms of oxygen represents

1) 6.02×10^{23} atoms of oxygen
2) 32 g of oxygen
3) 22.4L of O_2 at STP
4) 8g of oxygen

20. One mole of molecules of oxygen represents

1) 6.02×10^{23} molecules of oxygen
2) 8 gms of oxygen
3) 16g of O_2
4) 11.2L of O_2 at STP

21. The charge present on 1 mole electrons is

1) 96500 Coulombs
2) Coulomb
3) 1.60×10^{-19} C
4) 0.1 Faraday

22. The weight of 0.1 mole of Na_2CO_3 is

1) 106 g
2) 10.6 g
3) 5.3 g
4) 6.02×10^{22}g

23. Avogadro number of helium atoms have a mass of

1) 2g   2) 4g   3) 8g   4) $4\times6.02\times10^{23}$g

24. The volume of two moles of oxygen at STP is

1) 22.4 L   2) 11.2 L   3) 40 L   4) 44.8 L

25. The ratio between the number of molecules in equal masses of nitrogen and oxygen is

1) 7:8   2) 1:9   3) 9:1   4) 8:7

26. The gas which is twice as dense as oxygen under the same conditions is

1) Ozone   2) Sulphur trioxide   3) Sulphur dioxide   4) Carbon dioxide

27. A chemical equation is always balanced with respect which one of the following

i) Number of atoms   ii) Number of molecules

iii) Number of moles   iv) Mass

1) Only i is correct   2) Only iii correct   3) Only iv Correct   4) Both i & iv correct

Note: 1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false

4) (A) is false but (R) is true

28. **(A) :** 2 g of hydrogen contains Avogadro number of molecules

(R) : One mole of an ideal gas at STP occupies 22.4 lt.

29. **(A) :** 2 g of Hydrogen contains Avogadro number of atoms

(R) : One mole of any gas contains Avogadro number of molecules

30. **(A) :** In Haber's process, N_2 and H_2 combine in 1 : 3 volume ratio

(R) : Gases combine in simple volume ratio

31. **(A):** 1 c.c. of Nitrogen at STP contains 2.69×10^{19} molocules

(R): Molar volume of an ideal gas st STP contains Avogadro number of molecules

32. **(A) :** 8 g CH_4 and 14 gr. nitrogen together occupy 11.2 lt. of volume at STP.

(R) : Equal volumes of all gases under the same conditions contain equal number of molecules.

33. Which of the following has highest mass?

1) One gram atom of Iron   2) 5 moles of N_2

3) 10^{24} carbon atoms   4) 44.8 lit of He at STP

34. 1 gram of hydrogen contains 6×10^{23} atoms. Then 4 grams of He contains

1) 6×10^{23} atoms   2) 12×10^{23} atoms   3) 24×10^{23} atoms   4) 1.5×10^{23} atoms

35. Elements 'A' and 'B' combine in the ratio of their

1) Atomic weights   2) Molecular weights   3) Equivalent weights 4) Mass numbers

36. Molecular weight of orthophosphoric acid is M. Its equivalent weight is

1) 3M   2) M   3) $\frac{M}{2}$ 4) $\frac{M}{3}$

37. The equivalent weight of $CaCO_3$

1) 100 2) 50 3) 33.3 4) 25

38. Equivalent weight of $K_2Cr_2O_7$ in acidic medium is

1) 24.5 2) 49 3) 147 4)296

39. The equivalent weight of Bayer's reagent is

1) 31.6 2) 52.6 3) 79 4) 158

40. Molecular weight of $KMnO_4$ is "M". In a reaction $KMnO_4$ is reduced to K_2MnO_4. The equivalent weight of $KMnO_4$ is

1) M 2) $\frac{M}{2}$ 3) $\frac{M}{3}$ 4) $\frac{M}{5}$

41. $2H_2O \rightarrow 4e^- + O_2 + 4H^+$. The equivalent weight of molecular oxygen is

1) 32 2) 16 3) 8 4) 4

42. **(A) :** Normality is always a multiple of molarity

(R) : Molarity is in no way related to normality

The correct answer is

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false 4) (A) is false but (R) is true

43. **(A) :** The basicity of H_3PO_3 is 2

(R) : Three hydrogen atoms are attached to phosphorus through oxygen atoms

The correct answer is

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false 4) (A) is false but (R) is true

44. In acidic medium Dichromate ion oxidises Ferrous ion to Ferric ion. If the gram-molecular weight of potassium dichromate is 294 gm, its equivalent weight is

1) 294 2) 147 3) 49 4) 24.5

45. The equivalent weight of Hypo in the reaction [M = molecular weight]

$2Na_2S_2O_3 + I_2 \rightarrow 2NaI + Na_2S_4O_6$ is

1) M 2) $\frac{M}{2}$ 3) $\frac{M}{3}$ 4) $\frac{M}{4}$

46. The equivalent weight of $CuSO_4$ when it is converted to Cu_2I_2 [M=mol.wt]

1) $\frac{M}{1}$ 2) $\frac{M}{2}$ 3) $\frac{M}{3}$ 4) 2 M

47. The equivalent weight of Iodine in the reaction $2Na_2S_2O_3 + I_2 \rightarrow 2NaI + Na_2S_4O_6$ is [M=mol. wt]

1) M 2) $\frac{M}{2}$ 3) $\frac{M}{3}$ 4) 2M

48. The equivalent weight of glucose in the reaction $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ is [M=mol. wt]

1) $\frac{M}{4}$ 2) $\frac{M}{12}$ 3) $\frac{M}{24}$ 4) $\frac{M}{48}$

49. Medium Equivalent weight of $KMnO_4$

A) Acidic	a) 158
B) Neutral	b) 79
C) Strongly basic	c) 52.6
D) Weakly basic	d) 31.6

The correct match is

1) A - d, B - c, C - a, D - c
2) A - d, B - c, C - a, D - b
3) A - d, B - b, C - a, D - c
4) A - d, B - c, C - a, D - a

50.

LIST - 1 (Molecules)	LIST - 2 (Empirical formula)
A) Glucose	1) BNH_2
B) Oxalic acid	2) CH_2O
C) Inorganic Benzene	3) CH
D) Oxygenated water	4) CHO_2
	5) HO

The correct match is

	A	B	C	D		A	B	C	D
1)	3	5	2	4	2)	2	4	1	5
3)	1	3	2	4	4)	4	2	1	3

51. **(A) :** Empirical formula of glucose and acetic acid is CH_2O

(R) : If percentage composition is same, then empirical formula is same

The correct answer is

1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false
4) (A) is false but (R) is true

52. Oxidation state of 'S' in S_8 molecule is

1) 0 2) +2 3) +4 4) +6

53. Oxidation state of N in N_3H is

1) +1/3 2) +3 3) –1/3 4) –1

54. Oxidation number of C in CH_2O is

1) –2 2) +2 3) 0 4) 4

55. Oxidation state of Ni in $Ni(CO)_4$ is

1) 0 2) 4 3) 8 4) 2

56. Oxidation state of Fe in $K_4[Fe(CN)_6]$

1) +6 2) +4 3) +2 4) +5

57. Oxidation number and valency of oxygen in OF_2 are

1) +1,2 2) +2, 2 3) +1, 1 4) +2, 1

58. In which of the following the oxidation state of chlorine is +5 ?

1) $HClO_4$ 2) $HClO_3$ 3) $HClO_2$ 4) HCl

SOME BASIC CONCEPTS OF CHEMISTRY (STOICHIOMETRY)

59. In the conversion of $K_2Cr_2O_7$ to K_2CrO_4 the oxidation number of the following changes

1) K 2) Cr 3) Oxygen 4) None

60. The oxidation number of sulphur in S_8, S_2F_2 and H_2S are

1) 0, + 1 and - 2 2) +2, +1 and - 2 3) 0, +1 and + 2 4) -2, + 1 and - 2

61. In the conversion of $CrO_4^{-2} \rightarrow Cr_2O_7^{2-}$, the oxidation number of chromium

1) increases 2) decreases 3) becomes zero 4)remains unchanged

62.

LIST - 1	**LIST - 2** **(Oxidation state)**
A) + 3	1) Nitrogen
B) + 1	2) Nitrous oxide
C) 0	3) Nitrate ion
D) + 5	4) Hydroxylamine
	5) Nitrite ion

The correct match is

	A	**B**	**C**	**D**		**A**	**B**	**C**	**D**
1)	1	4	3	2	2)	5	2	4	3
3)	4	5	3	1	4)	5	2	1	3

63. If three electrons are lost by Mn^{+3}, its final oxidation state would be

1) 0 2) +6 3) +2 4) +4

64. Oxidation number and Covalency of sulphur in S_8 molecule are respectively

1) 6 and 8 2) 0 and 8 3) 0 and 2 4) 6 and 2

65. Sum of the oxidation numbers of carbon in acetaldehyde is

1) – 2 2) +2 3) – 4 4) –1

66. In bleaching powder oxidation states of Cl are

1) –1, +2 2) –2, +1 3) –1, +1 4) –2,+1

67. Oxidation number of sulphur in oleum ($H_2S_2O_7$) is

1) +4 2) +2 3) –2 4) +6

68. The compound formed in the brown ring test has the formula $[Fe(H_2O)_5NO]SO_4$. The oxidation state of iron in it is

1) +1 2) +2 3) +3 4) zero

69. Oxidation numbers of sodium, mercury in sodium amalgam are

1) zero, zero 2) +1, –1 3) –2, +2 4) 0, +1

70. Chlorine is passed into dilute, cold KOH solution. What are the oxidation numbers of chlorine in the products formed?

1) –1, +5 2) –1, +3 3) +1, +7 4) +1, –1

71. The oxidation state of sulphur in $Na_2S_4O_6$ is

1) 3/2 2) 2/3 3) 5/2 4) 2/5

72. The oxidation number of sulphur in $S_2O_8^{2-}$ is

1) +7 2) +6 3) +4 4) +5

73. The oxidation number of Cr in CrO_5 is

1) + 10 2) + 6 3) + 4 4) + 5

74.

LIST - 1	LIST - 2
A) NH_3	1) Oxidant
B) $KMnO_4$	2) Both oxidant and reductant
C) SO_2	3) Neither oxidant nor reductant
D) He	4) Reductant
	5) Dehydrating agent

The correct match is

	A	B	C	D		A	B	C	D
1)	4	3	1	5	2)	2	4	1	3
3)	4	1	2	3	4)	3	2	1	4

75. In the reaction, $I_2 + 2KClO_3 \rightarrow 2KIO_3 + Cl_2$

i) Iodine is oxidised ii) Chlorine is reduced

iii) Iodine displaces chlorine iv) $KClO_3$ is decomposed

The correct combination is

1) Only i & iv are correct 2) Only iii & iv are correct

3) i, ii, iii are correct 4) All are correct

76. The oxidation number of phosphorus in sodium hypophosphite is

1) +3 2) +2 3) +1 4) –1

77. Oxidation state of oxygen in potassium superoxide is

1) –1/2 2) –1 3) –2 4) 0

78. Average oxidation number of iodine in KI_3

1) +1/3 2) –1/3 3) +3 4) –1

79. The oxidation number of nitrogen in NCl_3 is

1) +3 2) –3 3) zero 4) –1/3

80. What are the oxidation numbers of 'N' in NH_4NO_3?

1) +3, –5 2) –3, +5 3) +3, +6 4) –2, +2

81. The oxidation number of phosphorus in Ba $(H_2PO_2)_2$ is

1) +3 2) +2 3) +1 4) -1

82. In which one of the following compounds the oxidation number of Iodine is fractional?

1) IF_3 2) IF_5 3) IF_7 4) KI_3

83. $PbS+H_2O_2 \rightarrow PbSO_4+4H_2O$. In this reaction PbS undergoes

1) oxidation 2) reduction 3) both 4) None

84. In the reaction

$P_4 + 3OH^- + 3H_2O \rightarrow 3H_2PO_2^- + PH_3$ phosphorus is undergoing

1) oxidation 2) reduction 3) disproportionation 4) hydrolysis

85. Which of the following is not a redox reaction?

1) $2BaO+O_2 \rightarrow 2BaO_2$ 2) $BaO_2+H_2SO_4 \rightarrow BaSO_4+H_2O_2$

3) $2KClO_3 \rightarrow 2KCl+3O_2$ 4) $SO_2+2H_2S \rightarrow 2H_2O+3S$

86. In a reaction between zin and iodine, in which zinc iodide is formed, what is being oxidised

1) Zinc ions 2) Iodide ions 3) Zinc atom 4) Iodine

87. Which of the following is redox reaction

1) H_2SO_4 with NaOH
2) In atmosphere, O_3 from O_2 by lightning
3) Evaporation of H_2O
4) Nitrogen oxide from nitrogen and oxygen by lightning

88. $C+O_2 \rightarrow CO_2$ the reaction is

1) Chemical combination
2) Decomposition reactions
3) Displacement reactions
4) Disproportionation reactions

89. Which of the following is decomposition reaction

1) $2HgO \rightarrow 2Hg + O_2$
2) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
3) $S + O_2 \rightarrow SO_2$
4) $Cl_2 + 2KBr \rightarrow 2KCl + Br_2$

90. Which one of the following is not prepared from halide by chemical oxidation process

1) F_2 2) Cl_2 3) Br_2 4) I_2

91. Which of the following is metal displacement reaction

1) $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$
2) $2Na + 2H_2O \rightarrow 2NaOH + H_2$
3) $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$
4) $2HgO \rightarrow 2Hg + O_2$

92. $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$, Zn can act as

1) Oxidising agent 2) Reducing agent 3) Reduced 4) Oxidant

93. Which of the following is a redox reaction?

1) $NaCl+KNO_3 \rightarrow NaNO_3+KCl$
2) $CaC_2O_4+2HCl \rightarrow CaCl_2+H_2C_2O_4$
3) $Mg(OH)_2+2NH_4Cl \rightarrow MgCl_2+2NH_4OH$
4) $Zn+2AgCN \rightarrow 2Ag + Zn(CN)_2$

94. In the reaction $3Mg+N_2 \rightarrow Mg_3N_2$

1) Magnesium is reduced
2) Magnesium is oxidized
3) Nitrogen is oxidized
4) None of these

95. Which one of the halogn is prepared by only electrolysis method

1) Cl_2 2) Br_2 3) F_2 4) I_2

96. Layer test is used for determination of

1) Chalogens 2) Pnicogens 3) Halogens 4) Noble gases

EXERCISE - II

1. The density of water is 1g/mL. Assuming that there are no interspaces between water molecules in liquid water, the volume of a water molecule is

1) 1.5×10^{-23}ml 2) 6×10^{-23}ml 3) 3×10^{-23}ml 4) 3×10^{-22}ml

2. Ordinary water contains one part of heavy water per 6000 parts by weight. The number of heavy water molecules present in a drop of water of volume 0.01mL is (density of water is 1g/mL)

1) 2.5×10^{16} 2) 5×10^{17} 3) 5×10^{16} 4) 7.5×10^{16}

3. An α -particle changes into a Helium atom. In the course of one year the volume of Helium collected from a sample of Radium was found to be 1.12×10^{-2}mL at STP. The number of α

particles emitted by the sample of Radium in the same time is

1) 6×10^{17} 2) 3×10^{17} 3) 1.5×10^{17} 4) 1.2×10^{18}

4. A gaseous mixture contains oxygen and nitrogen in the ratio 1:4 by weight. The ratio of their number of molecules is

1) 1:4 2) 4:1 3) 7:32 4) 3:16

5. The number of oxygen atoms present in 50g of calcium carbonate is

1) 6.023×10^{23} 2) 30.1×10^{23} 3) 9.035×10^{23} 4) 1.206×10^{24}

6. The mass of oxygen required to prepare 2 moles of water is

1) 16g 2) 32g 3) 8g 4) 64g

7. One mole of CH_4 contains

1) 6.02×10^{23} atoms of hydrogen 2) 4gm atoms of hydrogen

3) 3g of carbon 4) 1.81×10^{23} molecules of CH_4

8. The ratio between the number of molecules in equal masses of CH_4 and SO_2 is

1) 1:1 2) 4:1 3) 1:4 4) 2:1

9. The number of sulphur atoms present in 0.2 mole of sodium thiosulphate is (N=Avogadro number)

1) 4N 2) 0.2N 3) 0.4N 4) 0.1N

10. The number of nitrogen molecules present in 1c.c of gas at NTP is

1) 2.67×10^{22} 2) 2.67×10^{21} 3) 2.67×10^{20} 4) 2.67×10^{19}

11. The mixture containing the same number of molecules as that of 14 g of CO is

1) 14g of nitrogen + 16g of oxygen 2) 7g of nitrogen + 16g of oxygen

3) 14g of nitrogen + 8g of oxygen 4) 7g of nitrogen + 8g of oxygen

12. Which of the following is heaviest?

1) 50g of iron 2) 5 moles of nitrogen

3) 0.1 gram atom of silver 4) 10^{23} atoms of carbon

13. The density of a gas is 2, relative to nitrogen, under the same conditions. The molecular weight of the gas is

1) 5.6 2) 28 3) 56 4) 14

14. The density of a gas at STP is 1.5g/L at STP. Its molecular weight is

1) 22.4 2) 33.6 g 3) 33.6 4) 44.8

15. 7g of nitrogen occupies a volume of 5 litres under certain conditions. Under the same conditions one mole of a gas, having molecular weight 56, occupies a volume of

1) 40L 2) 20L 3) 10L 4) 80L

16. One mole of oxygen (O_2) is present in the following mass of sulphuric acid

1) 98g 2) 24.5g 3) 196g 4) 49g

17. The number of gram - atoms of sulphur in 2 moles of peroxydisulphuric acid is

1) 2 2) 3 3) 1 4) 4

18. Four ten litre flasks are separately filled with the gases hydrogen, helium, oxygen and ozone

at the same temperature and pressure. The ratio of the total number of atoms of these gases present in different flasks would be

1) 1:2:3:2 2) 2:1:2:3 3) 1:3:2:2 4) 1:1:1:1

19. If the relative atomic mass of oxygen is 64 units, the molecular mass of CO becomes

1) 112 2) 128 3) 28 4) 7

20. Three grams of carbon is completely burnt in excess of oxygen. The weight of carbon dioxide formed is

1) 22g. 2) 44g. 3) 11 g 4) 5.5 g

21. What is the mole percentage of O_2 in a mixture of 7g of N_2 and 8g of O_2?

1) 25% 2) 75% 3) 50% 4) 40%

22. The volume in litres of CO_2 liberated at STP, when 10g of 90% pure limestone is heated completely is

1) 2.016 2) 20.16 3) 2.24 4) 22.4

23. 7.5 g of a gas occupies 5.6 litres as STP. The gas is

1) NO 2) N_2O 3) CO 4) CO_2

24. $H_3PO_4 + 2KOH \rightarrow K_2HPO_4 + 2H_2O$

Based on the above reaction equivalent weight of H_3PO_4 is

1) 196 2) 98 3) 49 4) 32.67

25. A bivalent metal has 12 equivalent weight. The molecular weight of its oxide is

1) 16 2) 32 3) 40 4) 52

26. Molecular weight of Mohr's salt is 392. Its equivalent weight when it is oxidised by $KMnO_4$ in acidic medium is

1) 392 2) 196 3) 130.6 4) 78.5

27. The eqivalent weights of 'S' in SCl_2 and S_2Cl_2 are in the ratio

1) 1 : 2 2) 2 : 1 3) 1 : 1 4) 1 : 4

28. The equivalent weight of a metal in different compounds are 18.6 ad 28. Atomic mass of the metal would be

1) 18.6 2) 28 3) 46.6 4) 56

29. A gaseous alkane requires five times its volume of oxygen under the same conditions for complete combustion. The molecular formula of the alkane is

1) C_2H_6 2) C_4H_{10} 3) C_3H_8 4) CH_4

30. 0.262g of a substance gave, on combustion, 0.361g of CO_2 and 0.147g of H_2O. What is the empirical formula of the substance

1) CH_2O 2) C_3H_6O 3) $C_3H_6O_2$ 4) $C_2H_6O_2$

31. Analysis of a compound yields the following percentage composition. 65.03% of Ag; 15.68% Cr ; 19.29% O. The simplest formula of the compound is [Cr At.wt=52]

1) Ag_2CrO_4 2) $Ag_2Cr_2O_7$ 3) $AgCrO_2$ 4) $AgCr_2O_3$

32. The percentage of oxygen in NaOH is

1) 40 2) 6 3) 8 4) 20

33. The percentage of nitrogen in Magnesium nitride is

1) 14 2) 28 3) 42 4) 56

34. The mass of water (in grams) in one mole of crystalline hypo is

1) 18 2) 90 3) 158 4) 248

35. 0.36g of an organic compound on combustion gave 1.1g of CO_2 and 0.54g of H_2O. The percentages of carbon and Hydrogen in the compound are

1) 75, 25 2) 60, 40 3) 83.33, 16.67 4) 77.8, 22.2

36. 0.66g of a compound gave 112ml of nitrogen measured at STP in the Dumas method. The percentage of Nitrogen in the compound is

1) 25 2) 41.5 3) 42.4 4) 21.2

37. A compound contains 90% C and 10% H. The empirical formula of the compound is

1) C_8H_{10} 2) $C_{15}H_{30}$ 3) C_3H_4 4) $C_{15}H_{40}$

38. 60g of a compound on analysis gave C=24g, H=4g and O=32g. Its empirical formula is

1) $C_2H_4O_2$ 2) CH_2O 3) CH_2O_2 4) C_2H_2O

39. The empiricial formula of a compound is CH_2O. Its molecular weight is 120. The molecular formula of the compound is

1) $C_3H_6O_3$ 2) $C_4H_8O_4$ 3) $C_2H_4O_2$ 4) $C_6H_{12}O_6$

40. In the reaction

$MnO_4^- + SO_3^{2-} + H^+ \rightarrow Mn^{2+} + SO_4^{2-}$ the number of H^+ ions involved is

1) 2 2) 6 3) 8 4) 16

41. $Cr(OH)_3 + H_2O_2 \xrightarrow{\text{Alkali}} CrO_4^{-2} + H_2O$ the number of OH^- required to balance the above equation

1) 1 2) 3 3) 4 4) 6

42. In the reaction the stoichiometry coefficients of $Cr_2O_7^{2-}$, NO_2^- and H^+ respectively are

$Cr_2O_7^{2-} + NO_2^- + H^+ \rightarrow Cr^{3+} + NO_3^- + H_2O$

1) 1,3,8 2) 1,4,8 3) 1,3,12 4) 1,5,12

43. The number of moles of MnO_4^- and $Cr_2O_7^{-2}$ separately required to oxidise 1 mole of FeC_2O_4 each in acidic medium respectively

1) 0.5 ; 0.6 2) 0.6 ; 0.4 3) 0.4 ; 0.5 4) 0.6 ; 0.5

44. The weight of a pure sample of $KClO_3$ to be decomposed in order to get 0.96g of O_2 is

1) 2.45g 2) 1.225g 3) 9.90g 4) None

45. 6g of Mg reacts with excess of an acid. The amount of hydrogen produced would be

1) 0.5g 2) 1g 3) 2g 4) 4g

46. The number of moles of Fe_2O_3 formed when 5.6 lit of O_2 reacts with 5.6g of Fe?

1) 0.125 2) 0.01 3) 0.05 4) 0.10

47. What volume of H_2 at NTP is required to convert 2.8g of N_2 in to NH_3?

1) 2240 ml 2) 22400 ml 3) 6.72 lit 4) 224 lit

SOME BASIC CONCEPTS OF CHEMISTRY (STOICHIOMETRY)

48. The number of grams of NaOH that completely neutralises 9.8g of phosphoric acid is

1) 120 2) 24 3) 36 4) 12

49. Air contains 20% by volume of oxygen. The volume of air required for the complete combustion of 1L of methane under the same conditions is

1) 2L 2) 4L 3) 10L 4) 0.4L

50. When 20ml of methane and 20ml of oxygen are exploded together and the reaction mixture is cooled to laboratory temperature. The resulting volume of the mixture is

1) 40 ml 2) 20 ml 3) 30 ml 4) 10 ml

51. The volume of CO_2 obtained by the complete decomposition of one mole of $NaHCO_3$ at STP is

1) 22.4 L 2) 11.2 L 3) 44.8 L 4) 4.48 L

52. How many litres of CO_2 at STP will be formed when 100 ml of 0.1M H_2SO_4 reacts with excess of Na_2CO_3?

1) 22.4 2) 2.24 3) 0.224 4) 5.6

53. 25.5 g of H_2O_2 solution on decomposition gave 1.68L of O_2 at STP. The percentage strength by weight of the solution is

1) 30 2) 10 3) 20 4) 25

54. What is the volume (lit) of oxygen required at STP to completely convert 1.5 moles of sulphur into sulphurdioxide

1) 11.2 2) 22.4 3) 33.6 4) 44.8

55. A peroxidase enzyme contains 2% selenium (Se=80). The minimum molecular weight of the enzyme is

1) 1000 2) 2000 3) 4000 4) 800

56. The amount of Mg in gms. to be dissolved in dilute H_2SO_4 to liberate H_2 which is just sufficient to reduce 160g of ferric oxide is

1) 24 2) 48 3) 72 4) 96

57. Sodium carbonate of 92% purity is used in the reation $Na_2CO_3 + CaCl_2 \rightarrow CaCO_3 + 2NaCl$. The number of grams of Na_2CO_3 required to yield 1gm of $CaCO_3$

1) 8.5g 2) 10.5g 3) 11.52g 4) 1.152g

58. Benzene burns in oxygen according to the equation $2C_6H_6(l) + 15O_2(g) \rightarrow 12CO_2(g) + 6H_2O(l)$. How many litres of oxygen are required at STP for the complete combustion of 39g of liquid benzene?

1) 11.2 2) 22.4 3) 42 4) 84

59. The mass of 80% pure H_2SO_4 required to completely neutralise 60g of NaOH is

1) 92g 2) 58.8g 3) 73.5g 4) 98g

60. Haemoglobin contains 0.33% iron (Fe=56). The molecular weight of haemoglobin is 68000. The number of iron atoms in one molecule of haemoglobin is

1) 2 2) 3 3) 4 4) 5

61. Assuming that air at STP contained 80% by volume of nitrogen, the volume of air at STP that contains 4.8×10^{23} molecules of Nitrogen is

1) 18 L 2) 44.8 L 3) 22.4 L 4) 11.2 L

622. The atomic masses of two elements A and B are 20 and 40 respectively. If x gm of A contains Y atoms, how many atoms are present in 2x gm of B?

1) 2y 2) y/2 3) y 4) 4y

63. 20 ml of nitric oxide combines with 10 ml of oxygen at STP to give NO_2. The final volume will be

1) 30 ml 2) 20 ml 3) 10 ml 4) 40 ml

64. The number of moles of KI required to produce 0.4 mole K_2HgI_4 is

1) 1 2) 3 3) 16 4) 1.6

65. A compound contains atoms of three elements A, B and C. If the oxidation number of A is +2, B is +5 and that of C is -2, the possible formula of compound is

1) $A_3(BC_4)_2$ 2) $A_3(B_4C)_2$ 3) ABC_2 4) $A_2(BC_3)_2$

66. How many moles of magnesium phosphate, $Mg_3(PO_4)_2$ will contain 0.25 mole of oxygen atoms ?

1) 0.02 2) 3.125×10^{-2} 3) 1.25×10^{-2} 4) 2.5×10^{-2}

67. Total number of sulphate ions present in 3.92g of chromic sulphate is (Cr = 52, S=32, O=16)

1) 1.8×10^{22} 2) 1.8×10^{23} 3) 1.2×10^{21} 4) 6×10^{23}

68. The number of molecules in one litre of water is (density of water = 1g/mL)

1) 6×10^{23} / 22.4 2) 3.33×10^{25} 3) 3.33×10^{23} 4) 3.33×10^{24}

69. The mass of 1.5×10^{20} atoms of an element is 15mg. The atomic mass of the element is

1) 60g 2) 60mg 3) 60 4) 6

70. If 0.5 mol of $BaCl_2$ is mixed with 0.2 mol of Na_3PO_4 the maximum number of moles of $Ba_3(PO_4)_2$ that can be formed is

1) 0.7 2) 0.5 3) 0.30 4) 0.10

71. A copper plate of 20cm × 10cm is to be plated with silver of 1 mm thickness. The number of silver atoms required for the plating is (density of silver = 10.8 g/c.c)

1) 1.2×10^{24} 2) 2.4×10^{24} 3) 1.2×10^{13} 4) 2.4×10^{23}

72. Bell metal contains 80% copper. The mass of Bell metal which contains 1.5×10^{20} atoms of copper is (Cu=64)

1) 2mg 2) 20mg 3) 40mg 4) 12.8mg

73. 1 mole of each of $Ca(OH)_2$ and H_3PO_4 are allowed to react under dilute conditions. The maximum number of moles of $Ca_3(PO_4)_2$ formed is

1) 1 2) 1/2 3) 1/3 4) 3

74. The mass of 1.5×10^{26} molecules of a substance is 16kg. The molecular mass of the substance is

1) 64g 2) 64 a.m.u 3) 16 a.m.u 4) 32 a.m.u

75. A mixture of 7g of nitrogen and 8g of oxygen at STP occupies a volume of

1) 11,200 mL 2) 22, 400 mL 3) 2240 mL 4) 5600 mL

76. The elements 'A' and 'B' combine together to give two compounds A_2B_3 and AB_2. The weight of 0.2 mole of A_2B_3 is 26gm. The weight of 0.3 mole of AB_2 is 24gm. Then the atomic weights of A and B respectively

1) 15,20 2) 20,25 3) 20,30 4) 25,30

77. 40 ml of a hydrocarbon undergoes combustion in 260ml of oxygen and gives 160ml of CO_2. If all volumes are measured under similar conditions of temperature and pressure, the formula of the hydrocarbon is

1) C_3H_8 2) C_4H_8 3) C_6H_{14} 4) C_4H_{10}

78. 0.2 mole of an alkane on complete combustion gave 26.4g of CO_2. The molecular weight of alkane is

1) 16 2) 30 3) 44 4) 58

79. 0.4g of a compound on complete combustion gave 56ml of CO_2 at 760mm and 0^0C. The percentage of carbon in the compound is

1) 50 2) 60 3) 27.5 4) 7.5

80. The relative number of atoms of different elements in a compound are as follows. A=1.33, B=1 and C=1.5. The empirical formula of the compound is

1) $A_2B_2C_3$ 2) ABC 3) $A_8B_6C_9$ 4) $A_3B_3C_4$

81. A dibasic acid containing C, H and O was found to contain C=26.7% and H=2.2%. The vapour density of its dimethyl ester was found to be 73. The molecular formula of the acid is

1) CH_2O_2 2) $C_2H_2O_4$ 3) $C_3H_3O_4$ 4) $C_2H_4O_4$

82. In a compound C, H and N atoms are present in 9:1 : 3.5 by weight. Molecular weight of compound is 108. Molecular formula of compound is

1) $C_2H_6N_2$ 2) C_3H_4N 3) $C_6H_8N_2$ 4) $C_9H_{12}N_3$

EXERCISE - I

1) 4	2) 4	3) 1	4) 2	5) 2
6) 3	7) 2	8) 4	9) 3	10) 1
11) 1	12) 1	13) 2	14) 2	15) 2
16) 4	17) 1	18) 2	19) 1	20) 1
21) 1	22) 2	23) 2	24) 4	25) 4
26) 3	27) 4	28) 2	29) 4	30) 1
31) 1	32) 4	33) 2	34) 1	35) 3
36) 4	37) 2	38) 2	39) 2	40) 1

41) 3	42) 3	43) 3	44) 3	45) 1
46) 1	47) 2	48) 3	49) 1	50) 2
51) 1	52) 1	53) 3	54) 3	55) 1
56) 3	57) 2	58) 2	59) 4	60) 1
61) 4	62) 4	63) 2	64) 3	65) 1
66) 3	67) 4	68) 1	69) 1	70) 4
71) 3	72) 2	73) 2	74) 3	75) 3
76) 3	77) 1	78) 2	79) 2	80) 2
81) 3	82) 4	83) 1	84) 3	85) 2
86) 3	87) 4	88) 1	89) 1	90) 1
91) 1	92) 2	93) 4	94) 2	95) 3
96) 3				

EXERCISE - II

1) 3	2) 3	3) 2	4) 3	5) 3
6) 2	7) 2	8) 2	9) 3	10) 4
11) 4	12) 2	13) 3	14) 3	15) 2
16) 4	17) 4	18) 2	19) 1	20) 3
21) 3	22) 1	23) 1	24) 3	25) 3
26) 1	27) 1	28) 4	29) 3	30) 1
31) 1	32) 1	33) 2	34) 2	35) 3
36) 4	37) 3	38) 2	39) 2	40) 2
41) 3	42) 1	43) 4	44) 1	45) 1
46) 3	47) 3	48) 4	19) 3	50) 2
73) 2	74) 3	77) 3	79) 3	81) 3
82) 3	84) 4	85) 4	86) 1	90) 3
91) 3	92) 3	93) 2	94) 4	96) 1
51) 2	52) 1	53) 2	54) 3	55) 4
56) 1	57) 2	58) 3	59) 2	60) 1
61) 3	62) 4	63) 3	64) 4	65) 3
66) 2	67) 3			

EXERCISE- IA

Comprehension I

Mole of any reagent contains 6.023×10^{23} particles. The particles may be atom, molecule, ions, electron, proton and neutron. One mole of atom is equal to 1 gm-atom which is equal to atomic weight of atom. 1 gm-molecule of any gas is 1 mole of gas whose volume is 22.4 litre at N.T.P.

SOME BASIC CONCEPTS OF CHEMISTRY (STOICHIOMETRY)

1. The volume of 3.011×10^{23} atoms of hydrogen gas at N.T.P. is:

   1) 1.12 litres 2) 2.24 litres 3) 2.8 litres 4) 5.6 litres

2. Mass of 1 atom of an element X_2 is 6.64×10^{-23} gm. Molecular wt. of X_2 is about:

   1) 80 2) 60 3) 40 4) 20

3. In a reaction 1 Kg of O_2 gas was produced at 273°C and 2 atm. How many gm-atoms of O_2 will be present in 1 Kg O_2?

   1) 31.25 gm-atom 2) 62.5 gm-atom 3) 15.63 gm-atom 4) 125 gm-atom

Comprehension II

In chemistry, 'mole' is an essential tool for the chemical calculations. It is a basic S.I. unit adopted by the 14th general conference on weights and measurements in 1971. A mole contains as many elementary particles as the number of atoms present in 12 g of C. 1 mole of a gas at STP occupies 22.4 litre volume. Molar volume of solids and liquids is not definite. Molar mass of a substance is also called gram atomic mass or gram molar mass. The virtual meaning of mole is plenty, heap or the collection of large numbers. 1 mole of a substance contains 6.023×10^{23} elementary particles like atom or molecule. Atomic mass unit {amu) is the unit of atomic mass, e.g., atomic mass of single carbon is 12 amu.

4. The mass of one amu is approximately:

   1) 1 g 2) 0.5 g 3) 1.66×10^{-24}g 4) 3.2×10^{-24} g

5. 5.6 litre of a gas at STP are found to have a mass of 22 g. The molecular mass of the gas is:

   1) 22 2)44 3) 88 4) 33

6. The mass of one molecule of water is approximately:

   1) 1 g 2) 0.5 g 3) 1.66×10^{-24} g 4) 3.2×10^{-23} g

7. How many atoms are present in 49 g of H_2SO_4?

   1) $7 \times 6.023 \times 10^{23}$ 2) $5 \times 6.023 \times 10^{23}$ 3) $6\times6.023\times 10^{23}$ 4) $7 \times 3.02 \times 10^{23}$

8. x L N_2 gas at STP contains 3×10^{22} molecules. The number of molecules in x L ozone at STP will be:

   1) 3×10^{22} 2) 4×10^{23} 3) 6.02×10^{23} 4) 3×10^{2}

Comprehension - III

Isotopes are the atoms of same element; they have same atomic number but different mass numbers. Isotopes have different number of neutrons in their nucleus. If an element exists in two isotopes having atomic masses 'a' and 'b' in the ratio m : n, then average atomic mass will be mxa + nxb /m + n

Different isotopes of same element have same position in the periodic table. The elements which have single isotope are called monoisotropic elements. Greater is the percentage composition of an isotope, more will be its abundance in nature.

9. The isotopes of chlorine with mass number 35 and 37 exist in the ratio of Its average atomic mass is 35.5:

   1) 1 : 1 2) 2 : 1 3) 3 : 1 4) 3 : 2

10. Which of the following isotopes is/are used to decide the scale of atomic mass?

    1) $_6C^{12}$ 2) $_6C^{14}$ 3) $_8O^{16}$ 4) $_7N^{14}$

11. Atomic mass of boron is 10.81. It has two isotopes namely ${}_5B^{11}$ and ${}_5B^{x}$ with their relative abundance of 80% and 20% respectively. The value of x is:

1) 10.05 2) 10 3) 10.01 4) 10.02

12. The ratio of the mass of C-12 atom to that of an atom of element X (whose atomicity is four) is 1:9. The molecular mass of element X is:

1) 480 g mol^{-1} 2) 432 g mol^{-1} 3) 36 g mol^{-1} 4) 84 g mol^{-1}

13. C-12 and C-14 isotopes are found as 98% and 2% respectively in any sample. Then, the number of C-14 atoms in 12 g of the sample will be:

1) 1.5 mole atoms 2) 1.032×10^{22} atoms 3) 2.06×10^{21} atoms 4) 2 g atoms

Comprehension - IV

Empirical formula is the simplest formula of the compound which gives the atomic ratio of various elements present in one molecule of the compound. However, the molecular formula of the compound gives the number of atoms of various elements present in one molecule of the compound.

Molecular formula = (Empirical formul1) x n

$$n = \frac{Molecular\ \ mass}{Empirical\ \ formula\ \ mass}$$

A compound may have same empirical and molecular formula. Both these formulae are calculated using percentage composition of constituent elements.

Answer the following questions:

14. Which of the following compounds have same empirical formula?

1) Acetic acid 2) Glucose 3) Sucrose 4) Formaldehyde

15. Which of the following represents the formula of a substance which contains 50% oxygen?

1) N_2O 2) CO_2 3) NO_2 4) CH_3OH

16. An oxide of iodine (I = 127) contains 25.4 g of iodine and 8 g of oxygen. Its formula could be:

1) I_2O_3 2) I_2O 3) I_2O_5 4) I_2O_7

17. 10 g of hydrofluoric acid gas occupies 5.6 litres of volume at STP. If the empirical formula of the gas is HF, then its molecular formula in the gaseous state will be:

1) HF 2) H_2F_2 3) H_3F_3 4) H_4F_4

Comprehension - V

Read the following passage and answer the questions based on it. Oxidation state (or number) of all elements in free or uncombined state is zero. If oxidation state of any element in a compound is fractional, it is average oxidation state of the element which is present in different oxidation states. Oxidising agent gains electrons and reducing agent lose electrons. In redox reactions oxidation and reduction occur simultaneously and there will be exchange of electrons from reductant to oxidant.

18. Oxidation state of N^1, N^2, N^3 and H in HN_3 i.e., $H-N^3=N^2=N^1$ are respctively

1) 0,0,-1,+1 2) -l, 0, 0,+1/3 3) +1/3,+1/,+1/3,+14) 0, +2/3, +1/3, 0

19. Equivalent weight of chlorine molecule in the reaction $3Cl_2 + 6NaOH \rightarrow 5NaCl + NaClO_3 + 3H_2O$, will be:

1) 35.5 2) 7.1 3) 21.3 4) 42.6

20. How much volume of 0.1 M FeC_2O_4 solution will be required to reduce 200 mL of 0.6 M $K_2Cr_2O_7$ acidic solution:
1) 600mL 2) 120ml 3) 2400 mL 4) 3000 mL

Comprehension - VI

10 moles of SO_2 and 4 moles of O_2 are mixed in a closed vessel of volume 2 litres. The mixture is heated in presence of Pt catalyst. Following reaction takes place:

$$2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$$

Assuming the reaction proceeds to completion.

21. Select the correct statement:
1) SO_2 is the limiting reagent 2) O_2 is the limiting reagent
3) Both SO_2 and O_2 are limiting 4) Cannot be predicted

22. Number of moles of SO_3 formed in the reaction will be:
1) 10 2) 4 3) 8 4) 14

23. Number of moles of excess reactant remaining:
1) 4 2) 2 3) 6 4) 8

24. The calculation on the given reaction is based on:
1) Boyle's law 2) Charles' law 3) Gay-Lussac's law 4) Avogadro's hypothesis

25. Total number of moles of gaseous component after the reaction will be.
1) increase 2) decrease
3) remain same 4) may increase or decrease

Comprehension - VII

Read the following passage and answer the following questions. Oleum is mixture of H_2SO_4 and SO_3, i.e., $H_2S_2O_7$ which is obtained by passing SO_3 in solution of H_2SO_4. In order to dissolve SO_3 in oleum, dilution of oleum is done by water in which oleum is converted into pure H_2SO_4 as shown below: $H_2SO_4 + SO_3 + H_2O \rightarrow 2H_2SO_4(pure)$

When 100 gm oleum is diluted with water then total mass of diluted oleum is known as percentage labelling in oleum. For example: 109% H_2SO_4 labelling of oleum sample means that 109 gm pure H_2SO_4 is obtained on diluting 100 gm oleum with 9 gm H_2O which dissolved all free SO_3 in oleum.

26. If the number of moles of free SO_3, H_2SO_4 and H_2O be x, y and z, respectively in 118% H_2SO_4 labelled oleum, the value of (x+ y+ z) is:
1) 2.2 2) 3.2 3) 3.4 4) 4.2

27. How much volume of 1.00 M NaOH will be required to neutralise 118% H_2SO_4 labelled oleum:
1) 1.204 litre 2) 1.806 litre 3) 2.408 litre 4) 4.816 litre

28. In '109% H_2SO_4' labelled oleum, the percent of free SO_3 and H_2SO_4 are:
1) 30%, 70% 2) 40%, 60% 3)60%, 40% 4) 15%, 85%

Comprehension - VIII

Read the following passage and answer the questions based on it. H_2O_2 acts both as oxidant and reducing agent. H_2O and O_2 are products when H_2O_2 acts as oxidant and reducing agent respectively. The strength of H_2O_2 is expressed in terms of molarity, normality, % strength and volume strength. H_2O_2 decomposes as $H_2O_2 \rightarrow H_2O + 1/2O_2(g)$ i.e., one mole O_2 is released from 2 mole H_2O_2 'X' 'volume' strength of H_2O_2 means 1 volume (mL or litre) of H_2O_2

sample released x volume (mL or litre) O_2 gas at NTP on its decomposition.

Hence molarity = x/11.2 moles per litre, i.e., normality of H_2O_2 = x/5.6

Thus volume strength, i.e. , x = 5.6 x Normality. weight of H_2O_2 (in gm) present in 100 mL H_2O_2 solution is called percentage strength of H_2O_2

29. The percentage strength of 20 'vol' H_2O_2 is

1) 10% 2) 6.06% 3)22% 4) 15%

30. How much volume of H_2O_2 solution of 22.4 'vol' strength is required to oxidise 6.3 gm oxalic a c i d :

1)10mL 2)11.2mL 3) 25 mL 4) 30 mL

31. 50 mL of H_2O_2 solution were diluted to 200 mL and l0 mL of this diluted H_2O_2 solution reduced 10 mL of 0.1 M $KMnO_4$ acidic solution. The volume strength of H_2O_2 is:

1) 2.8'Vol' 2) 5.6'Vol' 3) 11.2'Vol' 4) 22.4 'Vol'

Comprehension - IX

Read the following passage and answer the following questions based on it. There are two types of iodine titration (1) lodometric & (2) Iodimetric. lodometric method is indirect method of I_2 estimation. Any oxidant which liberates I_2 from KI solution, the liberated iodine is estimated by titrating it with $Na_2S_2O_3$ solution as: $I_2 + 2Na_2S_2O_3 \rightarrow 2NaI + Na_2S_4O_6$

32. 100 mL of 'x' M $K_2Cr_2O_7$ solution is added to excess of KI solution in acidic medium. The liberated iodine required 50 mL of 0.1N $Na_2S_2O_3$ solution. The value of x is:

1) 1/10 M 2) 1/20 M 3) 1/12 M 4) 1/120 M

33. 3 gm $CuSO_4.5H_2O$ sample containing inert impurity reacted with KI and liberated I_2 reacted with 10 mL of 0.5 M $Na_2S_2O_3$. The percentage purity of $CuSO_4.5H_2O$ is:

1) 21.58% 2) 41.58% 3) 51.58% 4) 61.58%

34. 8.25 gm oxalic acid is oxidised by 50 mL of 0.1 M $KMnO_4$ solution in presence of H^+ ions. The remaining $KMnO_4$ was heated with excess of KI solution and the liberated I_2 was titrated with 10 mL of 0.05 M $Na_2S_2O_3$ solution. The percentage of purity of oxalic acid is:

1) 8.6% 2) 18.7% 3) 25.8% 4) 34.4%

Comprehension - X

Molarity is number of moles of solute dissolved per litre of the solution while normality is number of gm-equivalent of solute dissolved per litre of solution. Molality is number of moles of solute dissolved per Kg of solvent. Normality and molarity change with change of temperature of solution but molality is independent of temperature. In case of monobasic acid normality and molarity are equal but in dibasic acid or base molarity is two times of normality. In redox and neutralisation processes number of milliequivalents of reactants as well as products are always equal.

35. When 1000 mL of 0.5 M HC1 solution was heated, 2.25 gm HC1 was lost and volume of Solution became 750 mL. The molarity of resulting solution will be about:

1) 0.75 M 2) 0.075 M 3) 0.58M 4)1.16M

36. The volume of 0.1 M $Ca(OH)_2$ required to neutralise 0.2 M H_3PO_3 solution of volume 0.25 dm^3 will be:

1)100mL 2) 250 mL 3) 500 mL 4) 750 mL

SOME BASIC CONCEPTS OF CHEMISTRY (STOICHIOMETRY)

EXERCISE - IIB

1.

COLUMN-I	COLUMN-II
A) CrO_5	P) 6.4 x (specific heat)$^{-1}$
B) Mole fraction	Q) +6
C) Atomic mass	R) No. of molecules in 1cm^3 of gas at N.T.P.
D) Loschmidt Number	S) Independent of temperature

2

COLUMN-I	COLUMN-II
A) 1 a.m.u.	P) Independent of temperature
B) 2.4gm of Mg^{2+}	Q) 21.08 $\times 10^{23}$ neutrons
C) 11.2 L NH_3 at N.T.P.	R) 6.023 $\times 10^{23}$ electrons
D) Molality	S) 1.66x10^{-27}kg

3.

COLUMN-I	COLUMN-II
A) 96 g of ozone	P) 2.41 $\times 10^{23}$ hybridised orbitals
B) 1.6 gm CH_4	Q) 3.61 $\times 10^{23}$ hybridised orbitals
C) 2.24 L C_2H_4 at N.T.P.	R) 6gm-atom
D) 0.054 L H_2O	S) 2.9 $\times 10^{21}$ O - H bonds

4.

COLUMN-I	COLUMN-II
A) 22.4 volume of H_2O_2	P) Dibasic
B) 32 g of O_2	Q) 9.034 x 10^{23} atoms
C) 11.2 L CO_2 at S.T.P.	R) 2.0 moles L^{-1}
D) H_3PO_3	S) 9.64 $\times 10^{24}$ electrons

5.

COLUMN-I	COLUMN-II
A) $Cu^{2+} + I^- \rightarrow I_2 + ...$	P) Eq. wt. of oxidant = M.wt/6
B) $Cu^{2+} + Cl^- \rightarrow CuCl_2 + ...$	Q) Eq. wt. of oxidant = M.wt/5
C) $MnO_4^- + H^+ + e^- \rightarrow Mn^{2+} + ...$	R) Eq. wt. of oxidant = M.wt/1
D) $Cr_2O_7^{2-} \rightarrow Cr_2O_3......$	S) Eq. wt. of oxidant = M.wt/2

6. Match the stoichiometric coefficients listed in Column II with the species listed in Column I and involved in the balanced equation of the reaction :

$$FeC_2O_4 + MnO_4^- + H^+ \rightarrow Fe^{3+} + Mn^{2+} + CO_2 + H_2O$$

COLUMN-I	COLUMN-II
A) FeC_2O_4	P) 10
B) MnO_4^-	Q) 24
C) H^+	R) 5
D) CO_2	S) 3

7. 2.0 L water gas was mixed with 8.0 L of air $\left(H_2 : O_2 = 4:1 \; by \;\; volume\right)$ and ignited. The resulting gaesous mixture was cooled to 25^{0}C and successively brought in contact with aqueous KOH and alkaline pyrogallol. If all volumes were measured at 25^{0}C and 1atm pressure, match the following

COLUMN-I	COLUMN-II
A) Total volume of mixture that results	P) 6.4 L
B) Contraction in volume by aqueous KOH	Q) 0.6 L
C) Contraction in volume by alkaline pyrogallol	R) 1.0 L
D) Volume of residual gas	S) 9 L .

8. Match type of the salt formed with the appropriate reaction.

COLUMN-I	COLUMN-II
Reaction	**Type of Salt**
A) 1 mole of oxalic acid + 1 Mole of NaOH	P) Mixed salt
B) 1 mole of H_3PO_2 + 1 mole KOH	Q) Basic salt
C) 1 mole of $Ca(OH)_2$ + 1 mole of HCl	R) Acid salt
D) Dry slaked lime + Cl_2	S) Normal salt

9.

COLUMN-I	COLUMN-II
A) $\underset{0.1\,mol}{N_2} + \underset{0.1\,mol}{3H_2} \rightarrow 2NH_3$	P) 4.16×10^{-2} mol Product was formed
B) $\underset{1g}{H_2} + \underset{1g}{2C} \rightarrow C_2H_2$	Q) 4.16×10^{-2} mol Product was formed
C) $\underset{0.5g}{C} + \underset{(22.4L\ at\ NTP)}{O_2} \rightarrow CO_2$	R) 6.25×10^{-2} mol Product was formed
D) $\underset{1g}{2H_2} + \underset{1g}{O_2} \rightarrow 2H_2O$	S) 6.67×10^{-2} mol Product was formed

EXERCISE - IA

1) 4	2) a	3) 2	4) 3	5) 3	6) 4	7) 4	8) a	9) 3	10) a,3
11) 2	12) 2	13) 2	14) 24	15) 4	16) 3	17) 2	18) a	19) 4	20) 3
21) 2	22) 3	23) 2	24) 3	25) 2	26) a	27) 3	28) 2	29) 2	30) 3
31) 3	32) 4	33) 2	34) 2	35) 3	36) 3				

EXERCISE- IIB

1) A - Q ; B - S ; C - P ; D - R
2) A - S ; B - R ; C - Q ; D - P
3) A - R ; B - P ; C - Q ; D - R
4) A - R ; B - S ; C - Q ; D - P
5) A - R ; B - S ; C - Q ; D - P
6) A - R ; B - S ; C - Q ; D - P
7) A - S ; B - R ; C - Q ; D - P
8) A - R ; B - S ; C - Q ; D - P,
9) A - S ; B - P ; C - Q ; D - R

EXERCISE - I

1. Which of the following is not a fundamental particle?
   1) Proton 2) Neutron 3) Alpha particle 4) Electron

2. A neutral atom (At.no. >1) has
   1) electron and proton 2) neutron and electron
   3) neutron, electron and proton 4) neutron and proton

3. The study of discharge of electricity through gases led to the discovery of
   1) Structure of the atom 2) Nucleus
   3) Spectral lines 4) Electron

4. Electron is a particle having a
   1) negative charge of one unit and zero mass
   2) positive charge of one unit and zero mass
   3) negative charge of one unit and a mass of about 9.1×10^{-31} kg
   4) negative charge of one unit and a mass of about 1.67×10^{-27} kg .

5. The value of e/m for an electron is
   1) 1.78×10^{8} c/g 2) 1.6724×10^{-24} c/g 3) 0.005486 c/g 4) 1.00866 c/g

6. Charge of electron is
   1) 1.602×10^{-10} Coulomb 2) 4.8×10^{-10} coulomb
   3) 1.602×10^{-19} e.s.u 4) 4.8×10^{-10} e.s.u

7. The e/m of proton is
   1) 1.78×10^{8} c/g 2) 9.57×10^{4} c/g 3) 19.14×10^{4} c/g 4) 0.478×10^{4} c/g

8. Atomic number is equal to the
   1) number of neutrons in the nucleus 2) number of protons in the nucleus
   3) sum of protons and neutrons 4) atomic mass of the element.

9. A & Z can be
   1) negative 2) fractional 3) zero 4) Whole number

10. The number of protons electrons and neutrons in ${}^{80}_{35}Br$ are respectively
    1) 35, 35, 80 2) 35, 35, 45 3) 80, 80, 35 4) 45, 45, 35

11. Which one of the following is an isobar of ${}_{6}C^{14}$?
    1) ${}_{6}C^{13}$ 2) ${}_{6}C^{12}$ 3) ${}_{7}N^{14}$ 4) ${}_{7}N^{15}$

12. Number of protons in the nucleus of carbon atom is
    1) 7 2) 8 3) 4 4) 6

13. The number of nucleons in chlorine–37 is
    1) 17 2) 20 3) 54 4) 37

14. The nucleus of an atom contains
    1) Electrons and protons 2) Protons and neutrons
    3) Electrons and beta particles 4) Protons and alpha particles

15. The isotopes of neutral atoms of an element differ in

1) Atomic number 2) Mass number 3) Number of electrons 4) Chemical properties

16. The nucleus of tritium consists of

1) 1 proton + 1 neutron 2) 1 proton + 3 neutrons

3) 1 proton + zero neutrons 4) 1 proton + 2 neutrons

17. Sodium ion is isoelectronic with -- atom

1) Mg^{2+} 2) Al^{3+} 3) Ne 4) N^{3-}

18. An atom differs from its ion in

1) Nuclear charge 2) Mass number 3) Number of electrons 4) Number of neutrons

19. In C^{14} isotope the number of neutrons would be

1) 6 2) 14 3) 8 4) 10

20. The number of neutrons in the dipositve zinc ion (Mass no. of Zn = 65)

1) 35 2) 33 3) 65 4) 67

21. Rutherford's alpha ray scattering experiment showed for the first time that the atom has

1) Nucleus 2) Proton 3) Electron 4) Neutron

22. The radius of the atom is of the order of (PMT)

1) 10^{-10} cm 2) 10^{-13} cm 3) 10^{-15} cm 4) 10^{-8} cm

23. When alpha particles are sent through athin metal foil, most of them go straight through the foil because

1) Alpha particles are much heavier than electrons

2) Alpha particles are positively charged

3) Most part of the atom is empty 4) Alpha particles move with high velocity

24. Identify the incorrectly matched set from the following

SET - A	SET - B
1) Wavelength(λ)	Nanometre
2) Frequency (υ)	Hertz
3) Wave number ($\bar{\upsilon}$)	metre^{-1}
4) Velocity (C)	ergs

25. Einstein was awarded Noble Prize for

1) General theory of relativity 2) The equation, $E = mc^2$

3) Enunciation of quantum theory 4) Explanation of photoelectric effect

26. In electromagnetic radiation, which of the following has greater wavelength than visible light?

1) U.V-rays 2) I.R-rays 3) Gamma rays 4) X-rays

27. Which of the following is not an electromagnetic radiation?

1) Gamma rays 2) Alpha rays 3) Radio waves 4) X-rays

28. The energy of a photon is inversely proportional to its

1) Wavelength 2) Frequency 3) Wave number 4) Velocity

29. The value of Planck's constant is

1) 6.626×10^{-27}Js 2) 6.626×10^{-34}Js 3) 6.023×10^{23}Js 4) 1.602×10^{-19}Js

30. Which of the following properties of a wave is independent of the other?
1) Wave number 2) Wave length 3) Frequency 4) Amplitude

31. The radiation with highest wave number
1) Microwaves 2) X - rays 3) I.R. - rays 4) Radiowaves

32. Which of the following relates to photon both as wave motion and as a stream of particles?
1) $E = mc^2$ 2) Photoelectric effect 3) Diffraction 4) $E = h\nu$

33. The metal best used in photoelectric cells is
1) Na 2) Mg 3) Al 4) Cs

34. The energy required to emit an electron from the surface of a metal is called
1) Activation energy 2) Threshold energy 3) Critical energy 4) Kinetic energy

35. Kinetic energy of photoelectrons is independent on --------- of incident radiation.
1) Wavelength 2) Wave number 3) Frequency 4) Intensity

36. (A) : K and Cs are commonly used in photoelectric cells.
(R) : K and Cs can emit electrons when exposed to light of lesser frequency.
1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false
4) (A) is false but (R) is true

37. If the wavelength of an electomagnetic radiation is 2000^0A. What is the energy in ergs?
1) 9.94×10^{-12} 2) 9.94×10^{-10} 3) 4.97×10^{-12} 4) 4.97×10^{-19}

38. The energy of a photon is 3×10^{-12} ergs. What is its wavelength in nm ?
($h= 6.62 \times 10^{-27}$ erg. sec;$C=3\times10^{10}$Cm.s^{-1})
1) 662 2) 1324 3) 66.2 4) 6.62

39. The frequency associated with photon of radiation having a wavelength of $6000A^0$ is
1) 5×10^{14} Hz 2) 5×10^{10} Hz 3) 2×10^{14} Hz 4) 5×10^{15} Hz

40. The wave number of the radiation whose quantum is 1 erg is
1) 5×10^{15} cm^{-1} 2) 15×10^{5} cm^{-1} 3) 1.5×10^{15} cm^{-1} 4) 5×10^{5} cm^{-1}

41. Energy of a photon with a wave length of 450 nm is
1) 4.36×10^{-12} ergs 2) 4.36×10^{-13} ergs 3) 4.36×10^{-20} ergs 4) 4.36×10^{-11} ergs

42. A wave has a frequency of 3×10^{15} sec^{-1}. The energy of that photon is
1) 1.6×10^{-12} erg 2) 3.2×10^{-11} erg 3) 2.0×10^{-11} erg 4) 3×10^{15} erg

43. The wave length of light having wave number 4000 cm^{-1} is
1) 2.5 μm 2) 250 μm 3) 25 μm 4) 25nm

44. The energy of an electromagnetic radiation is 19.875×10^{-13} ergs. What is the wave number in cm^{-1}? ($h = 6.625 \times 10^{-27}$ erg.sec; $c = 3 \times 10^{10}$ cm.sec^{-1})
1) 1000 2) 10^6 3) 100 4) 10,000

45. Line spectrum is characteristic of

1) Atoms 2) Molecules
3) Any substance in solid state 4) Any substance in liquid state

46. The spectrum obtained from incandescent solids is

1) Continuous 2) Line 3) Band 4) Absorption

47. The wavelenghts of which series lie in the ultraviolet region?

1) Lyman 2) Balmer 3) Paschen 4) None of the above

48. (A) : Hydrogen has only one electron in its orbit but produces several spectral lines

(R) : There are many excited energy levels available in a sample of Hydrogen gas

1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false
4) (A) is false but (R) is true

49. When electron jumps from 5^{th} energy level to 1^{st} energy level, to which series the spectral line belongs?

1) Balmer 2) Lyman 3) Paschen 4) Pfund

50. When the electron in the 'H' atom jumps from the fifth orbit to the second orbit, the spectral line emitted is found in ---- region.

1) Visible 2) Ultraviolet 3) Near IR 4) Far IR

51. The following series of lines is found in the ultraviolet region of hydrogen atomic spectrum

1) Balmer 2) Paschen 3) Brackett 4) Lyman

52. Brackett series is produced when the electrons from outer orbits jump to

1) Third orbit 2) Second orbit 3) Fourth orbit 4) Fifth orbit

53. The equation corresponding to the wave number of spectral lines in Pfund series is

1) $R\left[\frac{1}{4^2}-\frac{1}{5^2}\right]$ 2) $R\left[\frac{1}{3^2}-\frac{1}{4^2}\right]$ 3) $R\left[\frac{1}{2^2}-\frac{1}{3^2}\right]$ 4) $R\left[\frac{1}{5^2}-\frac{1}{6^2}\right]$

54. n_1 value in Balmer series is

1) 2 2) 1 3) 3 4) 0

55. The value of Rydberg constant is

1) 109677 cm^{-1} 2) 109700 cm^{-1} s^{-1} 3) 10968 cm^{-1} 4) 10970 m

56. A spectral line with λ = 4938A^0 belongs to the - series of Hydrogen atom

1) Lyman 2) Balmer 3) Parchen 4) Pfund

57. Among the first lines of Lyman, Balmer, Paschen and Brackett series in hydrogen atomic spectra, which has higher energy?

1) Lyman 2) Balmer 3) Paschen 4) Bracket

58. What are the values of n_1 and n_2 respectively for H_b line in the Lyman series of hydrogen atomic spectrum?

1) 3 and 5 2) 2 and 3 3) 1 and 3 4) 2 and 4

59. The fourth line of the Balmer series corresponds to the electronic transition between two

orbits of the H atom, Identify the orbits.

1) 3 and 1 2) 5 and 1 3) 5 and 2 4) 6 and 2

60. In a H–atom, the transition takes place from L to K shell. If R = $1.08 \times 10^7 m^{-1}$, the wave length of the light emitted is nearly

1) 4400A° 2) 1250A° 3) 1650A° 4) 1850A°

61. The wave length of first member of Balmer series of a hydrogen atom is nearly (The value of Rydberg constant R = $1.08 \times 10^7 m^{-1}$)

1) 4400A° 2) 5500A° 3) 6600A° 4) 7700A°

62. The wave length of H_δ line of Balmer series of a hydrogen atom is nearly (R = $1.08 \times 10^7 m^{-1}$)

1) 4090A° 2) 5400A° 3) 6800A° 4) 7200A°

63. The first emission line of hydrogen atomic spectrum in the Balmer series appears at (R=Rydberg constant)

1) $\frac{5R}{36}$ cm^{-1} 2) $\frac{3R}{4} cm^{-1}$ 3) $\frac{7R}{144} cm^{-1}$ 4) $\frac{9R}{400} cm^{-1}$

64. What is the wave length of H_b line in Balmer series of hydrogen spectrum? (R = Rydberg constant)

1) 36/5R 2) 5R/36 3) 3R/16 4) 16/3R

65. If in Hydrogen atom, an electron jumps from n_2=2 to n_1= 1 in Bohr's orbit, then the value of wave number of the emitted photon will be (R=109700 cm^{-1})

1) 54850 cm^{-1} 2) 82275 cm^{-1} 3) 62875 cm^{-1} 4) 10970 cm^{-1}

66. The wavelength of the radiation emitted, when in hydrogen atom electron falls from infinity to stationary state 1, would be (Rydberg constant $1.097 \times 10^7 m^{-1}$)

1) 91 nm 2) 9.1×10^{-8} nm 3) 406 nm 4) 192 nm

67. The first use of quantum theory to explain the structure of atom was made by

1) Planck 2) Einstein 3) Bohr 4) Heisenberg

68. Bohr's theory is applicable to

1) Li^{+2} 2) Li^+ 3) He^+ 4) Both 1 and 3

69. Bohr's theory is not applicable to

1) H 2) He^+ 3) Li^{2+} 4) H^+

70. (A) : Bohr's orbits are called stationary orbits

(R) : Electrons remain stationary in these orbits for some time

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false

4) (A) is false but (R) is true

71. If the electron of a hydrogen atom is present in the first orbit, the total energy of the electron is

1) $\frac{-e^2}{r}$ 2) $\frac{-e^2}{r^2}$ 3) $\frac{-e^2}{2r}$ 4) $\frac{-e^2}{2r^2}$

72. The angular momentum of an electron present in the excited state of hydrogen is $1.5h/\pi$. The electron is present in

1) Third orbit 2) Second orbit 3) Fourth orbit 4) Fifth orbit

73. According to Bohr's theory, the angular momentum of electron in 5th orbit is

1) 2.5 h/p 2) 25 h/p 3) 1.0 h/p 4) 10 h/p

74. The angular momentum of a revolving electron in an orbit is equal to

1) $\frac{nh}{2\pi}$ 2) $\frac{h}{2\pi}$ 3) $\left(\frac{nh}{2\pi}\right)^2$ 4) $\frac{n\pi}{2h}$

75. Energy of an electron in n^{th} Bohr orbit is given as

1) $-\frac{n^2h^2}{4\pi^2mZe^2}$ 2) $-\frac{2\pi^2Z^2me^4}{n^2h^2}$ 3) $-\frac{2\pi Ze^2}{nh}$ 4) $-\frac{n^2h^2}{2\pi^2Z^2me^4}$

76. The energy of the electron when it is at an infinite distance from the nucleus is

1) Infinity 2) Zero 3) Minimum 4) Can not be predicted

77. According to Bohr's theory, when ever the electron drops from a higher energy level to a lower energy level, the frequency of radiation emitted is related to the energy change as

1) $\lambda = \frac{h}{m\nu}$ 2) $m\nu r = \frac{nh}{2\pi}$ 3) $\upsilon = \frac{\Delta E}{h}$ 4) $\upsilon = \frac{h}{\Delta E}$

78. In an atom when an electron jumps from K-shell to M-shell

1) Energy is absorbed 2) Energy is emitted

3) Energy is neither absorbed nor emitted 4) Sometimes energy is absorbed and some times emitted

79. The expression for radius of a Bohr orbit in hydrogen atom is

1) $\frac{nh}{2\pi mr}$ 2) $\frac{n^2h^2}{4\pi^2me^2}$ 3) $-\frac{2\pi^2me^4}{n^2h^2}$ 4) $\frac{n^2}{4\pi^2mhe^2}$

80. As the electron moves away from the nucleus its potential energy --- and kinetic energy ---

1) Decreases, increases 2) Increases, increases

3) Decreases, decreases 4) Increases, decreases

81. Identify the correctly matched set from the following lists

LIST - A	**LIST - B**
I) Energy	a) $\frac{2\pi ze^2}{nh}$
II) Velocity	b) $-\frac{2\pi^2mz^2e^4}{n^2h^2}$
III) Rydberg constant	c) $\frac{2\pi^2mz^2e^4}{h^3c}$
IV) Radius	d) $\frac{n^2h^2}{4\pi^2mze^2}$
	e) $-\frac{4\pi^2mz^2e^4}{n^2h^2}$

1) I – e, II – a, III – c, IV – d 2) I – b, II – a, III – c, IV – d

3) I – e, II – b, III – e, IV – d 4) I – b, II – a, III – d, IV – c

82. Bohr's model can explain

1) The spectrum of hydrogen atom only

2) Spectrum of an atom or ion containing one electron only

3) The spectrum of hydrogen molecule

4) The solar spectrum

83. Splitting of spectral lines under the influence of strong magnetic field is called
1) Stark effect 2) Zeeman effect 3) Photoelectric effect 4) None of these

84. Radius of tenth Bohr orbit of the hydrogen atom is.
1) 0.53A° 2) 5.3A° 3) 53A° 4) 5.3 × 5A°

85. Radius of 3rd Bohr orbit is
1) 6.529A° 2) 2.116A° 3) 4.761A° 4) 8.464A°

86. Velocity of the electron in the 1st Bohr orbit
1) 2.18×10^{8} cm/sec 2) 2.18×10^{8} m/sec 3) 2.18×10^{16} cm/se 4) 36559×10^{8} cm/sec

87. The energy that is needed to remove an electron from the 1st Bohr orbit of Hydrogen atom is
1) 2.72 ev 2) 40.8 ev 3) 13.6 ev 4) 54.4 ev

88. The speed of an electron in the inner most orbit of the hydrogen (Bohr radius = 52.9 pm; me = 9.11×10^{-31} kg) is
1) 2.19×10^{4} $m.s^{-1}$ 2) 2.19×10^{6} $m.s^{-1}$ 3) 2.19×10^{7} $m.s^{-1}$ 4) 2.19×10^{8} $m.s^{-1}$

89. The energy of an electron present in Bohr's second orbit of hydrogen atom is
1) –1312 J $atom^{-1}$ 2) – 328 kJ mol^{-1} 3) – 328 J mol^{-1} 4) – 164 kJ mol^{-1}

90. The de-Broglie's equation treats an electron to be
1) a particle 2) a wave 3) ray 4) both (1) and (2)

91. Wavelength of the wave associated with a moving electron
1) Decreases with increase in speed of electron 2) Increases with increase in speed of electron
3) Remains same irrespective of speed of electron 4) is zero.

92. The uncertainity principle and the concept of wave nature of matter were proposed by ------ and ------ respectively
1) Pauli, Hund 2) Heisenberg, Aufbau
3) Heisenberg, de Broglie 4) Heisenberg, Planck

93. Bohr's postulate that $mvr = \frac{nh}{2\pi}$ is proved mathematically by
1) Pauli's exclusion principle 2) de Broglie wave nature of the electron
3) Heisenberg's uncertainity principle 4) Sommerfield theory

94. The momentum of a particle of wave length 1A° is
1) 6.625×10^{-27} g. $cm.s^{-1}$ 2) 6.625×10^{-19} g. $cm.s^{-1}$
3) 6.625×10^{-16} g. $cm.s^{-1}$ 4) 6.625×10^{-23} g. $cm.s^{-1}$

95. The de Broglie wavelength of a particle with mass 1 g and velocity 100 m/s is
1) 6.63×10^{-33} m 2) 6.63×10^{-34} m 3) 6.63×10^{-35} m 4) 6.63×10^{-36} m

96. The de Broglie wave length of a riffle bullet of mass 2 grams moving with a velocity of 2m/sec is
1) $\frac{6.6\times10^{-34}}{2\times2}$ m 2) $\frac{6.6\times10^{-27}}{2\times10^{-3}\times2}$ cm 3) $\frac{6.6\times10^{-34}}{2\times10^{-3}\times2}$ m 4) $\frac{6.6\times10^{-27}}{2\times2}$ m

97. A cricket ball of mass 0.5kg is moving with a velocity of 100 $m.s^{-1}$, the wavelength associated

with its motion is

1) 13.25×10^{-26}m 2) 13.25×10^{-34}m 3) 13.25×10^{-36}m 4) 6.6×10^{-34}m

98. If the Planck's constant h = 6.6×10^{-34} Js, the de- Broglie's wave length of a particle having momentum of 3.3×10^{-24} kg.ms^{-1} will be

1) 2×10^{-10}m 2) 1×10^{-15} m 3) 10^{-5}m 4) 4×10^{-10} m

99. The de Broglie wave length associated with a particle of mass 1 mg moving with a velocity of 1 m/sec is

1) 6.63×10^{-29} m 2) 6.63×10^{-31} m 3) 6.63×10^{-28} m 4) 6.63×10^{-22} m

100. The de Broglie wavelength of a tennis ball of mass 60 g moving with a velocity of 10 metres per second is approximately

1) 10^{-33} metres 2) 10^{-31} metres 3) 10^{-16} metres 4) 10^{-25} metres

101. The de Broglie wavelength associated with a ball of mass, 200 g and moving at a speed of 5 metres/hour, is in the order of (h = 6.625×10^{-34} Js)

1) 10^{-15} m 2) 10^{-20} m 3) 10^{-25} m 4) 10^{-30} m 5) 10^{-35} m

102. If uncertainity in position is zero, the uncertainity in momentum of an electron will be

1) Zero 2) Infinity 3) Unity 4) Zero or infinity

103. Identify the correct set from the following for fundamental particles

LIST - A	LIST - B
I) Decreasing order of masses	a) $e^- > p > n$
II) Decreasingorder of e/m values	b) $p > e^- > n$
III) Decreasing order of de-Broglie's wavelength with same velocities	c) $n > p > e^-$
IV) Decreasingorder of uncertainity in velocity when Δ x is same	d) $n > e^- > p$

The correct match is

1) I – c, II – a, III – d, IV – a 2) I – c, II – a, III – a, IV – a
3) I – c, II – d, III – b, IV – a 4) I – c, II – b, III – d, IV – a

104. Uncertainity in position of a minute particle of mass 25g in space is 10^{-5} m. What is the uncertainity in its velocity (in ms^{-1}) ? (h = 6.6×10^{-34} Js)

1) 2.1×10^{-34} 2) 0.5×19^{-34} 3) 2.1×10^{-28} 4) 0.5×10^{-23}

105. The uncertainity in momentum of an electron is 1×10^{-5} kg.m/s. The uncertainity in its position will be (h = 6.62×10^{-34} kg.m/s)

1) 1.05×10^{-28} m 2) 1.05×10^{-26} m 3) 5.27×10^{-30} m 4) 5.27×10^{-28} m

106. The uncertainity in the momentum of a particle is 3.31×10^{-2} kgms^{-1}. The uncertainity in its position is (in metres)

1) 1.59×10^{-33} 2) 0.33×10^{-30} 3) 0.4×10^{-20} 4) 3.3×10^{-24}

107. According to Schrodinger model, nature of electron in an atom is as

1) Particles only 2) Wave only
3) Both simultaneously 4) Sometimes waves and sometimes particles

108. Which one of the following expressions represent the electron probability function (D)
1) $4\pi r\ dr\ \psi^2$ 2) $4\pi r^2\ dr\ \psi$ 3) $4\pi r^2\ dr\ \psi^2$ 4) $4\pi r\ dr\ \psi$

109. Radial part of the wave function depends on quantum numbers
1) n and s 2) l and m 3) l and s 4) n and l

110. p-orbitals are --- degenerate
1) Two fold 2) Three fold 3) Four fold 4) Five fold

111. Number of nodal planes that a p-orbital has
1) 0 2) 1 3) 2 4) 3

112. Which of the following is correct with respect to 'p' orbitals?
1) Spherical 2) Strong directional character
3) Five fold degenerate 4) No directional character

113. The maximum number of electrons accommodated in 5f orbitals
1) 5 2) 10 3) 14 4) 18

114. The maximum probability of finding an electron of a particular energy in an orbital is about
1) 80% 2) 85% 3) 95% 4) 99%

115. Number of nodal spaces in 4s orbital is
1) 0 2) 1 3) 3 4) 4

116. (A) : The p-orbital has dumb-bell shape
(R) : Electron present in p-orbital can have any one of the three values of magnetic quantum numbers (0, +1, –1)
1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false
4) (A) is false but (R) is true

117. The number of nodal planes for P_x orbital is
1) 1 2) 2 3) 3 4) 0

118. Number of nodes in 3p orbital is
1) 0 2) 1 3) 2 4) 3

119. The orbital without nodal planes is
1) 1s 2) 2p 3) 3d 4) 3p

120. The no.of spherical nodes in a 4s orbital is
1) Zero 2) 1 3) 2 4) 3

121. Which d-orbital has its four lobes along the axes
1) d_{xy} 2) $d_{x^2-y^2}$ 3) d_{z^2} 4) d_{xz}

122. The density of electron cloud of the orbital d_{xy} in yz plane is
1) Zero 2) Maximum 3) Not determined 4) None

123. The probability of finding an electron in p_y orbital along the x-axis is
1) Maximum 2) Zero 3) Not determined 4) Infinite

124. The number of nodes and nodal planes in 4p orbital are respectively

1) 2, 1 2) 1, 2 3) 2, 3 4) 3, 2

125. The number of nodes possible in radial probability distribution curve of 3d orbital is

1) 1 2) 2 3) 3 4) 0

126.The number of nodal planes 'd' orbital has

1) Zero 2) one 3) two 4) three

127. In the radial probability distribution curve for the 2s orbital of the hydrogen atom, the minor maximum, the node and the major maximum occur at the following distances from the nucleus respectively

1) $1.1A^o, 0.53A^o, 2.6A^o$ 2) $0.53A^o, 1.1A^o, 2.6A^o$

3) $2.6A^o, 1.1A^o, 0.53A^o$ 4) $0.53A^o, 2.116A^o, 2.6A^o$

128. (A) : There are two nodal regions in 3s- orbital

(R) : There is no nodal plane in 3s orbital

The correct answer is

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false 4) (A) is false but (R) is true

129.

LIST - 1	LIST - 2
A) Bohr's atomic model	1) Fine spectrum of Hydrogen
B) de-Broglie's concept	2) Atomic orbital
C) Sommerfield atomic model	3) Dual nature of any particle in motion
D) Schrodinger wave equation	4) Quantisation of angular momentu

The correct match is

	A	B	C	D		A	B	C	D
1)	2	3	4	1	2)	4	3	2	1
3)	4	3	1	2	4)	3	4	2	1

130. For complete description of an electron in an atom, the number of quantum numbers required is

1) one 2) Two 3) Three 4) Four

131. The azimuthal quantum number indicates .... of the orbital

1) Size 2) Shape 2) Orientation 4) Spin

132. Which of the following is indicated by the magnetic quantum number?

1) Size 2) Shape 3) Spatial orientation 4) Spin

133. Principal quantum number is related to

1) Size of the orbital 2) Spin angular momentum

3) Orbital angular momentum 4) Orientation of orbital in space

134. The spin quantum number has a value of

1) 1/2 2) +1/2 3) –1/2 4) either +1/2 or –1/2

135. When there are two electrons in the same orbital they have .... spins

1) $+\frac{1}{2}, +\frac{1}{2}$ 2) $-\frac{1}{2}, -\frac{1}{2}$ 3) $+\frac{1}{2}, -\frac{1}{2}$ 4) 0,0

136. The values of quantum numbers n, l and m for the fifth electron of boron is

1) n = 2, l = 1, m = –1 2) n = 2, l = 0, m = –1 3) n = 2, l = 2, m = –1 4) n = 1, l = 2, m = –1

137. When n=3, l =1, the designation given to the orbital is

1) 4s 2) 4p 3) 3s 4) 3p

138. Which of the following designation is impossible?

1) 4f 2) 5g 3) 2d 4) 6p

139. l = 3, then the values of magnetic quantum numbers are

1) $\pm 1, \pm 2, \pm 3$ 2) $0, \pm 1, \pm 2, \pm 3$ 3) -1, -2, -3 4) 0, +1, +2, +3

140. For a f-orbital, the values of m are

1) -1, 0, +1 2) 0, +1, +2, +3 3) -2, -1, 0, +1, +2 4) -3, -2, -1, 0, +1, +2, +3

141. The impossible set of quantum numbers is

1) n = 2, l = 0, m = 0 , s = +1/2 2) n = 2, l = 1, m = 0 , s = +1/2

3) n = 2, l = 0, m = 1 , s = –1/2 4) n = 3, l = 1, m = -1 , s = –1/2

142. Which of the following quantum numbers are not possible ?

1) n = 2, l = 1, m = –1, s = –1/2 2) n = 3, l = 2, m = –3, s = + 1/2

3) n = 2, l = 0, m = 0, s = +1/2 4) n = 3, l = 2, m = –2, s = +1/2

143. The correct set of quantum numbers for the unpaired electron of chlorine atom is

	n	l	m		n	l	m
1)	2	1	0	2)	2	1	1
3)	3	1	0	4)	3	0	0

144. The two electrons occupying an orbital are distinguished by

1) Principal quantum number 2) Azimuthal quantum number

3) Magnetic quantum number 4) Spin quantum number

145. Which of the following sets of quantum numbers is correct for an electron in 4 f orbital ?

1) n = 4, l = 3, m = + 4, s = +1/2 2) n = 3, l = 2, m = –2, s = +1/2

3) n = 4, l = 3, m = +1, s = +1/2 4) n = 4, l = 4, m = – 4, s = – 1/2

146. The set of quantum numbers not applicable to an electron is

1) 1, 1, 1, +1/2 2) 1, 0, 0, +1/2 3) 1, 0, 0, -1/2 4) 2, 0, 0, +1/2

147. For the p_z orbital, conventionally m is

1) –2 2) +2 3) 0 4) Any of these

148. For the d_{z^2} orbital, the value of m may be

1) –3 2) –2 3) 0 4) None

149. The qunatum number not obtained from the Schrodinger's wave equation is

1) n 2) l 3) m 4) s

150. A given orbital is labelled by the magnetic quantum number, m= –1. This can not be

1) s- orbital 2) p-orbital 3) d-orbital 4) f-orbital

151. The shape of orbital for which l = 1 is

1) Spherical 2) Dumb-bell 3) Double dumb-bell 4) Circular

152. The maximum number of electrons in a sub-shell is given by the expression.

1) (l+2) 2) (2l+2) 3) (4l+2) 4) (l+1)

153. The magnetic quantum number, m for the outermost electron in the sodium atom is

1) 1 2) 0 3) 2 4) -1

154. For the configuration $1s^2 2s^1$, the quantum numbers for the outermost electron are

1) 2,1,0, –1/2 2) 2,0,0,+1/2 3) 2,1,0,+1/2 4) 2,0,1,+1/2

155. The maximum number of electrons that a p-orbital can accomodate is

1) 6 2) 2 3) 10 4) 14

156. The number of orbitals in the quantum level n = 4 is

1) 4 2) 9 3) 16 4) 18

157. The quantum number which is equal for all the d-electrons in an atom is

1) l 2) m 3) s 4) n

158. Correct set of four quantum numbers for the valence electron of Rubidium (Z=37) is

1) 5, 0, 0, +1/2 2) 5, 1, 0, +1/2 3) 5, 1, 1, +1/2 4) 6, 0, 0, +1/2

159. n, l and m values of the $2p_z$ orbital are

1) 3,2,1 2) 2,1,0 3) 1,2,0 4) 2,0,1

160. The azimuthal quantum number for the last electron in sodium atom is

1) 1 2) 2 3) 0 4) 3

161. Which of the following is not a possible value of azimuthal quantum number (l) for an electron with n = 3?

1) zero 2) 1 3) 2 4) 3

162. Maximum number of electrons that can be present in M and N - shells respectively are

1) 18, 32 2) 8, 18 3) 32, 50 4) 32, 48

163. What is the maximum number of electrons that can be theoretically present in the seventh orbit?

1) 49 2) 32 3) 72 4) 98

164. The correct set of quantum numbers for a 4d electron is

1) 4, 3, 2, +1/2 2) 4, 2, 1, 0 3) 4, 3, –2, +1/2

4) 4, 2, 1, –1/2 5) 4, 2, –2, 0

165. Which of the following sets of quantum numbers is correct for an electron in 4f - orbitals?

1) n = 4, l = 3, m = 4, s = +1/2 2) n = 4, l = 4, m = –4, s = –1/2

3) n = 4, l = 3, m = +1, s = +1/2 4) n = 3, l = 2, m = –2, s = +1/2

166. No two electrons in an orbital can have parallel spin. This statement emerges from
1) Hund's rule 2) Aufbau principle
3) Pauli's exclusion principle 4) (n+l) rule

167. Electrons never pair, if there are empty orbitals in a given sub-shell. This is
1) Aufbau principle 2) Paulis exclusion principle
3) Hund's rule of maximum multiplicity 4) Heisenberg's uncertainity principle

168. Which of the following explains the sequence of filling electrons in different subshells?
1) Hund's rule 2) Aufbau principle 3) Pauli's principle 4) All of these.

169. Nitrogen atom has 3 unpaired electrons in its ground state. It can be explained by
1) Auf - bau principle 2) Paulis principle 3) Hund's rule 4) None of these

170. The electronic configuration of sodium is
1) $[Ne]3s^2$ 2) $[Ne]3s^1$ 3) $[Ar]4s^1$ 4) $[Ar]4s^2$

171. Which of the following may represent the ground state of nitrogen atom?
1) $\boxed{\downarrow\uparrow}\boxed{\downarrow\uparrow}\ \boxed{\uparrow}\boxed{\downarrow}\boxed{\downarrow}$ 2) $\boxed{\downarrow\uparrow}\boxed{\downarrow\uparrow}\ \boxed{\uparrow}\boxed{\uparrow}\boxed{\uparrow}$
3) $\boxed{\downarrow\uparrow}\boxed{\downarrow\uparrow}\ \boxed{\downarrow}\boxed{\downarrow}\boxed{\uparrow}$ 4) $\boxed{\downarrow\uparrow}\boxed{\uparrow}\ \boxed{\downarrow}\boxed{\uparrow\downarrow}\boxed{\downarrow}$

172. Electronic configuration of the element with atomic number 56 and mass number 138 is
1) $[Xe]6s^2$ 2) $[Kr]5s^2$ 3) $[Xe]6s^2\,6p^2$ 4) $[Xe]3d^2\,5d^2$

173. (A) : The electronic configuration of boron cannot be $1s^2 2s^3$,
(R) : No two electrons in an atom can have the same set of all the four quantum numbers
1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false
4) (A) is false but (R) is true

174. The correct valence electronic configura-tion for Cu (Z =29) is
1) $3d^9\,4s^2$ 2) $3d^{10}\,4s^1$ 3) $3d^{10}\,4s^2$ 4) $3d^8\,4s^2$

175. Which one of the following pairs of ions have the same electronic configuration
1) Cr^{3+}, Fe^{3+} 2) Fe^{3+}, Mn^{2+} 3) Fe^{3+}, Co^{3+} 4) Sc^{3+}, Cr^{3+}

176. The (n + l) value for 4f-sub shell is
1) 4 2) 5 3) 6 4) 7

177. The energy of the electron in the hydrogen atom depends on
1) The principal quantum number only 2) All the quantum numbers
3) The Azimuthal quantum number 4) The principal and azimuthal quantum numbers

178. After 3d-sub level is completely filled the differentiating electron enters into -- sub level.
1) 4s 2) 4p 3) 4f 4) 5s

179. The correct ground state electronic configuration of chromium atom is

1) [Ar] $3d^5 4s^1$ 2) [Ar] $3d^4 4s^2$ 3) [Ar] $3d^6$ 4) [Ar] $3d^5 4s^2$

180. The configuration $1s^2 2s^2 2p^6 3s^2 3p^3$ corresponds to

1) S 2) P 3) Na 4) Ar

181. The configuration $1s^2 2s^1 2p_x^1 2p_y^1 2p_2^1$ represents

1) Nitrogen atom (ground state) 2) Carbon atom (ground state)

3) An excited carbon atom 4) An excited nitrogen atom

182. The total number of 'p' electrons present in phosphorous atom is

1) 9 2) 2 3) 8 4) 3

183. The valence electron configuration of an element with atomic number 23 is

1) $3d^5$ 2) $3d^3 4s^2$ 3) $3d^2 4s^1 4p^1$ 4) $3d^2 4s^2 4p^1$

184. Mg^{2+} and Al^{3+} have same

1) Protons 2) Neutrons

3) Electronic configuration 4) Neutrons + protons

185. The number of unpaired electrons in the valence shell of silicon is

1) 2 2) 3 3) 1 4) 0

EXERCISE - II

1. If λ_0 & λ be threshold wavelength & wavelength of incident light, the velocity of photo electron ejected from the metal surface is

1) $\sqrt{\frac{2h}{m}(\lambda_0 - \lambda)}$ 2) $\sqrt{\frac{2hc}{m}(\lambda_0 - \lambda)}$ 3) $\sqrt{\frac{2hc}{m}\left(\frac{\lambda_0 - \lambda}{\lambda_0 \lambda}\right)}$ 4) $\sqrt{\frac{2h}{m}\left(\frac{1}{\lambda} - \frac{1}{\lambda_0}\right)}$

02. A light source of wavelength 'λ' illuminates on a metal surface, a photoelectron of K.E 1 eV is emitted. The another light source of wavelength $\lambda/3$ ejects photo electron from the same metal surface with K.E is 4eV, the value of work function is

1) 1 eV 2) 2 eV 3) 4 eV 4) 0.5 eV

03. Threshold frequency of metal is f_0. When light of frequency $\vartheta = 2f_0$ is incident on the metal plate, velocity of electron emitted in V_1. When a frequency of incident radiation is $5f_0$, V_2 is velocity of emitted electron, then $V_1 : V_2$ is

1) 1 : 4 2) 1 : 2 3) 2 : 1 4) 4 : 1

04. When light of wavelength 470 nm falls on the metal surface, photo electrons emitted with a velocity $6.4 \times 10^4 m/s$. Then work function of metal is

1) $421.14 \times 10^{-21} J/mole$ 2) $421.14 \times 10^{-21} J/atom$

3) $253.6\ KJ/mole$ 4) $213.6\ KJ/atom$

05. Which of the following characteristic property of a metal should have to exhibit photoelectric effect

1) Low ionisation potential 2) High ionisation potential

3) High electronegativity 4) High electron affinity

06. The wavelength & number of spectral lines for an electronic transition is depends on

1) Number of electrons undergoing transition

2) Nuclear charge of atom

3) Difference in the energy of energy levels involved in the transition

4) The velocity of an electron undergoing transition.

07. The wavelength of H-spectrum lines in given as

$\lambda = c\left(\dfrac{n^2}{n^2-4}\right)$ when $n > 2$ the value of constant 'e' in the above expression is

1) $3\times10^5 m/\sec$ 2) $3\times10^{10} cm/\sec$ 3) $1.06\times10^7 m$ 4) $364.7\ nm$

08. Ratio of m[th] to n[th] wavelength of Lyman series in H-spectrum in equal to

1) $\dfrac{\lambda_m}{\lambda_n} = \dfrac{(m^2-1)\times n^2}{(n^2-1)\times m^2}$ 2) $\dfrac{\lambda_m}{\lambda_n} = \dfrac{(m+1)^2}{(n+1)^2}\times\dfrac{(n+1)^2-1}{(m+1)^2-1}$

3) $\dfrac{\lambda_m}{\lambda_n} = \dfrac{(n+1)^2}{(m+1)^2}\times\dfrac{(m+1)^2-1}{(n+1)^2-1}$ 4) $\dfrac{\lambda_m}{\lambda_n} = \dfrac{(n^2-1)\times m^2}{(m^2-1)\times n^2}$

09. If the first emission in the Lyman series of H-spectrum occurs at $\lambda = 121.5\,nm$ then, energy difference (KJ mole^{-1}) between the first & second shell of H-atom

1) $985\,KJ\ mole^{-1}$ 2) $9850\,KJ\ mole^{-1}$ 3) $9.85\,KJ/mole$ 4) $98.5\,KJ/mole$

10. If λ_v, λ_x & λ_m represents the wavelength of visible light, x-ray & microwave respectively, then :

1) $\lambda_m > \lambda_v > \lambda_x$ 2) $\lambda_m > \lambda_x > \lambda_v$ 3) $\lambda_v > \lambda_m > \lambda_x$ 4) $\lambda_v > \lambda_x > \lambda_m$

11. The which of the following statements are incorrect about the photoelectric effect

1) The kinetic energy of photo electron depends on nature of metal

2) The no. of photo electrons is proportional to the energy of light incident

3) The kinetic energy of photo electron is proportional to the intensity of light

4) Highly electropositive metals like cesium can exhibit photo electric effect

12. The kinetic energy (KE) of photoelectron emitted on irradiating a metal surface with frequency 'ϑ' is related by KE = $h\vartheta$ -IE. The plots of K.E vs incident frequency ϑ shows

1) A straight line, slope equal to plank's constant

2) A straight line with intercept on x-axis equal to the product of threshold frequency & plank's constant

3) A straight line with extrapolated on y-axis is equal to IE

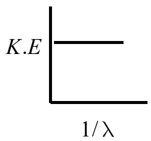
4) A straight line with intercept on-x-axis equal to threshold frequency

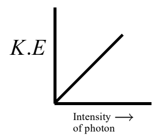
13. The photoelectric emission requires a threshold frequency ϑ_0 for a certain metal. If incident photons has wavelengths $\lambda_1 = 2200\,\overset{0}{A}$ & $\lambda_2 = 1900\,\overset{0}{A}$ produce two photo electrons with KE_1 & KE_2 receptivity & $KE_1 = 2KE_2$. Then

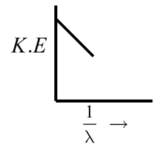
1) ϑ_0 is $1.1483\times10^{15}\sec^{-1}$ 2) λ_0 is $2.6126\times10^{-7}m$

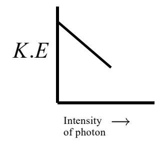
3) λ_0 is $1.1483\times10^{-16}m$ 4) ϑ_0 is $2.16\times10^{-7}\sec^{-1}$.

14. Which of the following graph(s) are incorrect about photoelectric effect.

1) 

2) 

3) 

4) 

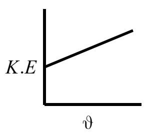
15. A certain photon emitted by an excited Li^{+2} sample is unable to ionise a H-atom sample from grand state then the photon can be related as following transition in Li^{+2} sample

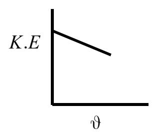
1) First line of Lyman series
2) Last line of Bracket series
3) Second line of Balmer series
4) Second line of Paschen series

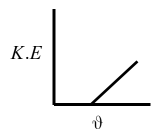
16. The value of constant 'R' in the following expression $\overline{\vartheta} = R\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$ is

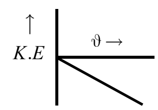
1) $2.18 \times 10^{-18} J/atom$
2) $3.29 \times 10^{-15} s^{-1}$
3) $1.09677 \times 10^{7} m^{-1}$
4) $9.1086 \times 10^{-8} m$

17. Which of the following graphs represents photoelectric effect

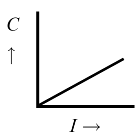
1) 

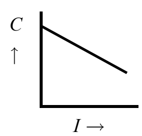
2) 

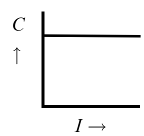
3) 

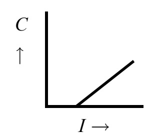
4) 

18. The graph between photo electron current (3) & intensity of photon (I)

1) 

2) 

3) 

4) 

19. Kinetic energy of photo electron varies with

1) Nature of metal
2) Intensity
3) Amplitude
4) Both A & C

EXERICSE- I

1) 3	2) 3	3) 4	4) 3	5) 1	6) 4	7) 2	8) 2	9) 4	10) 2
11) 3	12) 4	13) 4	14) 2	15) 2	16) 4	17) 3	18) 3	19) 3	20) 1
21) 1	22) 4	23) 3	24) 4	25) 4	26) 2	27) 2	28) 1	29) 2	30) 4
31) 2	32) 4	33) 4	34) 2	35) 4	36) 1	37) 1	38) 1	39) 1	40) 1
41) 1	42) 3	43) 1	44) 4	45) 1	46) 1	47) 1	48) 1	49) 2	50) 1
51) 4	52) 3	53) 4	54) 1	55) 1	56) 2	57) 1	58) 3	59) 4	60) 2
61) 3	62) 1	63) 1	64) 4	65) 2	66) 1	67) 3	68) 4	69) 4	70) 3
71) 3	72) 1	73) 1	74) 1	75) 2	76) 2	77) 3	78) 1	79) 2	80) 4
81) 2	82) 2	83) 2	84) 3	85) 3	86) 1	87) 3	88) 2	89) 2	90) 4
91) 1	92) 3	93) 2	94) 2	95) 1	96) 3	97) 3	98) 1	99) 3	100) 1
101) 4	102) 2	103) 2	104) 3	105) 3	106) 1	107) 3	108) 3	109) 4	110) 2
111) 2	112) 2	113) 3	114) 3	115) 3	116) 2	117) 1	118) 2	119) 1	120) 4
121) 2	122) 1	123) 2	124) 1	125) 4	126) 3	127) 2	128) 3	129) 2	130) 4
131) 2	132) 3	133) 1	134) 4	135) 3	136) 1	137) 4	138) 3	139) 2	140) 4
141) 3	142) 2	143) 3	144) 4	145) 3	146) 1	147) 3	148) 3	149) 4	150) 1
151) 2	152) 3	153) 2	154) 2	155) 2	156) 3	157) 1	158) 1	159) 2	160) 3
161) 4	162) 1	163) 4	164) 4	165) 3	166) 3	167) 3	168) 2	169) 3	170) 2
171) 2	172) 1	173) 1	174) 2	175) 2	176) 4	177) 1	178) 2	179) 1	180) 2
181) 3	182) 1	183) 2	184) 3	185) 1					

EXERCISE - II

01) 3	02) 4	03) 2	04) 2	05) 1	06) 3	07) 4	08) 2	09) 1	10) 1
11) 23	12) 134	13) 12	14) 1234	15) 24	16) 1234	17) 3	18) 1	19) 1	

EXERCISE - I

1. The maximum number of elements available in elemental form
   1) 26 2) 92 3) 111 4) 118
2. Which of the following is Dobereiner triad
   1) Li, Na, K 2) Fe, Co, Ni 3) Ru, Rh, Pd 4) Os, Ir, Pt
3. Number of short periods in short form of periodic table
   1) 3 2) 2 3) 4 4) 6
4. Considering the chemical properties, atomic weight of the element 'Be' was corrected based on
   1) Valency 2) Configuration 3) Density 4) Atomic volume
5. Eka silicon is now known as
   1) Scandium 2) Gallium 3) Germanium 4) Boron
6. The element 'Sc' is known long back as
   1) eka-aluminium 2) eka-boron 3) eka-silicon 4) eka-mercury
7. By taking chemical properties into consideration, the atomic weights of the following elements were corrected
   1) Te & I 2) Ar & K 3) Co & Ni 4) Be & In
8. Anomalous pair among the following is
   1) Boron - Silicon 2) Beryllium - Indium
   3) Aluminium - Gallium 4) Cobalt - Nickel
9. The longest and shortest periods are
   1) 1 & 6 2) 2 & 6 3) 6 & 1 4) 1 & 7
10. The number of elements present in 2nd, 3rd, 4th and 5th periods of modern periodic table respectively are
    1) 2, 8, 8 & 18 2) 8, 8, 18 & 32 3) 8, 8, 18 & 18 4) 8, 18, 18 & 32
11. Which of the following pair of elements are from the same group of the periodic table
    1) Mg, Cs 2) Mg, Sr 3) Mg, Cl 4) Na, Cl
12. Elements of a vertical group have
    1) Same atomic number 2) Same electronic configuration
    3) Same number of valency electrons 4) Same number of core electrons
13. The general electronic configuration of elements of carbon family
    1) $ns^2\ np^4$ 2) $ns^2\ np^3$ 3) $ns^2\ np^1$ 4) $ns^2\ np^2$
14. Outer shell 'octet' configuration is observed for the elements of the group
    1) 2 2) 8 3) 18 4) 32
15. The starting element of fifth period is
    1) K 2) Rb 3) Kr 4) Xe

16. Element with atomic number 15 and mass number 31 is present in
1) group 5 and period 4 2) group 5 and period 3
3) group 15 and period 3 4) group 15 and period 4

17. In the periodic table, the elements are arranged in the periods following the
1) Hund's rule of maximum multiplicity 2) Pauli's exclusion principle
3) Aufbau principle 4) Both (1) and (2)

18. Which of the following pairs of atomic numbers represents elements belonging to the same group?
1) 11, 20 2) 12, 30 3) 13, 31 4) 14, 33

19. As per the modern periodic law, the physical and chemical properties of elements are periodic functions of their (E1998)
1) atomic number 2) electronic configuration
3) atomic weight 4) atomic size

20. An element with atomic number 20 will be placed in which period of the periodic table?
1) 4 2) 3 3) 2 4) 1

21. If the atomic number of an element is 33, it will be placed in the periodic table in the
1) First group 2)Third group 3) Fifth group 4) Seventh group

22. The number of periods present in the long form of the periodic table
1) 6 2) 7 3) 8 4) 18

23. The electronic configuration of group III elements is
1) $ns^2\ np^3$ 2) ns^2np^5 3) ns^2np^1 4) ns^2np^2

24. The total number of gaseous elements are
1) 8 2) 9 3) 10 4) 11

25. In a period, elements are arranged in strict sequence of
1) Decreasing charges in the nucleus 2) Increasing charges in the nucleus
3) Constant charges in the nucleus 4) Equal charges in the nucleus

26. The general electronic configuration of d-block elements is
1) $ns^{1-2}\ (n-1)d^{1-10}$ 2) $ns^2(n-1)d^1(n-2)f^{1-14}$ 3) $ns^{1-2}\ (n-1)d^{1-9}$ 4) $ns^{1-2}\ np^6\ (n-1)d^{1-10}$

27. Identify the correctly matched set among the following
1) Scandium-d-block-representative element
2) Lanthanum-d-block-innertransition element
3) Cerium - f - block - transition element
4) Actinium - d - block - transition element

28. The representative elements get the nearest inert gas configuration
1) By losing electrons 2) By gaining electrons
3) By sharing electrons 4) By losing or gaining or sharing electrons

29. In transition elements, the shells that are incompletely filled
1) Ultimate shell only 2) Penultimate shell only
3) Both ultimate & penultimate shells 4) Outermost three shells

30. The characteristic properties of transition elements are due to
1) Unpaired electrons in d-subshell
2) d-orbitals have five fold degeneracy
3) Presence of 2 nodal planes for d-orbital
4) Because they belong to d-block

31. Rare earths are generally
1) Actinides
2) f-block elements
3) Inner transition elements
4) Lanthanides

32. Lanthanum belongs to
1) s-block 2) p-block 3) d-block 4) f-block

33. In the periodic table transition elements begin with
1) Scandium 2) Zinc 3) Copper 4) Mercury

34. Inert gas element which has a different valence shell configuration
1) Xe 2) Ne 3) Kr 4) He

35. Atomic numbers of actinides are
1) 57 to 71 2) 80 to 103 3) 58 to 71 4) 90 to 103

36. Most of the non-metals are present in the long form of the periodic table in
1) p-block 2) f-block 3) d-block 4) s-block

37. Metal used as catalyst in the hydrogenation of vegetable oils
1) Iron 2) Molybdenum 3) Nickel 4) Sodium

38. The 4f-subshell is successively filled for
1) Rare earths 2) Rare gases 3) Transition metals 4) Alkaline earth metals

39. The role of 'Molybdenum' in Haber's synthesis is
1) A positive catalyst 2) A negative catalyst 3) Poison for catalyst 4)Promoter for catalyst

40. The period in which s-block, p-block and d-block elements are present
1) 1 2) 6 3) 7 4) 3

41. Elements of p-block are
1) Only non-metals
2) Only metalloids
3) Metalloids and non-metals
4) Metalloids, non-metals and metals

42. The following ion is colourless in aqueous solution
1) Ca^{2+} 2) Sc^{3+} 3) Zn^{2+} 4) all the above

43. Which of the following configuration corresponds to an inert gas?
1) $1s^2\ 2s^2\ 2p^5$ 2) $1s^2\ 2s^2\ 2p^6$ 3) $1s^2 2s^1$ 4) $1s^2\ 2s^2\ 2p^6\ 3s^1$

44. The rare gas that is most abundant in the atmosphere is
1) He 2) Ne 3) Ar 4) Kr

45. In lanthanides, the differentiating electron enters into
1) d - subshell 2) f - subshell 3) p - subshell 4) s - subshell

46. Which is not a transition metal?
1) Ag 2) Pb 3) Cr 4) Pt

47. The general electronic configuration $(n\text{-}1)d^3ns^2$ indicates that the particular element belong to the group
1) VB 2) VA 3) IVB 4) IIB

48. The electronic configuration of chromium is

1) [Ar] $4d^4 4s^2$ 2) [Ar] $4d^5 4s^1$ 3) [Ar] $3d^4 3s^2$ 4) [Ar] $3d^5 4s^1$

49. Which of the following pairs of ions have the same electronic configuration

1) Cr^{+3}, Fe^{+3} 2) Fe^{+3}, Mn^{+2} 3) Fe^{+3}, Co^{+3} 4) Sc^{+3}, Cr^{+3}

50. The electronic configuration $1s^2 2s^2 2p^6 3s^2 3p^4$ represents

1) Oxygen 2) Magnesium 3) Calcium 4) Sulphur

51. What is wrong about transition metals?

1) They are diamagnetic 2) They are paramagnetic

3) They form complexes 4) They show variable oxidation state

52. Which of the following is a rare earth element?

1) Cadmium 2) Californium 3) Cerium 4) Cesium

53. Variable valency is exhibited by

1) Normal elements 2) Metallic elements

3) Transitional elements 4) Non-metallic elements

54. Which one of the following is correct about stability of the given ions (2003)

1) $Pb^{2+} > Pb^{4+}$ 2) $Pb^{4+} > Pb^{2+}$ 3) $Si^{2+} > Si^{4+}$ 4) $Sn^{4+} > Sn^{2+}$

55. The transition element among the following is

1) Cu 2) Sn 3) Pb 4) Zn

56. Which of the following is not a periodic property

1) Valency 2) Specific heat

3) Ionisation portential 4) Atomic size

57. Elements of the same vertical group of the periodic table have

1)same atomic size

2) same electronic configuration

3) same number of electrons in outermost shell of their atoms

4) same number of atoms

58. The appoximate size of an atom is

1) 10^{-6}m 2) 10^{-8}m 3) 10^{-10}m 4) 10^{-12}m

59. Atomic radius is measured by

1) Mulliken oil drop method 2) Rutherford's a-ray scattering experiment

3) X-ray diffraction technique 4) Electric discharge tube experiment

60. Atomic radius depends upon

1) Number of bonds formed by the atom 2) Nature of the bonding

3) Oxidation state of the atom 4) All the above

61. Covalent bond length of chlorine molecule is 1.98Å. Then covalent radius of chlorine is

1) 1.98Å 2) 1.7Å 3) 2.05Å 4) 0.99Å

62. Van der waal's radius is used for

1) Molecular substances in gaseous state only

2) Molecular substances in solid state only

3) Molecular substances in liquid state only 4) Molecular substances in any state

63. If the atomic radius of non-metal bromine is 1.14Å, its covalent radius is

1) 1.14Å 2) 1.12Å 3) 1.16Å 4) 0.57Å

64. The covalent and van der waals radii of chlorine respectively are

1) 1.80Å & 0.99Å 2) 0.99Å & 1.80Å 3) 1.80Å & 1.80Å 4) 0.99Å & 0.99Å

65. In the isoelectronic species the ionic radii (A^o) of N^{3-}, O^{2-}, F^- are respectively given by

1) 1.36, 1.71, 1.40 2) 1.36, 1.40, 1.71 3) 1.71, 1.36, 1.40 4) 1.71, 1.40, 1.36

66. Correct statement among the following is

1) Covalent radius is 40% more than Van der waals radius

2) Van der waals radius is less than covalent radius

3) Van der waal's radius is 40% more than covalent radius

4) Radii cannot be compared

67. Very slight decrease in atomic radius occurs in a transition series when compared with that in a representative series. This is due to

1) Shielding effect 2) Penetrating effect 3) Compton effect 4) Inert pair effect

68. Separation of Lanthanides from their mixture is not easy because of

1) Shielding effect 2) Penetrating effect

3) Consequences of lanthanide contraction 4) Inert pair effect

69. If the radius of Fe^{++} is 0.76A^o; the radius of Fe^{+++} is

1) 0.64A^o 2) 0.76A^o 3) 0.88A^o 4) 1.08A^o

70. Among elements with the following electronic configurations, the one with the largest radius is

1) $1s^2\ 2s^2\ 2p^6\ 3s^2$ 2) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$ 3) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$ 4) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$

71. Largest ion among the following is

1) Na^+ 2) O^{-2} 3) S^{-2} 4) Cl^-

72. Which of the following has the largest atomic radius ?

1) Al 2) Si 3) Cl 4) Na

73. Which of the following order is correct for the size of Fe^{3+}, Fe and Fe^{2+} ?

1) $Fe < Fe^{2+} < Fe^{3+}$ 2) $Fe^{2+} < Fe^{3+} < Fe$ 3) $Fe < Fe^{3+} < Fe^{2+}$ 4) $Fe^{3+} < Fe^{2+} < Fe$

74. Metallic radius of Ca is 200pm. Covalent radius of Ca is

1) 200 pm 2) 230 pm 3) 280 pm 4) 174 pm

75. Similarity in the radius of Zr and Hf is explained on the basis of

1) Lanthanide contraction 2) Inert pair effect

3) Same outershell configuration 4) Anomalous configuration

76. Which one is the correct order of the size of the iodine species?

1) $I > I^+ > I^-$ 2) $I > I^- > I^+$ 3) $I^+ > I^- > I$ 4) $I^- > I > I^+$

77. The correct sequence which shows decreasing order of the ionic radii of the elements is

1) $Na^+ > Mg^{2+} > Al^{3+} > O^{2-} > F^-$ 2) $Na^+ > F^- > Mg^{2+} > O^{2-} > Al^{3+}$

3) $O^{2-} > F^- > Na^+ > Mg^{2+} > Al^{3+}$ 4) $Al^{3+} > Mg^{2+} > Na^+ > F^- > O^{2-}$

78. The Lanthanide contraction relates to

1) Oxidaion states 2) Magnetic state 3) Atomic radii 4) Valence electrons

79. Which of the following process refers to ionisation potential?

1) $X_{(s)} \rightarrow X^+_{(g)} + e^-$ 2) $X_{(g)} + aq \rightarrow X^+_{(aq)} + e^-$ 3) $X_{(g)} \rightarrow X^+_{(g)} + e^-$ 4) $X_{(g)} + e^- \rightarrow X^-_{(g)}$

80. When the screening effect increases, ionisation energy

1) Decreases 2) Increases

3) First increases and then decreases 4) Remains constant

81. With an increase in the extent of penetration of valence electrons, ionisation energy

1) Decreases 2) Increases 3) Remains constant 4) Both are not related

82. The group of elements with highest second ionisation energy is

1) IIA group 2) Zero group 3) VIIA group 4) IA group

83. How many ionisation energies can carbon have? Electronic configuration of carbon

in Ground state : $1s^2\ 2s^2\ 2p_x^1\ 2p_y^1$

in Excited state : $1s^2\ 2s^1\ 2p_x^1\ 2p_y^1\ 2p_z^1$.

1) 1 2) 2 3) 4 4) 6

84. First ionisation potential of magnesium is greater than that of aluminium because

1) Aluminium atom is very large when compared to Mg

2) Aluminium has a stable electronic configuration

3) Magnesium has a stable electronic configuration

4) The electron affinity of Magnesium is positive (energy is absorbed)

85. Electrons with the highest penetrating power are

1) p-electrons 2) s-electrons 3) d-electrons 4) f-electrons

86. The element that possess the lowest ionisation energy among the following

1) Oxygen 2) Fluorine 3) Sulphur 4) Nitrogen

87. Atoms of the following group possess the highest ionisation energies

1) IA 2) IIA 3) VA 4) Zero

88. Atoms of the following group possess the lowest ionisation energies

1) IA 2) IIA 3) VA 4) Zero

89. Configuration of the element with the highest ionisation energy is

1) $[Ne]3s^1$ 2) $[Ne]\ 3s^2\ 3p^3$ 3) $[Ne]\ 3d^{10}\ 4s^2\ 4p^3$ 4) $[Ne]\ 3s^2\ 3p^4$

90. When Lithium vapour is taken in a discharge tube and the potential difference between the electrodes is 5.4 ev, there is a sudden increase in the flow of current. The ionisation energy of Lithium is

1) 54 ev 2) 520 kJ mol^{-1} 3) 54 kJ $atom^{-1}$ 4) 5.4 ev $atom^{-1}$

91. Which of the following transition involves maximum amount of energy?

1) $M^-_{(g)} \rightarrow M_{(g)}$ **2)** $M_{(g)} \rightarrow M^+_{(g)}$ **3)** $M^+_{(g)} \rightarrow M^{2+}_{(g)}$ **4)** $M^{+2}_{(g)} \rightarrow M^{3+}_{(g)}$

92. The first ionisation potential is maximum for

1) Lithium 2) Uranium 3) Iron 4) Hydrogen

93. The lowest first ionization energy would be associated with which of the following configurations.

1) $1s^22s^22p^63s^1$ 2) $1s^22s^22p^5$ 3) $1s^22s^22p^6$ 4) $1s^22s^22p^63s^23p^2$

94. The maximum tendency to form unipositive ion is for the element with the electronic configuration

1) $1s^22s^22p^63s^2$ 2) $1s^22s^22p^63s^23p^1$ 3) $1s^22s^22p^63s^23p^2$ 4) $1s^22s^22p^63s^23p^3$

95. As one moves along a given row in the periodic table, ionisation energy

1) Remains same 2) Increasing from left to right

3) First increases and then decreases 4) decreases from left to right

96. First four ionisation energy values of an element are 191, 578, 872 and 5972 K.Cals The number of valence electrons in the element is

1) 4 2) 3 3) 1 4) 2

97. Ionisation potential values of Li, Be and B are respectively in kJ mol^{-1}

1) 801, 899, 520 2) 520, 801, 899 3) 899, 801, 520 4) 520, 899, 801

98. Screening effect is not common for the elements of the period

1) 7 2) 3 3) 1 4) 4

99. Electron affinity is

1)Energy required to take out an electron from an isolated gaseous atom

2)The tendency of an atom to attract an electron towards itself

3)Energy absorbed when an electron is added to an isolated atom in gaseous state

4)Energy released when an electron is added to an isolated atom in the gaseous state

100. The property of an element that cannot be determined directly but can be obtained indirectly from Born-Haber cycle is

1) Ionisation potential 2) Electron affinity 3) Electronegativity 4) Electropositive character

101. Electron affinity is measured in

1) No units 2) kcal mol^{-1} 3) kJ mol^{-1} 4) Both (2) and (3)

102. Which of the following is an endothermic process?

1) First electron affinity of chlorine

2) Second electron affinity of oxygen

3) Formation of NaCl from gaseous ions

4) Hydration of $MgCl_2$

103. In a period from left to right, electron affinity

1) Increases 2) Decreases 3) Remains constant

4) First increases and then decreases

104. Configuration that shows the highest energy released when an electron is added to the atom is

1) $1s^2\ 2s^2\ 2p^3$ 2) $1s^2\ 2s^2\ 2p^4$ 3) $1s^2\ 2s^2\ 2p^5$ 4) $1s^2\ 2s^2\ 2p^6$

105. Electron affinity of Fluorine is less than that of Chlorine because

1) Electronegativity of Fluorine is more 2) 2p sub shell of F is smaller

3) Chlorine is a stronger oxidant 4) Bond dissociation energy of F_2 is less

106. Among chalcogens electron affinity is highest for

1) O 2) S 3) Se 4) Te

107. The element with highest electron affinity is

1) Fluorine 2) Cesium 3) Helium 4) Chlorine

108. Incorrect statement is

1) Fluorine has the highest electron affinity

2) Greater the nuclear charge, greater is the electron affinity

3) The electron affinity of Nitrogen is positive (energy is absorbed)

4) Chlorine has highest electron affinity

109. Pauling's electronegativity is based on

1) Electron affinity 2) Ionisation potential 3) Both IP and EA 4) Bond energies

110. Pauling's electronegativity values for elements are useful in predicting

1) Polarity of the molecules 2) Position in the E.M.F. series

3) Coordination numbers 4) Dipole moments

111. Correct relation among X_A, X_B and D, where X_A and X_B are the electronegativities of elements A and B.

1) $X_A + X_B = 0.208\sqrt{\Delta}$ 2) $\sqrt{X_A - X_B} = 0.208 \times D$

3) $X_A - X_B = 0.208\sqrt{\Delta}$ 4) $X_A - X_B = \sqrt{0.208 \times \Delta}$

112. Reference element for Pauling's electronegativity is

1) H 2) C 3) Cl 4) He

113. Electronegativity of an element is the average of its ionisation energy and electron affinity according to

1) Pauling 2) Rutherford 3) Bohr 4) Mulliken

114. The electronegativity values according to Mulliken scale are .... times to those in Pauling scale

1) 0.208 2) 2 3) 2.8 4) 544

115. Electronegativity on Mulliken scale is limited to

1) Monovalent atoms 2) Bivalent atoms

3) Both monovalent and bivalent atoms 4) All multivalent atoms

116. If I and E are ionisation energy and electron affinity of an element in kJ mole^{-1} electronegativity is given as

1) $\frac{I+E}{2}$ 2) $\frac{I+E}{5.6}$ 3) $\frac{I+E}{129}$ 4) $\frac{I+E}{544}$

117. In a period electronegativity is highest for

1) Chalcogen 2) Halogen 3) Inert gas 4) Alkali metal

118. The values that are useful in writing chemical formulae and in calculation of oxidation states are

1) Ionisation potential 2) Electron affinity 3) Electronegativity 4) Metallic character

119. Elements with high electronegativity are generally

1) Good reductants 2) Hard solids 3) Good oxidants 4) Soft solids

120. The stable oxidation state of Thallium, a IIIA group element is

1) +1 2) +3 3) –3 4) +5

EXERCISE - II

1. The triad not present in Group VIII of Mendeleeff's table

1) Li, Na, K 2) Fe, Co, Ni 3) Ru, Rh, Pd 4) Os, Ir, Pt

2. In the periodic table, inversion of atomic weights took place in this pair

1) Argon - Potassium 2) Boron - Scandium 3) Hydrogen - Helium 4) Beryllium - Boron

3. The period that contains only gaseous elements is

1) 1 2) 2 3) 3 4) 4

4. The element which belong to 3rd period and IVA group of periodic table is

1) Silicon 2) Carbon 3) Germanium 4) Tin

5. (A) : According to Mendeleeff, periodic properties of elements is a function of their atomic masses.

(R) : Atomic number is equal to number of protons

The correct answer is

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false

4) (A) is false but (R) is true

6. Pair of elements with the following atomic numbers have the same chemical properties

1) 13 & 22 2) 3 & 11 3) 4 & 24 4) 2 & 1

7. The sub-shells filled one by one for 4th period elements are

1) 3d, 4s and 4p 2) 4s, 4p and 4d 3) 4s, 3d and 4p 4) 3d, 4p and 4s

8. The starting element and last element in the largest period in modern periodic table are

1) Rb and Xe 2) Cs and I 3) Cs and Rn 4) Fr and Kr

9. Which of the following has both members from the same period of the periodic table
1) Na, F 2) Mg, Ca 3) Na, Cl 4) Be, Al

10. Atomic number of nitrogen is 7. The atomic number of the third member in the same family is
1) 23 2) 15 3) 33 4) 51

11. Element with atomic number 38, belongs to
1) II A group and 5^{th} period 2) II A group and 2^{nd} period
3) V A group and 2^{nd} period 4) III A group and 5^{th} period

12. Set of elements with the following atomic numbers belong to the same group
1) 9, 16, 35, 3 2) 12, 20, 4, 38 3) 11, 19, 27, 5 4) 24, 47, 42, 55

13. Which of the following pairs has both members from the same group of the periodic table?
1) Mg-Ba 2) Mg-Na 3) Mg-Cu 4) Mg-Cl

14. The elements with atomic number 10,18,36,54 and 86 are all
1) Light metals 2) Inert gases 3) Halogens 4) Rare earths

15. Which of the following pairs has elements containing same number of electrons in the outermost orbit?
1) N,O 2) Na, Cl 3) Ca, Cl 4) Cl, Br

16. The period that includes all blocks of elements is
1) 1 2) 2 3) 6 4) 7

17. Among s-block metals and transition metals, which are more metallic?
1) s-block metals 2) Transition metals
3) Both are equally metallic 4) Cannot be predicted

18. Element with atomic number 52 belongs to
1) s-block 2) p-block 3) d-block 4) f-block

19. The general electronic configuration of f-block elements is
1) $ns^2\ np^6\ (n-1)d^{0-1}\ (n-2)f^{1-14}$ 2) $ns^2\ (n-1)d^{0,1}\ (n-2)f^{1-14}$
3) $ns^2\ nd^{0,1}\ nf^{1-14}$ 4) $ns^2\ (n-1)d^{0,1}\ (n-1)f^{1-14}$

20. The common oxidation state exhibited by inner transition elements usually in their compounds is
1) + 2 2) + 3 3) + 5 4) Zero

21. The pair of atomic numbers which represent the p-block elements
1) 6, 12 2) 7, 53 3) 19, 35 4) 38, 51

22. Which of the following is an element present in the d-block, but not a transition element
1) Cd 2) Cu 3) Ca 4) Cr

23. Which of the following is an alloy of non- transition elements
1) Elektron 2) Brass 3) Bronze 4) German silver

24. Common oxidation state of elemental transition metal is
1) +1 2) 0 3) + 3 4) + 2

25. Configuration that does not denote a transition element
1) $3d^1\ 4s^2$ 2) $3d^{10}\ 4s^1$ 3) $3d^{10}\ 4s^2\ 4p^2$ 4) $3d^8\ 4s^2$

26. An element of 5f-series but has no electrons filled in 5f-sub shell

1) Ac 2) Ce 3) Th 4) U

27. An element has 18 electrons in the outer most shell. The element is

1) Transition metal 2) Rare earth metal 3) Alkaline earth metal 4) Alkali metal

28. Element with electronic arrangement $[Ar]3d^2 4s^2$ belongs to

1) s-block 2) p- block 3) d - block 4) f - block

29. (A) : The transition metal ions are generally paramagnetic in nature

(R) : Metal ions with incompletely filled d-orbitals are paramagnetic in nature.

The correct answer is

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false 4) (A) is false but (R) is true

30. Number of outer shells partially filled for representative elements

1) Zero 2) One 3) Two 4) Three

31. The atomic number of the element which is not included in the main body of the period table

1) 43 2) 57 3) 68 4) 80

32. Zinc is not considered as a transition metal because

1) It is diamagnetic 2) It is not known to from alloys

3) It has no unpaired electrons 4) It has white shade

33. The electronic configuration of an element 'X', is $1s^2 2s^2 2p^6 3s^2 3p^3$. What is the atomic number of the element which is just below 'X' in the periodic table

1) 33 2) 34 3) 31 4) 49

34. Atomic radii of fluorine and neon in angstrom units are respectively

1) 0.72, 1.62 2) 0.72, 0.72 3) 1.2, 1.2 4) 1.62, 0.72

35. Which of the following will have largest size?

1) Br 2) I^- 3) I 4) F

36. The size of the following species increases in the order

1) $Mg^{2+} < Na^+ < F^- < Al^{3+}$ 2) $Al^{3+} < Mg^{2+} < Na^+ < F^-$

3) $Na^+ < F^- < Al^{3+} < Mg^{2+}$ 4) $Na^+ < Al^{3+} < Mg^{2+} < F^-$

37. In a period of representative elements, the decrease in ionic radius when compared with the corresponding decrease in atomic radius

1) is equal 2) is less 3) is more 4) Cannot be predicted

38. In which of the following sets, elements have nearly same atomic radii?

1) Li, Be, B 2) Mg, Ca, Sr 3) Fe, Co, Ni 4) O, S, Se

39. Correct order of atomic radii is

1) N < C < P < S 2) C < N < S < P 3) C < N < P < S 4) N < C < S < P

40. If an element 'X' is assumed to have the types of radii, then their order is

1) Crystal radius > Van der waals radius > Covalent radius

2) Van der waals radius > Crystal radius > Covalent radius

3) Covalent radius > Crystal radius > Van der waals radius

4) Van der waals radius > Covalent radius > Carystal radius

41. Which of the following has smallest radius?
1) Be^{+2} 2) Li^{+} 3) O^{-2} 4) F^{-}

42. Which of the following series of elements have most nearly the same atomic radius ?
1) Mg, Ca, Sr, Ba 2) Ca, Ge, As, Se 3) B, C, N, O 4) Cr, Mn, Fe, Co

43. If the Ionisation potential (I.P.) of Na is 5.48 eV. The I.P. of K will be
1) 4.34 eV 2) 5.68 eV 3) 10.88 eV 4) 5.48 eV

44. A sudden jump between the values of second and third ionisation energies of an element is associated with configuration
1) $1s^2 2s^2 2p^6 3s^1$ 2) $1s^2 2s^2 2p^6 3s^2 3p^1$ 3) $1s^2 2s^2 2p^6 3s^2 3p^2$ 4) $1s^2 2s^2 2p^6 3s^2$

45. Amongst the following elements (whose electronic configurations are given below), the one having the highest first ionization energy is
1) $[Ne]3s^2 3p^1$ 2) $[Ne]3s^2 3p^3$ 3) $[Ne]3s^2 3p^2$ 4) $[Ar]3s^{10} 4s^2 4p^2$

46. The first ionization energy of Lithium will be
1) Greater than Be 2) Less than Be 3) Equal to that of Na 4) Equal to that of F

47. A sudden jump between the values of second and third ionisation energies of an element would be associated with the electronic configuration
1) $1s^2, 2s^2, 2p^6, 3s^2, 3p^2$ 2) $1s^2, 2s^2, 2p^6, 3s^2$ 3) $1s^2, 2s^2, 2p^6, 3s^2, 3p^1$ 4) $1s^2, 2s^2, 2p^6, 3s^1$

48. Generally the ionisation potential in a period increases, but there are some exceptions. The one which is not an exception is
1) Be & B 2) N & O 3) Mg & Al 4) Na & Mg

49. Element that has the highest first ionisation energy among the following is
1) Ca 2) Mg 3) Al 4) Si

50. The ionization potential of nitrogen is more than that of oxygen because of
1) the greater attraction of the electrons by the nucleus
2) the extra stability of the half filled p - orbitals
3) the smaller size of nitrogen
4) more penetration effect

51. Which element has the greatest tendency to lose electrons ?
1) F 2) S 3) Fe 4) Be

52. Second ionisation potential of oxygen is
1) Equal to that of fluorine 2) Less than that of fluorine
3) Greater than that of fluorine 4) Half of that of fluorine

53. Among the elements A, B, C and D having atomic numbers 9, 10, 11 and 12 respectively the correct order of ionisation energies is
1) A > B > C > D 2) B > A > D > C 3) B > A > C > D 4) D > C > B > A

54. In which of the following process maximum energy is released
1) $O_{(g)} + e^- \rightarrow O^-_{(g)}$ 2) $O^-_{(g)} + e^- \rightarrow O^{-2}_{(g)}$ 3) $S_{(g)} + e^- \rightarrow S^-_{(g)}$ 4) $S^-_{(g)} + e^- \rightarrow S^{-2}_{(g)}$

55. Ionisation energy of F^- is equal in magnitude with the electron affinity of
1) F^- 2) F 3) F^+ 4) F^{2+}

56. When an electron is added, energy is absorbed in which of the following?
1) C 2) N 3) F 4) O

57. The correct order of electron affinity of the elements of oxygen family in the periodic table is (Roorkee)

1) O > S > Se 2) S > O > Se 3) S > Se > O 4) Se > O > S

58. The I.P of X^- ion is equal to

1) EA of X 2) EN of X 3) IP of X 4) IP of X^+

59. Energy is released in the process of

1) $Na_{(g)} \rightarrow Na^+_{(g)} + e$ 2) $O^-_{(g)} + e \rightarrow O^{-2}_{(g)}$ 3) $N^{-2}_{(g)} + e \rightarrow N^{-3}_{(g)}$ 4) $O_{(g)} + e \rightarrow O^-_{(g)}$

60. Which of the following is the correct order of electron affinity

1) I > Br > F > Cl 2) F < Cl < Br < I 3) F > Cl > Br > I 4) I < Br < F < Cl

61. Pair of elements with equal values of electronegativiy

1) Be, Al 2) Mg, Al 3) Mg, Ca 4) F, Ne

62. The electronegativity of the following elements increase in the order

1) C, N, Si ,P 2) N , Si, C, P 3) Si, P, C, N 4) P, Si, N, C

63. Two elements A and B have the following electronic configurations. The formula of the compound formed between them can be

A = $1s^2\,2s^2\,2p^6\,3s^2\,3p^1$ B = $1s^2\,2s^2\,2p^4$

1) AB 2) AB_2 3) A_2B_3 4) A_3B_2

64. The formula of a .metallic carbonate is MCO_3. The formula of that metallic perchlorate is

1) $MClO_4$ 2) M_2ClO_4 3) M_3ClO_4 4) $M(ClO_4)_2$

65. A metal forms a chloride with the formula MCl_2. Formula of Phosphoric acid is H_3PO_4. Formula of the Phosphate of the metal is

1) $M_3\,PO_4$ 2) MPO_4 3) $M_3(PO_4)_2$ 4) M_2PO_4

66. An oxide of an element is a gas and dissolves in water to give an acidic solution. The element belongs to

1) II group 2) IV group 3) VIII group 4) Zero group

67. Acidic nature of the similar oxides of a group from top to bottom

1) Increases 2) Decreases 3) Remains constant 4) First increases and then decreases

68. Which of the following properties increases across a period

1) Reducing property 2) Size of atom
3) Acidic nature of oxides 4) Metallic property

69. Among the following elements most acidic oxide is given by

1) Al 2) P 3) N 4) Sb

70. The strongest reducing agent is

1) K 2) Al 3) Mg 4) Br

71. The more basic oxide is

1) CaO 2) MgO 3) K_2O 4) Na_2O

72. An element with $1s^2\,2s^2\,2p^6\,3s^2$ electronic arrangement will be forming

1) Acidic oxide 2) Basic oxide 3) Neutral oxide 4) Amphoteric oxide

73. Diagonal relationship is present between the lighter elements of periods

1) Second, third 2) Second, fourth 3) Third, fourth 4) Third, fifth

74. The diagonal relationship phenomenon is not observed after

1) I A Group 2) II A Group 3) III A Group 4) IV A Group

75. The polarising power of which of the following pair is similar

1) Li, Mg 2) Li^+, Mg^{2+} 3) Li^{2+}, Mg^{2+} 4) Li^+, Mg^+

76. (A) : Be and Al have similar properties.

(R) : Cations of Be and Al have same polarising power

77. Which of the following oxide is amphoteric?

1) CrO 2) Cr_2O_3 3) CrO_3 4) CrO_5

78. (A) : Li forms covalent compounds

(R) : Li^+ ion is small and has high polarizing power

79. (A) : As_2O_3, Sb_2O_3 are amphoteric in nature

(R) : As, Sb are metalliods

80. (A) :Lithium resembles magnesium in its properties

(R) : The ratio of ionic charge to (Ionic radius)^2 is almost same for Li^+ and Mg^{2+}

81. Some statements are given. Among them the correct statements are

a) IP_2 of sodium is greater than that of Magnesium

b) IP_2 of lithium is greater than IP_1 of Helium

c) IP_2 of sodium is greater than IP_1 of Neon

d) IP_1 of oxygen is greater than that of Nitrogen

1) All are correct 2) Only a, b and c are correct

3) Only a,b are correct 4) Only a, d are correct

82. Elements X, Y and Z have atomic numbers 19, 37 and 55 respectively. Which of the following statements is true about them?

1) Their ionization potential would increase with increasing atomic number

2) 'Y' would have an ionization potential between those of X and Z.

3) Z would have the highest ionization potential

4) Y would have the highest ionization potential

83. The statement that is false for the long form of the periodic table is

1) It reflects the sequence of filling the electrons in the order of sub energy levels s,p,d and f

2) It helps to predict the stable valency states of the element

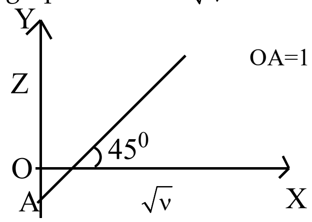
3) It reflects trends in physical and chemical properties of the elements

4) It helps to predict the relative ionicity of the bond between any two elements

84. The compound of vanadium has magnetic moment of 1.73 BM. The vanadium chloride has the formula:

1) VCl_2 2) VCl_3 3) VCl_4 4) VCl_5

85. The frequency of the characterstic X ray of K_α line of metal target 'M' is 2500 cm^{-1} and the graph between $\sqrt{\nu}$ Vs 'z' is as follows, then atomic number of M is



1) 49 2) 50 3) 51 4) 25

86. $(IE)_1$ and $(IE)_2$ of $Mg_{(g)}$ are 740, 1540 kJ mol^{-1}. Calculate percentage of $Mg^+_{(g)}$ and $Mg^{2+}_{(g)}$ if 1 g of $Mg_{(g)}$ absorbs 50.0 kJ of energy.

1) $\%Mg^+ = 70\%$ $\%Mg^{+2} = 30\%$ 2) $\%Mg^+ = 68.35\%$ $\%Mg^{+2} = 31.65\%$

3) $\%Mg^+ = 72\%$ $\%Mg^{+2} = 28\%$ 4) $\%Mg^+ = 60\%$ $\%Mg^{+2} = 40\%$

87. Use (IE) and (EA) listed below to determine whether the following process is endothermic exothermic.

$\mathbf{Mg_{(g)} + 2F_{(g)} \rightarrow Mg^{2+}{}_{(g)} + 2F^-{}_{(g)}}$ $\mathbf{(IE)_1 \text{ of } Mg_{(g)} = 737.7 kJmol^{-1}}$

$\mathbf{(IE)_2 \text{ of } Mg_{(g)} = 1451 \text{ kJ mol}^{-1}}$ $\mathbf{(EA) \text{ of } F(g) = -328 \text{ kJ mol}^{-1}}$

1) Exo 2) Endo 3) both 4) None

88. If Aufbau rule is not followed, K – 19 will be placed in .... block

1) s 2) p 3) d 4) f

89. $\mathbf{M(g) \rightarrow M^+(g) + e^-, \Delta H = 100eV}$

$\mathbf{M(g) \rightarrow M^{2+}(g) + 2e^-, \Delta H = 250eV}$

which is incorrect statement?

1) I_1 of $M_{(g)}$ is 100 eV 2) I_1 of $M^+_{(g)}$ is 150 eV 3) I_2 of $M_{(g)}$ is 250 eV 4) I_2 of $M_{(g)}$ is 150 eV

90. AB is predominantly ionic as $A^+ B^-$ if

1) $(IP)_A < (IP)_B$ 2) $(EA)_A < (EA)_B$ 3) $(EN)_A < (EN)_B$ 4) $(IP)_B < (IP)_A$

91. EN of the element (A) is E_1 and IP is E_2. Hence EA will be

1) $2E_1 - E_2$ 2) $E_1 - E_2$ 3) $E_1 - 2E_2$ 4) $(E_1 + E_2)/2$

92. Gd (64) has.... unpaired electrons with sum of spin .....

1) 7. 3.5 2) 8, 3 3) 6, 3 4) 8, 4

93. For the process

$\mathbf{X_{(g)} + e^- \rightarrow X^-(g), \quad \Delta H = x}$ and

$\mathbf{X^-{}_{(g)} \rightarrow X_{(g)} + e^-, \quad \Delta H = y}$

Select correct alternate:

1) ionisation energy of $X^-(g)$ is y 2) electron affinity of X(g) is X

3) electron affinity of X(g) is -y 4) all are correct statements.

94. Some statements are given regarding nature of oxides
i) In second period, nitrogen form strongest acidic oxide
ii) In third period, sodium froms strongest basic oxide
iii)Oxides of metalloids are generally amphoteric in nature
1) I and II are correct 2) II and III are correct
3) I and III are correct 4) I, II and III are correct

EXERCISE - III

1. The long form of the periodic table is based on the properties of elements as a function of
1) atomic size 2) electronegativity 3) atomic number 4) atomic mass

2. What is the electronic configuration of the outer shell of the elements of Group 14 ?
1) ns^2np^4 2) ns^2np^6 3) ns^2np^2 4) ns^2

3. The complex formation tendency is maximum in elements belonging to the
1) s-block 2) p-block 3) d-block 4) none of these

4. Which of the following elements are rare earths ?
1) Niobium 2) Samarium 3) Uranium 4) Osmium

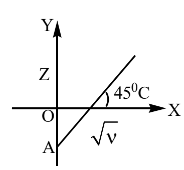
5. The outer electronic configuration of d-block elements in the periodic table is
1) $3d^{10}4s^2$ 2) $3s^23p^4$ 3) $6s^24p^3$ 4) $3s^23p^64s^2$

6. Which of the following has the maximum number of unpaired electrons ?
1) Ti^{3+} 2) V^{3+} 3) Fe^{2+} 4) Mg^{2+}

7. An element with the atomic number 21 belongs to the
1) s-block 2) p-block 3) d-block 4) f-block

8. Which ofthe following can not be iso electronic
1) two different cations 2) two different anions 3) cation and anion
4) two different atoms

9. The frequency of the chracterstic X-ray of K_α line of metal target 'M' is 2500 cm^{-1} and the graph between $\sqrt{\nu}$ vs 'Z' is as follows, then atomic number of that metal (M) is ....
1) 50
2) 51
3) 25
4) 49



10. Which one of the following is a different pair
1) Li, Na 2) Be, Ba 3) N, As 4) O, At

11. Anamolous pair among the following are
(i) Co, Cu (ii) Ar - K (iii) Te - I (iv) Th - Pr
1) (i) and (ii) 2) (i) and (iii) 3) (iii) and (iv) 4) (ii), (iii) and (iv)

12. Which of the following statements are true ?
1) Mendeleev's periodic law is based on the atomic number of elements
2) The table presented by Mendeleev did not have the zero group.
3) Each group in Medeleev's periodic table was divided into two subgroups
4) Mendeleev's periodic table consists of ten horizontal rows or series.

13. Which of the following belong to a triad ?

1) Osmium 2) Platinum 3) Iridium 4) Palladium

14. Which of the following elements are present in Group 16 of the periodic table ?

1) Cerium 2) Tungsten 3) Thorium 4) Platinum

15. Which of the following outer electronic configurations corresponds to the d-block of the periodic table ?

1) $3s^2 3p^3$ 2) $3d^5 4s^1$ 3) $3s^2 3p^6 4s^2$ 4) $5d^1 6s^2$

16. Which of the following are correct ?

1) The configuration of Mo (Z=42) is $[Kr]4d^5 5s^1$.

2) The configuration of Mo (Z = 42) is $[Kr]4d^4 5s^2$.

3) The configuration of Ag (Z=47) is $[Kr]4d^{10} 5s^1$.

4) The configuration of Ag (Z = 47) is $[Kr]4d^9 5s^2$.

Comprehension - I **(Read the following passage and answer the question no's 17 to 19)**

First periodic table was constructed by Mendeleeff. The periodic law is the physical and chemical properties are periodic functions of their atomic weights. Mendeleeff predicted the missing elements by studying the adjacent elements and their compounds.

17. Eka boron was named as

1) Aluminium 2) Gallium 3) Scandium 4) Germanium

18. Which of the following are absent in Mendeleef's periodic table

1) zero group 2) Halogens 3) Metals 4) liquids

19. Which elements atomic weights are corrected

1) Be 2) In 3) U 4) All the above

Comprehension - II **(Read the following passage and answer the question no's 20 to 22)**

Based on the enetry of the differentiating electron, elements are classified into 4 blocks s, p, d and f and based on the electronci configuration and the properties, elements are classified into four types.

20. .... are called rare-earths,

1) Lanthanides 2) actinides 3) transuranic elements 4) all the above

21. Many gases, non - metals and metalloids are present in the ....

1) d-block 2) s -block 3) p-block 4) f-block

22. All transition elements are solids except

1) Fe 2) Ag 3) Hg 4) Sc

23. Match List - 1 with List - II :

List - I (Group/Period)	**List - II (Element)**
1) 7th period	p) Transition elements
2) IIIB group	q) Inner transition elements
3) IA	r) Hydrogen
4) VIIA	s) Halogens

24. Match the atomic number in List - I, with groups in List - II

List - I (Atomic number)	**List - II (Group)**
1) 55	p) VIII
2) 45	q) IIIB

3) 81 r) IIIA

4) 64 s) IA

25. An element 'Y' belong to 1^{st} period & 1^{st} group in Modern Periodic Table. Its atomic number is ____

26. The number of groups which contains only gaseous elements is _____

27. The atomic number of newly predicted Noble gas element may be 110 + a. value of 'a' is ____

28. The number of elements present in short periods are ______

29. Maximum number of elements are present in III_B group. Among them d-block elements present are __

30. All the four blocks and four types of elementsare present in the ----------- period

EXERCISE - I

1) 2	2) 1	3) 1	4) 1	5) 3	6) 2	7) 4	8) 4	9) 3	10) 3
11) 2	12) 3	13) 4	14) 3	15) 2	16) 3	17) 3	18) 3	19) 2	20) 1
21) 3	22) 2	23) 3	24) 4	25) 2	26) 1	27) 4	28) 4	29) 3	30) 1
31) 4	32) 3	33) 1	34) 4	35) 4	36) 1	37) 3	38) 1	39) 4	40) 2
41) 4	42) 4	43) 2	44) 3	45) 2	46) 2	47) 1	48) 4	49) 2	50) 4
51) 1	52) 3	53) 3	54) 1	55) 1	56) 2	57) 3	58) 3	59) 3	60) 4
61) 4	62) 2	63) 1	64) 2	65) 4	66) 3	67) 1	68) 3	69) 1	70) 1
71) 3	72) 4	73) 4	74) 4	75) 1	76) 4	77) 3	78) 3	79) 3	80) 1
81) 2	82) 4	83) 4	84) 3	85) 2	86) 3	87) 4	88) 1	89) 2	90) 4
91) 4	92) 4	93) 1	94) 2	95) 2	96) 2	97) 4	98) 3	99) 4	100) 2
101) 4	102) 2	103) 1	104) 3	105) 2	106) 2	107) 4	108) 1	109) 4	110) 1
111) 3	112) 1	113) 4	114) 3	115) 1	116) 4	117) 2	118) 3	119) 3	120) 1

EXERCISE- II

1) 1	2) 1	3) 1	4) 1	5) 2	6) 2	7) 3	8) 3	9) 3	10) 3
11) 1	12) 2	13) 1	14) 2	15) 4	16) 3	17) 1	18) 2	19) 2	20) 2
21) 2	22) 1	23) 1	24) 2	25) 3	26) 3	27) 1	28) 3	29) 1	30) 2
31) 3	32) 3	33) 1	34) 1	35) 2	36) 2	37) 3	38) 3	39) 4	40) 2
41) 1	42) 4	43) 1	44) 4	45) 2	46) 2	47) 2	48) 4	49) 4	50) 2
51) 3	52) 3	53) 2	54) 3	55) 2	56) 2	57) 1	58) 1	59) 4	60) 4
61) 1	62) 3	63) 3	64) 4	65) 3	66) 2	67) 2	68) 3	69) 3	70) 1
71) 3	72) 2	73) 1	74) 4	75) 2	76) 1	77) 2	78) 1	79) 1	80) 1
81) 2	82) 2	83) 2	84) 3	85) 3	86) 2	87) 2	88) 3	89) 4	90) 3
91) 1	92) 4	93) 4	94) 1						

EXERCISE - III

1) 3	2) 3	3) 3	4) 2	5) 1	6) 3	7) 3	8) 4	9) 2	10) 4
11) 34	12) 24	13) 123	14) 13	15) 24	16) 13	17) 3	18) 1	19) 4	20) 1
21) 3	22) 3	23) 1-P,Q; 2-P, Q; 3-R; 4-R,S				24) 1-S; 2-P; 3-R; 4-Q			25) 1
26) 1	27) 7	28) 8	29) 4	30) 6					

EXERCISE - I

1. Valency of an element indicates
1) combining power with hydrogen 2) acidity
3) electrons in the outermost orbit 4) none of these

2. Between atoms of a molecule, there exists
1) only attractive forces 2) only repulsive forces
3) both attractive and repulsive forces 4) neither attractive nor repulsive forces

3. When two atoms of chlorine combine to form one molecule of chlorine gas, the energy of the molecule is 1) greater than that of separate atoms 2) equal to that of separate atoms
3) lower than that of separate atoms 4) none of these

4. Most energetic species among the following is
1) H_2 2) Ne 3) F 4) F_2

5. The coordination numbers of cation and anion in NaCl crystal are respectively
1) 8, 6 2) 8, 8 3) 6, 6 4) 6, 8

6. Which of the following is easily formed?
1) Calcium chloride 2) Calcium bromide 3) Potassium chloride 4) Potassium bromide

7. Among the compounds NaCl, KCl, RbCl and CsCl, the one with greatest ionic character is
1) NaCl 2) KCl 3) CsCl 4) RbCl

8. The 8:8 type of packing is present in
1) NaCl 2) KCl 3) CsCl 4) MgF_2

9. Which of the following is favourable condition for the formation of ionic bond?
1) Small cation with small charge 2) Small anion with large charge
3) Large differecne in the electronegativity 4) Small cation with high charge

10. The toal number of Na^+ ions present per unit cell of NaCl is
1) 1 2) 6 3) 8 4) 4

11. The number of ion pairs that constitute one unit cell of CsCl
1) 4 2) 2 3) 8 4) 1

12. Which of the following is not involved in Born-Haber cycle?
1) Sublimation energy 2) Ionisation potential 3) Lattice energy 4) Electonegativity

13. In a NaCl crystal, cations and anions are held together by
1) Electrons 2) Electrostatic forces 3) Nuclear forces 4) Covalent bonds

14. Molten sodium chloride conducts electricity due to the presence of
1) Free electrons 2) Free ions 3) Free molecules 4) Free atoms

15. Number of electrons transferred from one Al atom during bond formation in Aluminium fluoride
1) 1 2) 2 3) 3 4) 4

16. Which one of the following has an electrovalent linkage?
1) CH_4 2) $MgCl_2$ 3) $SiCl_4$ 4) BF_3

17. Which of the following is least ionic?
1) CaF_2 2) $CaBr_2$ 3) $CaCl_2$ 4) CaI_2

18. The strongest ionic bond is present in
1) LiF 2) NaF 3) RbF 4) CsF

19. Which is more stable among the following
1) Li^+ 2) K^+ 3) Cs^+ 4) Na^+

20. What is the crystal structure of CsCl ?
1) Body centered cubic 2) Face centered cubic 3) Tetrahedral 4) Octahedral

21. Which of the following is a favourable factor for cation formation
1) High electronegativity 2) High electron affinity
3) Low ionisation potential 4) Smaller atomic size

22. Which of the following is not correct
1) low ionisation potential is a favourable condition for the formation of cation
2) coordination number of Cs in CsCl is 8 3) ionic bond is directional
4) ionic compounds have high melting points

23. AB is an ionic solid. The ionic radii of A^+ and B^- are respectively r_c and r_a. Lattice energy of AB is proportional to
1) $\frac{r_c}{r_a}$ 2) $(r_c + r_a)$ 3) $\frac{r_a}{r_c}$ 4) $\frac{1}{r_c + r_a}$

24. (A) : Ionic compounds tend to be non-volatile
(R) : Inter ionic forces in ionic compounds are weak

25. (A) : Among Ca^{2+} and Zn^{2+} ions, Ca^{2+} is more stable than Zn^{2+}
(R) : Both Ca^{2+} and Zn^{2+} ions are diamagnetic

26. (A) : NaCl is bad conductor in the solid state
(R) : Na^+ and Cl^- ions are not free in the solid state

27. (A) : Ionic compounds exhibits isomerism
(R) : Ionic bond is non directional bond

28. The element that exhibits both electrovalency and covalency is
1) Neon 2) Sodium 3) Barium 4) Chlorine

29. The total number of electrons that take part in forming bonds in O_2 molecule according to V.B.T.
1) 2 2) 4 3) 6 4) 10

30. In the farmation of covalent bond
1) transter of electrons take place 2) electrons are gained by only one atom
3) sharing of electrons take place 4) gaining of electrons take place

31. The bond between two identical non-metal atoms has a pair of electrons
1) unequally shared between the two 2) transferred fully from one atom to another
3) with identical spin 4) equally shared between them

32. A covalent bond is likely to be formed between two elements which
1) have high electronegativities 2) have low ionization energies
3) have low melting points 4) form ions with a small charge

33. Covalent compounds are generally soluble in
1) polar solvents 2) non-polar solvents 3) concentrated acids 4) all solvents

34. Which of the following has directional character?

1) ionic bond 2) metallic bond
3) covalent bond 4) both covalent and ionic bonds

35. Maximum number of covalent bonds by which two atoms can be bonded to each other
1) Four 2) Two 3) Three 4)No fixed number

36. Among the alkaline earth metals, the element forming predominantly covalent compound is
1) Be 2) Mg 3) Sr 4) Ca

37. Which of the following substances has covalent bonding?
1) Sodium chloride 2) Solid neon 3) Copper metal 4) Germanium

38. The molecule that deviates from octet rule is
1) CCl_4 2) BF_3 3) MgO 4) NCl_3

39. Most important concept of valence bond theory is
1) Overlap of atomic orbitals results in the bond
2) Sharing of odd number of electrons for bonding
3) Sharing of electrons follow the octet rule 4) Transfer of electrons follow the octet rule.

40. In N_2 molecule the atoms are bonded by the bonds
1) $1\sigma, 2\pi$ 2) $1\sigma, 1\pi$ 3) $2\sigma, 1\pi$ 4) $3\sigma, 2\pi$

41. Bond present in iodinemonochloride is
1) Coordinate 2) Electrovalent 3) Covalent 4) Metallic

42. Two carbon atoms in which of the following have more number of shared electrons
1) Benzene 2) Acetylene 3) Ethane 4) Ethylene

43. Which of the following has homoatomic overlap?
1) H–Cl 2) Li–Cl 3) C–Cl 4) Cl–Cl

44. The total number of electrons that take part in forming bonds in a C_2H_4 molecule are
1) 12 2) 14 3) 6 4) 10

45. Which of the following molecules contain one lone pair of electrons on the central atom?
1) CH_4 2) PH_3 3) CCl_4 4) H_2S

46. The type of overlap present in the bonds of hydrogen sulphide molecule is
1) σ s–p 2) σ s–s 3) σ p–p 4) σ sp^3–s

47. Hydrogen chloride molecule contains
1) Covalent bond 2) Double bond 3) Co-ordinate bond 4) Electrovalent bond

48. Iodine monochloride molecule is formed by the overalap of
1) s-s orbitals 2) s-p orbitals
3) p-p orbitals end to end 4) p-p orbitals sideways

49. Which is true regarding a sigma bond
1) It has lateral overlap 2) It has two electron pairs in the bond
3) It has electron transfer 4) It has head – to – head overlap

50. In solid argon, the atoms are held together by
1) Ionic bonds 2) Hydrogen bonds 3) Vander Waal forces 4) Hydrophobic forces

51. Which of the following boils at higher temperature.
1) CCl_4 2) CO_2 3) $C_6H_{12}O_6$ 4) KCl

52. Anhydrous $AlCl_3$ is covalent while AlF_3 is ionic. This is justified by
1) Crystal structure 2) VB theory 3) Fajan's rules 4) Lattice energy

53. CCl_4 is insoluble in water because
1) H_2O is non-polar 2) CCl_4 is non-polar
3)They do not form inter molecular H-bonding
4) They do not form intra molecular H–bonding

54. Which of the following molecule does not obey the octet rule and also has lone pair on the central atom.
1) CCl_4 2) PCl_3 3) NH_3 4) SCl_4

55. Which of the following overlap is the strongest?
1) 2p – 2p 2) 3p – 3p 3) 5p – 5p 4) π (5p–5p)

56. The ion that is iso - electronic with CO
1) O_2^+ 2) CN^- 3) O_2^- 4) N_2^+

57. Which is a covalent compound?
1) RbF 2) $MgCl_2$ 3) CaC_2 4) NH_3

58. Double bonds are present in
1) CO_2 2) $BeCl_2$ 3) $HgCl_2$ 4) MgO

59. Six electrons are mutually shared in
1) F_2 2) Cl_2 3) O_2 4) N_2

60. Octet rule is not followed in
1) SF_6 2) PF_5 3) $BeCl_2$ 4) All the three

61. Silicon has 4 electrons in the outermost orbit. In forming the bonds
1) It gains electrons 2) It loses electrons 3) It shares electrons 4) None of the above

62. The type of bonds present in ammonium chloride are
1) Only ionic and dative 2) Only covalent and electrovalent
3) Only covalent and coordinate 4) Ionic, covalent and coordinate

63. PH_3 and BF_3 form an adduct readily because they form
1) A coordinate bond 2) A covalent bond 3) An ionic bond 4) A hydrogen bond

64. Dative bond is present in the molecule of
1) NH_3 2) CO_2 3) CO 4) PCl_5

65. According to valence bond theory, water molecule has
1) Two dative bonds and bond angle 90° 2) Two covalent bonds and bond angle 90°
3) Two dative bonds and bond angle 104.5° 4) Two covalent bonds and bond angle 104.5°

66. According to V.B theory the bonds in methane are formed due to the overlapings
1) $1\sigma s-s, 3\sigma s-p$ 2) $1\sigma s-p, 3\sigma s-s$ 3) $2\sigma s-s, 2\sigma s-p$ 4) 4 σsp^3-s

67. Among LiCl, $BeCl_2$, BCl_3 and CCl_4, the covalent bond character follows the order,
1) $LiCl < BeCl_2 > BCl_3 > CCl_4$ 2) $LiCl > BeCl_2 < BCl_3 < CCl_4$
3) $LiCl < BeCl_2 < BCl_3 < CCl_4$ 4) $LiCl > BeCl_2 > BCl_3 > CCl_4$

68. Which of the following does not contain coordinate covalent bond ?
1) NH_4^+ 2) H_3O^+ 3) CH^-_3 4) $[Ag(CN)_2]^+$

69. In ammonium ion the covalency of nitrogen is

1) 3 2) 4 3) 2 4) 5

70. The directional nature of covalent bond was introduced by

1) VB theory 2) Kossel and Lewes theory
3) Hybridisation theory 4) VSEPR theory

71. Which one of the following molecules contain both ionic and covalent bonds ?

1) CH_2Cl_2 2) K_2SO_4 3) $BeCl_2$ 4) SO_2

72. Molecules with sp^2 hybridisation will have the following shapes

1) Linear 2) Trigonal planar 3) Tetrahedral 4) Pyramidal

73. The hybridization involved in acetylene is

1) sp 2) sp^2 3) sp^3 4) dsp^2

74. The type of hybrid orbitals employed in the formation of SF_6 molecules is

1) sp^3d 2) sp^3 3) sp^3d^2 4) d^2sp^3

75. Hybridization produces a set of orbitals which are

1) Parallel 2) Perpendicular 3) Equivalent 4) None of these

76. The % of 'p' character in hybrid orbital of the central atom of water molecule

1) 25% 2) 50% 3) 75% 4) 33.3%

77. Maximum number of planar atoms in SF_6 molecule

1) 5 2) 4 3) 6 4) 7

78. Which hybridisation is found in NH_3 and H_2O

1) sp^3 2) dsp^2 3) sp 4) sp^2

79. Octahedral shape is due to the hybridisation

1) sp^3d 2) sp^3d^2 3) sp^3 4) sp

80. In the molecule of XeF_4, hybridisation of 'Xe' atom is

1) sp^3 2) sp^3d 3) sp^3d^2 4) d^2sp^3

81. Which of the following has pentagonal bipyramidal shape?

1) PCl_5 2) SO_4^{2-} 3) CO_3^{2-} 4) IF_7

82. The orientation of hybrid orbitals is tetrahedral in

1) NH_3 2) SCl_4 3) PCl_5 4) XeF_4

83. Which one of the following is a linear molecule?

1) NO_2 2) SO_2 3) CO_2 4) H_2S

84. In BCl_3 molecule, the Cl-B-Cl bond angle is

1) 90° 2) 120° 3) 109°28' 4) 180°

85. Which of the following has a planar structure

1) NH_4^+ 2) SCl_4 3) XeF_4 4) BF_4^-

86. The shape of sulphate ion is

1) Tetrahedral 2) Square planar 3) Trigonal 4) Trigonal planar

87. The angle between two covalent bonds is minimum in

1) H_2O 2) CO_2 3) NH_3 4) CH_4

88. The shape of ClO_3^- is

1) Linear 2) Angular 3) Tetrahedral 4) Pyramidal

89. Angular molecule among the following is

1) C_2H_2 2) H_2O 3) HCN 4) NH_3

90. Octahedral molecule among the following is

1) SO_3 2) $CHCl_3$ 3) SF_6 4) PCl_5

91. Bond angle (H-O-H) in H_2O is

1) 90° 2) 104°30' 3) 107°18' 4) 109°28'

92. In PCl_5 Bond angle in plane is

1) 90° 2) 120° 3) 180° 4) 109°28'

93. The orientation of electron pairs and the shape of molecule are different in

1) $BeCl_2$ 2) H_2O 3) BCl_3 4) CCl_4

94. Largest bond angle is present in

1) CH_4 2) C_2H_6 3) C_2H_4 4) C_2H_2

95. A molecule AX_2 has two lone pairs over A. Its shape is

1) Tetrahedral 2) Pyramidal 3) Angular 4) Linear

96. The geometry of H_3O^+ ion is

1) Planar 2) Triangular 3) Pyramidal 4) Tetrahedral

97. The shape of AB_3E is

1) Pyramidal 2) Tetrahedral 3) Angular 4) Linear

98. As the s-character of a hybrid orbital increases the bond angle

1) Increases 2) Decreases 3) does not change 4) Becomes zero

99. In the formation of SF_6 molecule, the sulphur atom is in

1) 1st excited state 2) second excited state 3) third excited state 4) fourth excited state

100. Regarding hybridisation the correct statement is

1) Orbitals of different atoms hybridize

2) The angle between any two hybrid orbitals is not the same

3) Hybrid orbitals always form sigma bonds

4) Only electrons undergo hybridisation and not orbitals.

101. Which of the following is a correct pair ?

1) $BeCl_2$, linear 2) NH_3, linear 3) CO_2, tetrahedral 4) BF_3, octahedral

102. What is the hybridisation state of the central atom in the conjugate base of NH^+_4 ion?

1) sp 2) sp^3 3) sp^2 4) dsp^2

103. Which one of the following is the correct set with reference to molecular formula, hybridisation of central atom and shape of the molecule ?

1) CO_2, sp^2, bent 2) H_2O, sp^2, bent 3) $BeCl_2$, sp, linear 4) H_2O, sp^3, linear

104. Which one of the following is a correct set ?

1) H_2O, sp^3, angular   2) H_2O, sp^2, linear
3) NH_4^+, dsp^2, squre planar   4) CH_4, dsp^2, tetrahedral

105. Which of the following is a linear molecule

1) $BeCl_2$ 2) H_2O 3) SO_2 4) CH_4

106. Which of the following has pyramidal shape

1) XeF_4 2) XeO_3 3) XeF_2 4) XeF_6

107. In which of the following molecules, sigma bonds formed by the overlap of sp^3d and p-orbitals are absent

1) PCl_5 2) ClF_3 3) $SbCl_5$ 4) $HClO_4$

108. A) $\mathbf{I_3^-}$ ion is linear.

R) It is not in sp hybridized state.
1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false   d) (A) is false but (R) is true

109. Which of the following is not tetrahedral?

1) BF_4^- 2) NH_4^+ 3) CO_3^{2-} 4) SO_4^{2-}

110. Which of the following has square pyramidal structure.

1) BrF_5 2) ClF_3 3) IF_7 4) ClF

111.

LIST - 1	**LIST - 2**
A) Diamond	1) sp^2
B) Graphite	2) sp^3
C) PCl_5	3) sp^3d
D) CO_2 gas	4) sp
	5) sp^3d^2

The correct match is

	A	B	C	D		A	B	C	D
1)	3	4	1	2	2)	2	1	3	4
3)	1	2	3	4	4)	2	3	1	2

112. The para magnetic nature of oxygen is best explained by

1) V.B.theory   2) Hybridisation   3) M.O.theory   4) VSEPR theory

113. Bond order in He_2 species is

1) 0   2) 1   3) 2   4) 3

114. The bond order in O_2^{2-} species is

1) 1   2) 2   3) 3   4) 4

115. In O_2 molecule the correct order of molecular orbital is

1) $\pi 2py > \pi 2pz$ 2) $\pi 2py^* = \pi 2pz$ 3) $\sigma 2s < \sigma 2s^*$ 4) $\sigma 2s^* > \sigma 2px^*$

116. Fractional bond order is in

1) O_2 2) O_2^+ 3) O_2^{2-} 4) N_2

117. Among the following degenerate orbitals are

1) $\sigma 1s, \sigma 1s^*$ 2) $\sigma 2px, \sigma 2px^*$ 3) $\pi 2p_x, \pi 2p_y$ 4) $\pi 2py, \pi 2pz^*$

118. Maximum number of electrons that can be present in any molecular orbital is

1) 3 2) 6 3) 8 4) 2

119. While filling electrons in $\pi 2px$ and $\pi 2py$ the electronic configuration rules that one to be followed is
1) Paulis exclusion principle 2) Aufbau principle
3) Both Paulis and Hund's rule 4) All the above

120. Number of bonding electrons in N_2 molecule are
1) 4 2) 5 3) 6 4) 10

121. Bond order is maximum among the following
1) N_2 2) He_2 3) H_2 4) O_2

122. The shape of molecular orbital depends upon
1) Size of the molecule 2) Size of the atoms involved
3) Shape of the atomic orbital 4) All the above

123. Number of anti bonding electrons in O_2 molecule are
1) 10 2) 6 3) 4 4) 2

124. Which of the following species have the same bond order
1) CN^- and CN^+ 2) O_2^- and CN^- 3) NO^+ and CN^- 4) CN^- and NO^-

125. In which pair, the stronger bond found in the first species
a) O_2^-, O_2 b) $N_2 . N_2^+$ c) NO^+, NO^-
1) a only 2) b only 3) a and c only 4) b and c only

126. The common features among the species CN^{-1}, CO and NO^+ are
1) bond order three and isoelctronic 2) bond order three and weak field ligands
3) bond order two and π electron acceptors 4) isoelectronic and weak field ligands

127. Which of the following species in not diamagnetic?
1) N_2 2) F_2 3) Li_2 4) O_2

128. Bond energy is maximum in
1) F_2 2) N_2 3) O_2 4) Br_2

129. The bond order
1) Can have negative value 2) Is any number other than zero
3) Is any integer 4) Can have any value including zero

130. Accroding to Molecular orbital theory, a molecule of H_2 has two electrons in
1) σ_{1s} 2) σ^*_{2s} 3) σ_{2s} 4) σ^*_{1s}

131. Higher the bond order, greater is the
1) Bond dissociation energy 2) Bond length
3) Paramagnetism 4) Ionic character

132. Which of the following molecular orbital has the lowest energy for O_2 molecule
1) σ_{2pz} 2) π_{2py} 3) π^*_{2pz} 4) σ^*_{2px}

133. Molecular orbitals are
1) Monocentric 2) Bicentric 3) Polycentric 4) None

EXERCISE - II

1. The charge on a cation 'M' is +2 and anion 'A' is –3. The compound formed has the formula

   1) MA_2 2) M_3A_2 3) M_2A_3 4) M_2A

2. Two elements 'X' and 'Y' have the following configuration

   X= $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2$ Y= $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$

   The compound formed by the combination of 'X' and 'Y' will be

   1) XY_2 2) X_5Y_2 3) X_2Y_5 4) XY_5

3. Which of the following reaction involves the liberation of energy?

   1) $Na_{(s)} \rightarrow Na^+_{(g)}$ 2) $Cl_{2(g)} \rightarrow 2Cl_{(g)}$

   3) $Na^+_{(g)} + Cl^-_{(g)} \rightarrow NaCl_{(s)}$ 4) $NaCl_{(s)} \rightarrow Na^+_{(g)} + Cl^-_{(g)}$

4. An element 'X' is strongly electropositive and an element 'Y' is strongly electronegative both are univalent. The compound formed would be

   1) X^+Y^- 2) X^-Y^+ 3) X–Y 4) $X \rightarrow Y$

5. The electronic structure of four elements a,b,c and d are

   1) $1s^2$ 2) $1s^2, 2s^2, 2p^2$ 3) $1s^2, 2s^2, 2p^5$ 4) $1s^2, 2s^2, 2p^6$.

   The tendency to form electrovalent bond is greatest in

   1) a 2) b 3) c 4) d

6. An atom of an element 'A' has three electrons in its outermost shell and that of 'B' has six electrons in the outrer most shell. The formula of the compound formed between these two elements is

   1) A_3B_4 2) A_2B_3 3) A_3B_2 4) A_2B

7. If Na^+ ion is larger than Mg^{2+} ion and S^{2-} ion is larger than Cl^- ion, Which of the following will be least soluble in water?

   1) NaCl 2) Na_2S 3) $MgCl_2$ 4) MgS

8. In which of the following solvents should KCl be soluble at 25^0C ?(D = Dielectric constant value)

   1) C_6H_6[D=0] 2) CH_3COCH_3[D=2] 3) CCl_4[D=0] 4) CH_3OH[D=32]

9. The following has more size

   1) Na^+ 2) Cs^+ 3) F^- 4) Cl^-

10. The mass of one unit cell of NaCl is

    1) 234amu 2) 234gm 3) 58.5amu 4) 58.5gm

11. A, B and C are atoms of elements with atomic number Z, Z+1 and Z+2 respectively. If 'B' has octet configuration the bond formed between 'A' and C predominently is

    1) Covalent bond 2) Ionic bond 3) Dative bond 4) Hydrogen bond

12. Lattice energy of NaCl is 'X'. If the ionic size of A^{+2} is equal to that of Na^+ and B^{-2} is equal to Cl^-, then lattice energy associated with the crystal AB is

    1) X 2) 2X 3) 4X 4) 8X

13. The number of unit cells present in 1 mole of NaCl crystal are

    1) 6.023×10^{23} 2) 1.5×10^{23} 3) 4 4) 1

14. The order of relative case of formation of various ions is

1) $F^- > O^{-2} > N^{-3}$ 2) $N^{-3} > O^{-2} > F^-$ 3) $O^{-2} > N^{-3} > F^-$ 4) $F^- > N^{-3} > O^{-2}$

15. The incorrect statement regarding the formation of ionic bond
1) It involves electrostatic attraction 2) It is a redox process
3) It is an exothermic process 4) It involves the absroption of energy

16. What is the total number of ions present in one unit cell of sodium chloride lattice (2006)
1) 2 2) 6 3) 12 4) 8

17. (A) : Na_2SO_4 is more soluble in water while $BaSO_4$ is less soluble
(R) : Lattice energy of Na_2SO_4 is greater than that of $BaSO_4$
1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false
4) (A) is false but (R) is true

18. The element that exhibits neither electrovalency nor covalency is
1) Neon 2) Sodium 3) Barium 4) Chlorine

19. The attraction that non-polar molecules have for each other is primarily caused by
1) Van der Waal's forces 2) Difference in electronegativities
3) Hydrogen bonding 4) High ionisation energy

20. The compound which contains both ionic and covalent bonds is
1) CH_4 2) C_2H_2 3) KCN 4) KCl

21. Which of the following ion has maximum polarising power
1) Mg^{+2} 2) Al^{3+} 3) Na^+ 4) Ca^{+2}

22. The bond between chlorine and bromine in BrCl is
1) ionic 2) non-polar
3) polar with negative end on Br 4) polar with negative end on Cl

23. Oxygen cannot exhibit tetravalency and hexavalency like sulphur. This is because
1) Oxygen has two unpaired electrons 2) Oxygen can form double bond
3) Oxygen lacks valence d-orbitals 4) Oxygen has only 2 electrons in valence shell

24. The covalency of nitrogen in HNO_2 is
1) 0 2) 2 3) 3 4) 5

25. Van der Walls' forces are maximum in the following substance
1) HBr 2) LiBr 3) LiCl 4) AgBr

26. An aqueous solution of silver nitrate gives a white precipitate with
1) C_2H_5Cl 2) $CHCl_3$ 3) HCl 4) None of the above

27. Which of the following is very much volatile
1) Diamond 2) Sodium chlorde 3) Calcium 4) Dry ice

28. Which of the following is truely covalent?
1) AgCl 2) KCl 3) $BaCl_2$ 4) $COCl_2$

29. Which of the following is covalent?
1) H_2 2) CaO 3) KCl 4) Na_2S

30. If the electronegativity of two atoms are low then expected bond between the elements is

1) Ionic Bond 2) Covalent Bond 3) Dative bond 4) Metallic Bond

31. Direct overlap leads

1) σ bond 2) π bond 3) Both σ & π Bonds 4) Neither σ nor π bond

32. The bonds present in N_2O_5 are

1) Ionic 2) Covalent 3) Ionic and covalent 4) Covalent and dative

33. In which type of bond fomation, can a proton participate?

1) Hydrogen bond 2) Electrovalent 3) Dative 4) Covalent

34. The bonds present in $[Cu(NH_3)_4]SO_4$ between copper and ammonia are

1) ionic 2) covalent 3) co-ordinate 4) hydrogen

35. The types of bonds present in $CuSO_4.5H_2O$ are

1) electrovalent and covalent
2) electrovalent, covalent, co-ordinate and hydrogen bond
3) covalent and co-ordinate covalent
4) electrovalent

36. The bonds present in HCl molecule are

1) Non-polar Covalent 2) Polar Covalent 3) Ionic 4) dative

37. (A) : BeF_2 is predominantly a covalent compound.

(R) : Electronegativity difference between Be and F is too small

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false

4) (A) is false but (R) is true

38. (A) : SiF_4 has octet configuration, but acts as an electron pair acceptor

(R) : Central atom of Si has vacant d-orbitals is its valence shell

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false 4) (A) is false but (R) is true

39. Increasing order of size of hybrid orbitals is

1) sp, sp^2, sp^3 2) sp^3, sp^2, sp 3) sp^2, sp^3, sp 4) sp^2, sp, sp^3

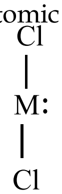
40. The type of hybridisation present on "S" in SO_2 and SO_3 molecules respectively

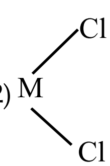
1) sp, sp^2 2) sp^2, sp^2 3) sp, sp^3 4) sp^2, sp^3

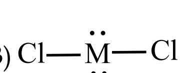
41. The hybridisation of Ag in the complex $[Ag(NH_3)_2]^+$ is

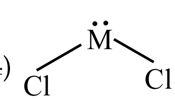
1) sp 2) sp^2 3) sp^3 4) dsp^2

42. Atomic number of the centrtal atom in MCl_2 is 50. The shape of gaseous MCl_2 is given as

1) 

2) 

3) 

4) 

43. An element M reacts with chlorine to from a compound X. The bond angle in X is 120^0. What is M

1) Be 2) B 3) Mg 4) N

44. When the hybridisation state of carbon atom changes from sp^3 to sp^2 and finally to sp, the angle between the hybrid orbitals

1) Decreases gradually 2) Decreased considerably
3) No change 4) Increases progressively

45. Hybridisation of one 's' and one 'p' orbitals we get

1) Two mutually perpendicular orbitals 2) Two orbitals at 180^0
3) Four orbitals directed tetrahedrally 4) Three orbitals in plane

46. Which orbital is used by oxygen atom to form a σ bond with other oxygen atom in O_2 molecule?

1) pure p-orbital 2) sp-hybrid orbital 3) sp^2-hybrid orbital 4) sp^3-hybrid orbital

47. The hybrid state of carbon in acetylene is the same as that of carbon in

1) Benzene 2) Carbondioxide 3) Graphite 4) Ethylene

48. Regarding hybridisation which is incoreect?

1) BF_3, C_2H_4, C_6H_6 involves sp^2 hybridisation 2) BeF_2, C_2H_2, CO_2 involves sp hybridisation
3) NH_3, H_2O, CCl_4 involves sp^3 hybridisation 4) CH_4, C_2H_4, C_2H_2 involves sp^2 hybridisation

49. sp^2 hybrid orbitals are not present in

1) SO_2 2) BF_3 3) B_2H_6 4) SO_3

50. Which hybridisation is found in $HClO_4$ and $HClO_3$

1) sp^3 2) sp^2 3) sp 4) dsp^2

51. The ratio of pure orbitals to hybridized orbitals in ethylene is

1) 2 : 3 2) 3 : 1 3) 1 : 1 4) 1 : 3

52. The ratio of hybrid and unhybrid orbitals involved in the bonding of a benzene molecule is

1) 3:2 2) 1:1 3) 3:1 4) 1:3

53. The pair having similar geometry is

1) BF_3, NH_3 2) H_2O, C_2H_2 3) CO_2, SO_2 4) NH_3, PH_3

54. The correct increasing order of bond angle is

1) CO_2, SO_2, BF_3, CH_4 2) CH_4, SO_2, BF_3, CO_2 3) BF_3, CH_4, CO_2, SO_2 4) CO_2, CH_4, BF_3, SO_2

55. The molecule with maximum number of lone pairs on central atom is

1) XeO_3 2) SF_4 3) PCl_3 4) lCl_3

56. The type of overlaping not observed in the formation of ethylene molecule is

1) $\sigma sp^2 - sp^2$ 2) $\sigma sp^2 - p$ 3) $\sigma sp^2 - s$ 4) $p^\pi - p^\pi$

57. The hybrid orbitals have a bond angle of $109^0 28^|$. The ratio of percentage of 's' and 'p' characters is

1) 1:1 2) 1:2 3) 1:3 4) 2:3

58. **LIST - 1** **LIST - 2**

LIST - 1	LIST - 2
A) NH_4^+	1) sp^3 hybridisation, two lone pairs
B) H_3O^+	2) sp^2 hybridisation, one lone pair
C) XeO_3	3) sp^3 hybridisation, no lone pairs

D) SO_3

4) sp^3 hybridisation, one lone pair

5) sp^2 hybridisation, no lone pairs

The correct match is

	A	B	C	D		A	B	C	D
1)	1	2	4	5	2)	2	2	3	5
3)	3	4	4	5	4)	4	4	3	5

59. **LIST - 1** / **LIST - 2**

A) CH_4

B) C_2H_4

C) C_2H_6

D) C_2H_2

1) sp^2–sp^2 overlap, sp^2–s overlap

2) sp–sp overlap, sp–s overlap

3) sp^3–s overlap only

4) sp^3–sp^3 overlap, sp^3–sp^2 overlap

5) sp^3–sp^3 overlap, sp^3–s overlap

The correct match is

	A	B	C	D		A	B	C	D
1)	5	2	1	3	2)	3	5	1	2
3)	3	4	1	2	4)	3	1	5	2

60. Which of the following statements is not correct from the viewpoint of molecular orbital ?

1) Be_2 is not a stable molecule

2) He_2 is not stable but He^+ is expected to exist

3) Bond strength of N_2 is maximum amongest the homonuclear diatomic molecules

4) The order of energies of molecular orbitals in F_2 molecule is

$$E(\sigma 2s) < E(\sigma^* 2s) < E(\pi 2p_x)$$
$$= E(\pi 2p_y) < E(\sigma 2p_z) < E(\pi^* 2p_x)$$
$$= E(\pi^* 2p_y) < E(\sigma^* 2p_z)$$

61. Which of the following orders regarding the bond order is correct?

1) $O_2^- > O_2 > O_2^+$ 2) $O_2^- < O_2 < O_2^+$ 3) $O_2^- > O_2 < O_2^+$ 4) $O_2^- < O_2 > O_2^+$

62. Which of the following orders regarding the bond length is correct?

1) $O_2^- > O_2 > O_2^+$ 2) $O_2^- < O_2 < O_2^+$ 3) $O_2^- > O_2 < O_2^+$ 4) $O_2^- < O_2 > O_2^+$

63. The molecular electronic configuration of B_2 is

1) $KK(\sigma 2s)^2(\sigma^* 2s)^2(\pi 2p)_x^1(\pi 2p)_y^1$

2) $KK(\sigma 2s)^2(\sigma^* 2s)^2(\pi 2p)_x^2$

3) $KK(\sigma 2s)^2(\sigma^* 2s)^2(\pi 2p)^2$

4) $KK(\sigma 2s)^2(\sigma^* 2s)^2(\sigma 2p)^1(\pi 2p)^1$

64. When N_2 goes to N_2^+, the N–N bond distance .... and when O_2 goes to O_2^+, the O–O bond distance ....:

1) increases, decreases

2) decreases, increases

3) increases, increases

4) decreases, decreases

65. The wave function of a molecular orbital formed by reinforce of wave functions of Ψ_A and Ψ_B of atomic orbital A and B is represented as

1) $\Psi_A + \Psi_B$ 2) $\Psi_A - \Psi_B$ 3) $\Psi_A \pm \Psi_B$ 4) $2\Psi_A + \Psi_B$

66. The wavelength of the wave function of a bonding molecular orbital formed by LCAO is

1) Equal to the wave function of atomic orbital

2) Less than the wave function of atomic orbital

3) Greater than the wave function of atomic orbital

4) Double the wave function of atomic orbital

67. The molecular orbital electronic configuration is $(\sigma_{1s})^2, (\sigma^*_{1s})^1$. It corresponds to

1) He_2 2) He_2^+ 3) H_2^- 4) Both 2 & 3

68. A bonding molecular orbital is produced by

1) Destructive interference of wave functions 2) Constructive interference of wave functions

3) Pairing of electrons with opposite spins 4) Combination of +ve and –ve wave functions

69. π^*_{2px} differs from π^*_{2py} molecular orbital in which of the following

1) Number of nodal planes 2) Energy 3) Symmetry 4) Shape

70. The bond order of individual carbon bonds in benzene is

1) one 2) two 3) Between one and two 4) One and two alternately

71. In the formation of a homo diatomic neutral molecule if 'N' atomic orbitals combine, then the total number of bonding molecular orbital formed.

1) 2N 2) N 3) N/2 4) N /4

72. In an anti – bonding molecular orbital, electron density is minimum

1) around one atom of the molecule 2) between 2 nuclei

3) at a point away from nuclei of the molecule 4) at no place.

73. The correct order of the energy of molecular orbitals in a molecules having 4 electrons.

1) $\sigma^*_{2s} > \sigma_{2pz} > \pi_{2px}$ 2) $\sigma^*_{2s} < \pi_{2p} < \sigma_{2pz}$ 3) $\sigma^*_{2s} < \sigma_{2pz} = \pi_{2px}$ 4) $\sigma_{2pz} < \sigma^*_{2s} < \pi_{2px}$

74. Maximum number of hydrogen bonds that one water molecule is capable of forming is

1) 1 2) 2 3) 3 4) 4

75. Which of the following compounds has Hydrogen bonding?

1) HCl 2) C_2H_6 3) RCH_2NHCH_3 4) RCH_2CHO

76. Acetic acid exists as a dimer in benzene due to

1) Condensation reaction 2) Hydrogen bonding

3) presence of phenyl group 4) presence of hydrogen atom at α-carbon

77. Hydrogen bond may be formed between

1) Two hydrogen atoms 2) Hydrogen atom and electropositive atom

3) H–atom and electronegative atom with small size

4) H–atom and electronegative atom with larger size

78. The intermolecular attractive forces vary in the order

1) Water < Alcohol < Ether 2) Ether < Alcohol < Water

3) Alcohol < Water < Ether 4) Ether < Water < Alcohol

CHEMICAL BONDING

79. Which of the following hydrogen bond is relatively weaker?

1) N..........H–N   2) F.........H–F   3) N..........H–O   4) O........H–O

80. Boiling point is highest for

1) HF   2) H_2O 3) NH_3 4) CH_4

81. Which of the following is soluble in water

1) $C_2H_5OC_2H_5$ 2) C_2H_5OH 3) C_2H_5Cl 4) C_6H_6

82. Among the three isomers of nitro phenol, which is least soluble in water

1) ortho isomer   2) para isomer   3) meta isomer   4) all are insoluble

83. Strongest hydrogen bonds can be formed by

1) HF   2) H_2O 3) NH_3 4) HCl

84. Hydrogen bonds are present even in vapour state of

1) H_2O 2) HF

3) p-hydroxy benzaldehyde   4) C_2H_5OH

85. (A) : Water is a liquid whereas sulphurdi-oxide is a gas at room temp

(R) : Molecular mass of SO_2 is more than that of H_2O

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false

4) (A) is false but (R) is true

86. (A) : O–Hydroxy benzaldehyde is steam volatile but not P–hydroxy benzaldehyde

(R) : Intramolecular hydrogen bond is present in orthohydroxy benzaldehyde but intermolecular hydrogen bond in parahydroxy benzaldehyde

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false

4) (A) is false but (R) is true

87. Between any two of the following molecules, hydrogen bonding is not possible

1) Two primary amine molecules   2) Two secondary amine molecules

3) Two tertiary amine molecules   4) Two ammonia molecules

88. For which of the following sets, all the compounds are ionic

1) NaF, BF_3, MgF_2 2) NaBr, $MgBr_2$, MgO   3) Al_2O_3, MgO, SO_3 4) NCl_3, $BeCl_2$, $AlCl_3$

89. The following are some statements about the crystal lattice structure of sodium chloride

i) If the corners of unit cell are occupied by Na^+ ion, the face edges are occupied by sodium ions

ii) The ratio between radii of Na^+ and Cl^- ions is 0.93

iii) If the body centered ion of unit cell is Na^+, face centered ion in it is Cl^-.

The correct combination is

1) only iii is correct   2) only ii is wrong   3) only i is wrong   4) all are wrong

90. Which of the following pairs will form the most stable ionic bond?

1) Na and F   2) Fe and Cl   3) N and O   4) Li and I

91. The following are some statements about the characteristics of covalent compounds

i) The combination of a metal and non-metal must give a covalent compound.

ii) All covalent substances are bad conductors of electricity.

iii) All covalent substances are gases at room temperature.

The correct combination is

1) all are correct
2) only i and ii are correct
3) only ii and iii are correct
4) all are wrong

92. Coordination number of cation is minimum in

1) NaCl 2) CsCl 3) ZnO 4) KCl

93. Some statements about valence bond theory are given below

i)The strength of bond depends upon extent of overlapping.

ii) The theory explains the directional nature of covalent bond.

iii)According to this theory oxygen molecule is paramagnetic in nature.

1) all are correct
2) only i and iii are correct
3) only i and ii are correct
4) all are wrong

94. The following are some statements about the type of chemical bond present in a given compound

i) All complex compounds contain ionic, covalent and dative bonds.

ii)The compound having monoatomic cation and monoatomic anion contains ionic bond.

iii) The compound having dative bond must possess covalent bond also.

The correct combination is

1) all are correct
2) only i and ii are correct
3) only ii and iii are correct
4) only i and iii are correct

95. Consider the following statements. The common features of the molecules BF_3, SF_6 and NO are that

i) all contain odd electron bond
ii) all are gases at room temperature
iii) all contain unpaired electrons
iv) all do not confirm to the octet rule

1) i and ii 2) iii and iv 3) i and iii 4) ii and iv

96. Which of the following contains unshared electrons.

1) NO_2 2) CO_2 3) NO_2^- 4) CN^-

97. The formal charges on the three oxygen atoms in O_3 molecule are

1) 0, 0, 0 2) 0, 0, –1 3) 0, 0 + 1 4) 0, +1, –1

98. Which of the following when dissolved in water forms a solution which is non–conducting

1) Chile salt petre 2) Green vitrol 3) Potash alum 4) Alcohol

99. i)The formation of a cation from a neutral atom is favoured by small size of the atom

ii) π-bond does not exist between two atoms without σ-bond

iii) The formation of chemical bond is associated with an increase in potential energy.

The correct combination of the above statements is

1) only i and ii are correct
2) only ii is correct
3) only ii and iii are correct
4) only i and iii are correct

100. How many unit cells are present in a cube-shped ideal crystal of NaCl of mass 1g ? (atomic masses : Na = 23, Cl=35.5)

1) 1.7×10^{21} unit cells
2) 2.57×10^{21} unit cells
3) 5.14×10^{21} unit cells
4) 1.28×10^{21} unit cells

101. In the electronic structure of acetic acid there are

1) 16 shared and 8 unshared valence electrons
2) 8 shared and 16 unshared valence electrons
3) 12 shared and 12 unshared valence electrons
4) 18 shared and 6 unshared valence electrons

102. Octet rule is mostly violated in the compounds formed by

1) Alkali metals
2) Alkaline earth metals
3) p–block elements
4) Transition elements

103. The following are some statements about hybridisation

i) Pure orbitals of same atom of an element will participate.

ii) The number of hybrid orbitals formed is twice the number of pure orbitals that participate in hybridisation.

iii) Completely filled (or) half-filled (or) vacant orbitals may participate in this process.

The correct combination is

1) all are correct
2) only i and ii are correct
3) only iii is correct
4) only i and iii are correct

104. The nodal plane in the π-bond of ethene is located in

1) The molecular plane
2) A plane parallel to the molecular plane
3) A plane perpendicular to the molecular plane which bisects the carbon-carbon sigma bond at right angle.
4) A plane perpendicular to the molecular plane which contains the carbon-carbon σ-bond.

105. A square planar complex is formed by hybridisation of which of the following atomic orbitals?

1) s, p_x, p_y, d_{yz}
2) $s, p_x, p_y, d_{x^2-y^2}$
3) s, p_x, p_y, d_{z^2}
4) s, p_y, p_z, d_{xy}

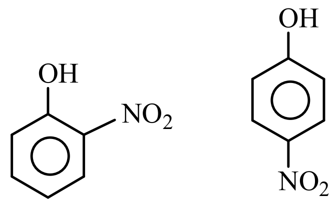
106. Which of the following statements are incorrect for PCl_5

1) Its all P–Cl bond lengths are equal
2) It involves sp^3d hybridisation
3) It has irregular geometry
4) Its shape is trigonal bipyramid

107. Using MO theory predict which of the following species has the shortest bond length?

1) O_2^{2-}
2) O_2^{2+}
3) O_2^{+}
4) O_2^{-}

108. Some statements are given below with respect to



A (orthonitrophenol) **B** (paranitrophenol)

i) 'A' contains intermolecular hydrogen bond and 'B' contains intramolecular hydrogen bond

ii) Boiling point of 'A' is higher than that of 'B'.

iii) 'A' is more volatile than 'B'.

The correct combination is

1) all are correct statements
2) only iii is correct statement
3) only i is correct statement
4) Both i and iii are correct statements

109. From the following given statements

i) O -----H hydrogen bond length is more than covalent "O–H" bond length.

ii) The ionic bond strength of CsF is more than that of NaF.

iii) The number of electrons present in all inner shells of sodium atom is 10.

The correct combination is

1) only i is correct
2) only i and ii are correct
3) only ii and iii are correct
4) only i and iii are correct

WORK SHEET - III

Comprehension - I

Ionic bond is defined as the electrostatic force of attraction holding the oppositely charged ions. Ionic compounds are mostly crystalline solids having high melting and boiling points, electrical conductivity in molten state, solubility in water etc. Covalent bond is defined as the force which binds atoms of same or different elements by mutual sharing of electrons in a covalent bond. Covalent compounds are solids, liquids or gases. They are low melting and boiling point compounds. They are more soluble in non polar solvents.

1. The valence electrons not involved in formation of covalent bonds are called.
   1) non bonding electrons
   2) lone pairs
   3) unshared pairs
   4) none of these

2. The amount of energy released when one mole of ionic solid is formed by close packing of gaseous ions is called.
   1) Ionisation energy 2) Solvation energy 3) Lattic energy 4) Hydration energy

3. Examples of covalent compounds are
   1) Urea 2) Sugar 3) Sodium chloride 4) Calcium fluoride

WORK SHEET - IV

Comprehension - I

1.Total number of electron pairs = $\frac{1}{2}$ (number of valence electrons ± electrons (for ionic charge)

2.Number of bond electron pairs = number of atoms – 1

3.Number of electron pairs around central atom = total number of electron pairs – 3 [number atoms (except H)]

4.Number lone pair = (number of central electron pairs – number bond pairs)

1. Pair of species with same shape and same state of hybridisation of the central atom is:

   1) PCl_5, ICl_4^- 2) NH_3, H_2O 3) NH_3, ClO_3^- 4) ICl_4^-, ClO_3^-

2. Square planar shape is predicted for:

   1) ICl_4^-, ClO_3^- 2) PCl_4^+, PCl_6^- 3) ICl_4^-, PCl_4^+ 4) $ICl_4^-, XeF_4]$

3. Based on above method, structure of the some of the molecules have been matched. Which is the incorrect matching?

   1) PCl_5 - trigonal bipyramidal 2) ClO_3^- - square planar

   3) ICl_4^- - square planar 4) PCl_4^+ - tetrahedral

4.

Column-I	**Column-II**
1) I_3^-	p) Linear
2) NH_4^+	q) T-shape
3) ClF_3	r) Sea-saw
4) SF_4	s) Tetrahedral

EXERCISE - I / ANSWERS

WORK SHEET - I

1) 1	2) 3	3) 3	4) 3	5) 3	6) 3	7) 3	8) 3	9) 3	10) 4
11) 4	12) 4	13) 2	14) 2	15) 3	16) 2	17) 4	18) 1	19) 3	20) 1
21) 3	22) 3	23) 4	24) 3	25) 2	26) 1	27) 4	28) 4	29) 2	30) 3
31) 4	32) 1	33) 2	34) 3	35) 3	36) 1	37) 4	38) 2	39) 1	40) 1
41) 3	42) 2	43) 4	44) 1	45) 2	46) 1	47) 1	48) 3	49) 4	50) 3
51) 4	52) 3	53) 2	54) 4	55) 1	56) 2	57) 4	58) 1	59) 4	60) 4
61) 3	62) 4	63) 1	64) 3	65) 2	66) 1	67) 3	68) 3	69) 2	70) 1
71) 2	72) 2	73) 1	74) 3	75) 3	76) 3	77) 1	78) 1	79) 2	80) 3
81) 4	82) 1	83) 3	84) 2	85) 3	86) 1	87) 1	88) 4	89) 2	90) 3
91) 2	92) 2	93) 2	94) 4	95) 3	96) 3	97) 1	98) 1	99) 2	100) 3
101) 1	102) 2	103) 3	104) 1	105) 1	106) 2	107) 4	108) 2	109) 3	110) 1

111) 2	112) 3	113) 1	114) 1	115) 3	116) 2	117) 3	118) 4	119) 3	120) 4
121) 1	122) 3	123) 2	124) 3	125) 4	126) 1	127) 4	128) 2	129) 4	130) 1
131) 1	132) 1	133) 3							

WORK SHEET - II

1) 2	2) 1	3) 3	4) 1	5) 3	6) 2	7) 4	8) 4	9) 4	10) 1
11) 2	12) 3	13) 2	14) 1	15) 4	16) 4	17) 3	18) 1	19) 1	20) 3
21) 2	22) 4	23) 3	24) 3	25) 4	26) 3	27) 4	28) 4	29) 1	30) 4
31) 1	32) 4	33) 3	34) 3	35) 2	36) 2	37) 3	38) 1	39) 1	40) 2
41) 1	42) 4	43) 2	44) 4	45) 2	46) 1	47) 2	48) 4	49) 3	50) 1
51) 3	52) 1	53) 4	54) 2	55) 4	56) 2	57) 3	58) 3	59) 4	60) 4
61) 2	62) 1	63) 1	64) 1	65) 1	66) 1	67) 4	68) 2	69) 3	70) 3
71) 3	72) 2	73) 2	74) 4	75) 3	76) 2	77) 3	78) 2	79) 1	80) 2
81) 2	82) 1	83) 1	84) 2	85) 2	86) 1	87) 3	88) 2	89) 1	90) 1
91) 4	92) 3	93) 3	94) 3	95) 4	96) 1	97) 4	98) 4	99) 2	100) 2
101) 1	102) 4	103) 4	104) 1	105) 2	106) 1	107) 2	108) 2	109) 4	

WORK SHEET - III

1) 13 4) 3 3) 12

WORK SHEET - IV

1) 3 2) 4 3) 2 4) 1 - P ; 2 - S ; 3 - Q ; 4 - R

EXERCISE - I

Thermodynamic terms

1. Which of the following come under the view of thermodynamics ?
   1) Predicting the feasibility of chemical change
   2) Predicting the extent of completion of the chemical change
   3) Rate at which chemical change occurs at particular set of conditions
   4) Effect of temperature on the rate of reaction
2. An isolated system is that in which :
   1) There is no exchange of energy with the surroundings
   2) There is exchange of mass and energy with the surroundings
   3) There is no exchange of mass and energy with the surroundings
   4) There is exchange of mass with the sounroundings
3. A well stoppered thermos flask contains some ice cubes. This is an example of
   1) Closed system 2) Open system
   3) Isolated system 4) Non-thermodynamic system
4. A system which can exchange energy with the surroundings but no matter is called
   1) A heterogeneous system 2) An open system
   3) A closed system 4) An isolated system
5. An intensive property of thermodynamics means a property which depends
   1) On the amount of the substance only 2) On the nature of the substance only
   3) Both on the amount as well as nature of the substance
   4) Neither on the amount nor on the nature
6. The intensive property among these quantities is
   1) Mass 2) Density 3) Enthalpy 4) Volume
7. Which is an extensive property of the system?
   1) Volume 2) Viscosity 3) Temperature 4) Refractive index
8. In which of the following sets, all the properties belong to same category (all extensive or all intensive)
   1) Mass, volume, specific heat 2) Temperature, Pressure, Volume
   3) Heat capacity, density, entropy 4) Enthalpy, Internal energy, volume
9. Which of the following statements is corect ?
   1) Only internal energy is a state function but not work
   2) Only work is a state function but not internal energy
   3) Both internal energy and work are state functions
   4) Neither internal energy nor work is a state function
10. Which of the following statement is false ?
    1) Work is a state function 2) Temperature is a state function
    3) Change of state is completely defined when initial and final states are specified
    4) Work appears at the boundary of the system
11. A process in which no heat change takes place is called
    1) An isothermal process 2) An adiabatic process
    3) An isobaric process 4) An isochoric process
12. A gaseous system changes from state A(P_1,V_1,T_1) to B (P_2,V_2.T_2), B to C (P_3,$V_3$$T_3$) and finally

from C to A. The whole process may be called

1) Reversible process 2) Cyclic process
3) Isobaric process 4) Spontaneous process

E, H, heat changes, first law

13. On which of the following factors the internal energy depends
1) Mass of the system 2) Temperature of the system
3) Nature of the system 4) All the above

14. For a substance more internal energy is observed in [same quantity]
1) Solid state 2) Liquid state 3) Gaseous state 4) All have same

15. The total heat content of a system at constant pressure is
1) Enthalpy 2) Interanl energy 3) Entropy 4) Free energy

16. Enthalpy "H" can be given as
1) H = E - PV 2) H = E + PV 3) H = E + P + V 4) H = E -TS

17. The enthalpy is maximum for
1) 10 gms of water 2) 10 gms of ice 3) 10 gms of steam 4) Same for all

18. The expression $[\Delta E / \Delta T]_v$ represent
1) Heat capacity at constant volume 2) Heat capacity at constant pressure
3) Enthalpy change 4) Eantropy change

19. The heat of reaction at constant volume and temperature is represented by
1) DE 2) DH 3) DP 4) DV

20. Which of the following relationship is correct for a reaction involving both reactants and products are in either solid or liquid state ?
1) $\Delta H > \Delta E$ 2) $\Delta H = \Delta E$ 3) $\Delta H < \Delta E$ 4) $\Delta H - \Delta E = \infty$

21. The difference between ΔH and ΔE for the reaction
$BaCl_2(aq)+K_2SO_4(aq) \rightarrow BaSO_4(s)\downarrow + 2KCl(aq)$
1) RT 2) 2RT 3) (1/2)RT 4) Zero

22. For which one of the following system DE<DH
1) $2SO_{2(g)} + O_{2(g)} \rightarrow 2SO_{3(g)}$ 2) $N_{2(g)} + O_{2(g)} \rightarrow 2NO_{(g)}$
3) $2NH_{3(g)} \rightarrow N_{2(g)} + 3H_{2(g)}$ 4) $H_{2(g)} + I_{2(g)} \rightarrow 2HI_{(g)}$

23. When a reaction is conducted in an open vessel, the heat of reaction is represented as
1) ΔH 2) ΔE 3) $P\Delta V$ 4) ΔnRT

24. Which of the following holds good to the laws of thermodynamics for the reaction $C_2H_4(g)+3O_2(g) \rightarrow 2CO_2(g)+2H_2O(l)$
1) $\Delta H = \Delta E + RT$ 2) $\Delta H = \Delta E - RT$ 3) $\Delta H = \Delta E + 2RT$ 4) $\Delta H = \Delta E - 2RT$

25. For which of the following reaction $\Delta H = \Delta E + 2RT$
1) $2SO_{2(g)} + O_{2(g)} \rightarrow 2SO_{3(g)}$ 2) $NH_4HS_{(s)} \rightarrow NH_{3(g)} + H_2S_{(g)}$
3) $N_{2(g)} + O_{2(g)} \rightarrow 2NO_{(g)}$ 4) $PCl_{5(g)} \rightarrow PCl_{3(g)} + Cl_{2(g)}$

26. For $N_2+3H_2 \rightarrow 2NH_3$, enthalpy and internal energy changes respectively are, ΔH & ΔU then

1) $\Delta H = O$ 2) $\Delta H \ \Delta U$ 3) $\Delta H < \Delta U$ 4) $\Delta H > \Delta U$

27. According to IUPAC conventions, which one of the following is not correct ?
1) The heat absorbed by a system is taken as positive
2) If a system is accompained by decrease in energy, ΔE is negative
3) The work done by the system is taken as negative
4) All the above three statements are correct

28. During expansion of a gas into vaccum ($P_{ext} = 0$), Work done is zero if the process is
1) Reversible 2) Irreversible 3) Isothermal
1) A, B & C are true 2) A, B & C are false 3) A & C are true 4) B & C are false

29. Mathematical from of 1st law
1) $C_V = aT^3$ 2) $\Delta S_{total} = \Delta S_{sys} + \Delta S_{sur}$
3) $q = \Delta U + \Delta W$ 4) $\Delta S_{sys} = \frac{qrev}{T}$

30. A system absorbs 'xJ' heat and does "yJ" work. Its ΔE is +Ve when
1) y > x 2) x > y 3) y = 2x 4) x = y

31 . In an adiabatic expansion of ideal gas :
1) $W = -\Delta E$ 2) $W = \Delta E$ 3) $\Delta E = 0$ 4) $W = 0$

32. During isothermal expansion of an ideal gas, its internal energy
1) Decreases 2) Increases
3) May increase or decrease 4) Remains unchanged

33. For the gaseous reaction involving the complete combustion of isobutane
1) $\Delta H = \Delta E$ 2) $\Delta H > \Delta E$ 3) $\Delta H = \Delta E = 0$ 4) $\Delta H < \Delta E$

Exothermic and endothermic reactions

34. Which are of the following is an exothemic reaction ?
1) $N_{2(g)} + O_{2(g)} + 180.8\,k.J \rightarrow 2NO_{(g)}$ 2) $N_{2(g)} + 3H_{2(g)} - 92\,k.J \rightarrow 2NH_{3(g)}$
3) $C_{(graphite)} + H_2O_{(g)} \rightarrow CO_{(g)} + H_{2(g)} - 131.3\,kJ$ 4) $C_{(graphite)} + 2S_{(s)} \rightarrow CS_{2(l)} - 91.9\,k.J$

35. Which of the following is an endothemic reaction?
1) $N_{2(g)} + 3H_{2(g)} - 92\,KJ \rightarrow 2NH_{3(g)}$ 2) $N_{2(g)} + O_{2(g)} + 180.8\,KJ \rightarrow 2\,NO_{(g)}$
3) $H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_{(g)}; \Delta H = -184.6\,kJ$
4) $C_{(graphite)} + 2H_{2(s)} \rightarrow CH_{4(g)} + 74.8\,k.J$

36. Which of the following is an exothermic reaction ?
1) $H_2(g)+Cl_2(g) \rightarrow 2HCl(g);\ \Delta H = -184.6KJ$ 2) $N_2(g)+O_2(g) \rightarrow 2NO(g);\ \Delta H = +180.8KJ$
3) C (graphite) + $H_2O(g) \rightarrow CO_2 + H_2(g) - 131.4KJ$
4) C(graphite) +2S(g)+91.9KJ $\rightarrow CS_{2(l)}$

37. Which of the following reaction do you think will result in the absorption of heat ?
1) Carbon burning in air
2) Iron reacting with sulphur to from iron sulphide

3) Formation of water gas from steam and coke
4) Formation of producer gas

38. The formation of water from $H_{2(g)}$ and $O_{2(g)}$ is an exothermic reaction because
1) $H_{2(g)}$ and $O_{2\,(g)}$ have a higher chemical energy that water
2) $H_{2(g)}$ and $O_{2(g)}$ have a lower chemical energy that water
3) $H_{2(g)}$ and $O_{2(g)}$ have a higher temperature than water
4) Energy considerations do not arise

39. When a solid melts there is
1) An increase in enthalpy 2) A decrease in enthalpy
3) No change in enthalpy 4) A decrease in internal energy

Heat of formation

40. The enthalpies of elements under the following conditions are assumed to be
1) Zero at 298K and 1 atm 2) Unity at 298K and 1 atm
3) Zero at 273K and 1 atm 4) Unity at 273K and 1 atm

41. For which of the following elements, the standard enthalpy is not zero ?
1) C (Diamond) 2) C (Graphite) 3) Liquid mercury 4) Rhombic sulphur

42. The enthalpy of elements in their standard states are taken as zero. Hence the enthalpy of formation of a compound is
1) always negative 2) always positive 3) positive (or) negative 4) equal to zero

43. In which of the following reactions, heat liberated is known as standard heat of formation of CO_2

1) $2CO_{(g)} + O_{2(g)} \rightarrow 2CO_{2(g)} + 135.6\ \text{kcals}$

2) $C_{(diamond)} + O_{2(g)} \rightarrow 2CO_{2(g)} + 94.5\ \text{kcals}$

3) $C_{(graphite)} + O_{2(g)} \rightarrow CO_{2(g)} + 94.05\ \text{kcals}$

4) $CH_{4(g)} + 2O_{2(g)} \rightarrow 2Co_{2(g)} + 2H_2O_{(1)} + 2128\ \text{kcals}$

44. Identify the reaction in which the heat liberated corresponds to the heat of formation (ΔH)
1) C(diamon4) + O_2 (g) $\rightarrow$ CO_2 (g) + heat 2) $2H_2$(g) + O_2(g) $\rightarrow$ $2H_2O$(g) + heat
3) C(diamon4) + $2H_2$(g) $\rightarrow$ CH_4(g) + heat 4) S(rhombi3) + O_2(g) $\rightarrow$ SO_2(g) + heat

45. The heat change for the following reaction $C_{(s)} + 2S_{(s)} \rightarrow CS_{2(l)}$ is known as
1) Heat of formation of CS_2 2) Heat of fusion of CS_2
3) Heat of vapourisation of CS_2 4) Heat of transition of Carbon

46. Which of the following reactions represents ΔH_f^0 ?
1) C(diamon4) + O_2(g) $\rightarrow$ CO_2(g) 2) $\frac{1}{2}H_{2(g)} + \frac{1}{2}F_2(g) \rightarrow HF(g)$
3) $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$ 4) $CO(g) + \frac{1}{2}O_2(g) \rightarrow CO_2(g)$

47. Which of the following equation represents standard heat of formation of ethanol ?

1) $CH_3CHO_{(l)} + \frac{1}{2}H_{2(g)} \xrightarrow{Ni} C_2H_5OH_{(l)}$ 2) $2C_{graphite} + 3H_{2_{(g)}} + \frac{1}{2}O_{2_{(g)}} \rightarrow C_2H_5OH_{(g)}$

3) $2C_{diamond} + 3H_{2_{(g)}} + \frac{1}{2}O_{2_{(g)}} \rightarrow C_2H_5OH_{(g)}$

4) $2C_{graphite} + 3H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow C_2H_5OH_{(l)}$

48. The reaction which shows standard heat of formation of water correctly is

1) $H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l); \Delta H = -68.3\,kcal$

2) $H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(s); \Delta H = -68.3\,kcal$

3) $H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(g); \Delta H = -68.3\,kcal$

4) $2H_2(g) + \frac{1}{2}O_2(g) \rightarrow 2H_2O(l); \Delta H = -136.6\,kcal$

49. The enthalpy of the reaction $H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow H_2O_{(g)}$ is DH_1 and that of $H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow H_2O_{(l)}$ is DH_2. Then

1) $\Delta H_1 < \Delta H_2$ 2) $\Delta H_1 + \Delta H_2 = 0$ 3) $\Delta H_1 > \Delta H_2$ 4) $\Delta H_1 = \Delta H_2$

Heat of combustion

50. The chemical process involved in the combustion reaction is

1) Oxidation 2) Reduction
3) Redox reaction 4) Disproportionation reaction

51. The following is not a combustion reaction

1) $CO + \frac{1}{2}O_2 \rightarrow CO_2$ 2) $CO + O_2 \rightarrow CO_2$

3) $C + \frac{1}{2}O_2 \rightarrow CO$ 4) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

52. $C_{graphite} + O_{2(g)} \rightarrow CO_{2(g)}$; $\Delta H = -393.5\,kJ$ Δ H of the above reaction cannot be

1) Heat of formation of CO_2 2) Heat of combustion of C
3) Heat of reaction 4) Heat of transition

Heat of neutralization

53. For the following reaction $H^+_{(aq)} + OH^-_{(aq)} \rightarrow H_2O_{(l)}$; ΔH = -Q, Where ΔH represents

1) Heat of formation 2) Heat of combustion
3) Heat of neutralisation 4) Heat of dilution

54. Enthalpy of neutralisation of all strong acids and strong bases has the same value because

1) Neutralisation leads to the formation of a salt and water
2) Strong acid and bases are ionic substances
3) Acids always furnish H^+ ions and bases always furnish OH^- ions
4) the net chemical change involes the combination of 1 mol of H^+ ions and 1 mol OH^- ions to from water.

55. The heat of neutralisation is maximum when

1) Sodium hydroxide is neutralised by acetic acid

2) Ammonium hydroxide is neutralised by acetic acid

3) Ammonium hydroxide is neutralized by hydrochloric acid

4) Sodium hydroxide is neutralized by hydrochloric acid.

Other heats of reactions

56. $MgSO_{4(s)} + aq. \rightarrow MgSO_{4(aq)}$ ΔH =-84 K.cals, ΔH of the reaction is known as

1) Heat of dilution 2) Heat of solution 3) Heat of fusion 4) Heat of transition

57. Dissolution of which of the following in water is endothermic

1) NaOH 2) Na_2CO_3 3) $MgSO_4$ 4) NH_4Cl

58. The enthalpy change for the process $C_{(graphite)} \rightarrow C(g); \Delta H = +xKJ$ represents enthalpy of

1) Fusion 2) Sublima1sation 3) Combustion 4) Vapourisation

59. The standard enthalpy of formation (ΔH^0) at 298 K for methane, $CH_4(g)$, is 74.8 $KJmol^1$.The additional information required to determine the average energy for C-H bond formation would be

1) The dissociation energy of hydrogen molecule, H_2

2) The dissociation energy of H_2 and enthalpy of sublimation of carbon

3) Latent heat of vaporisation of methane.

4) The first four ionisation energies of carbon and electron gain enthalpy of hydrogen

60. For the transition $C_{(diamond)} \rightarrow C_{(graphite)}; \Delta H = -1.5KJ$. It follows that

1) Graphite is stabler than diamond 2) Diamond is stabler than graphite

3) Graphite is endothermic substance 4) Diamond is exothermic substance

61. Which of the following is not correct

1) Dissolution of NH_4Cl in excess of water is an endothermic process

2) Neutralisation proces is always exothermic

3) The absolute value of enthalpy (H) can be determined experimentally

4) The heat of reaction at constant volume is denoted by Δ E

Hess law

62. Hess's law states that

1) The standard enthalpy of an overall reaction is the sum of the enthalpy chages in individual reaction

2) enthalpy of formation of compoud is same as the enthalpy of decomposition of the compound into constituent elements, but with opposite sign

3) at constant temperature the pressure of a gas in inversely proportional to its volume.

4) the mass of a gas dissolved per lit of a solvent is proportional to the pressure of the gas in equilibrium with the solution

63. Heat of reaction (DH) is given by

1) DH = Activation energy of forward reaction - Activation energy of backward reaction

2) DH = Sum of bond energy of reactants - Sum of bond energy of products

3) DH = Sum of enthalpy of products - Sum of enthalpy of reactants

4) All the above

64. The factor which does not influence the heat of the reaction is

1) Pressure
2) Temperature
3) Physical state of substance
4) Number of steps involved in the reaction

65. Hess's law is based on

1) Law of conservation of mass
2) Gibb's equation
3) First law of thermodynamics
4) Kirchoff's equation

66. In which of the following equations ΔH^0 reaction equals to ΔH_f^0 for the product ?

1) $2CO_{2(g)} + O_2 \rightarrow 2CO_2$
2) $N_{2(g)} + O_{3\,(g)} \rightarrow N_2O_{3(g)}$
3) $CH_{4(g)} + 2CI_{2(g)} \rightarrow CH_2Cl_{2(l)} + 2HCl_{(g)}$
4) $Xe_{(g)} + 2F_{2(g)} \rightarrow XeF_{4(g)}$

Second, Third laws, S and G

67. 1st law does not tell about

1) Law of conservation of energy
2) Workdone whether +Ve (or) - Ve
3) Feasibility of a process
4) Δ E at const T

68. For change in entropy units are

1) mol/lit
2) Mol. lit^{-1} sec^{-1}
3) J. mol^{-1} K^{-1}
4) s^{-1}

69. In standard state the non spontaneous reaction is

1) Melting of ice
2) Natural radioactivity
3) Freezing of water
4) Rusting of iron

70. The incorrect statment according to second law of themodynamics is

1) Heat can not flow from colder body to a hotter body of its own
2) All spontaneous processes are themody-namically irreversible
3) Heat can be converted into work completely without casusing some permanent change in the system (or) surroundings
4) Perpetual motion machine of second kind is not possible

71. Incorrect statement related to an irreversible process is

1) Entropy of the universe goes on increasing
2) Gibbs energy of the system goes on decreasing
3) Total energy of the universe goes on decreasing
4) Total energy of the universe remain constant

72. False statement regarding second law of thermodynamics

1) It is impossible to construct a machine working in cycles which transforms heat from a lower temperature region to higher temperature region with out intervention of any external agency.
2) Heat can not flow from a colder body to a hotter body on its own
3) Any spontaneous process taking place in isolated system $\Delta S < O$
4) All spontaneous processes are thermo-dynamically irreversible & entropy of the system increases in all spontaneous processes.

73. Entropy of a system depends upon

1) Volume only 2) Temperature only 3) Pressure only

4) Pressure, Volume and temperature

74. One of the following reaction involves in decrease of entropy

1) Sublimation of dry ice 2) Crystallisation of salt from brine (aq)

3) Burning of rocket fuel 4) Decomposition of gaseous N_2O_4.

75. The least random state of H_2O system is

1) Ice 2) Liquid water

3) Steam 4) Randomness is same all.

76. Which of the following process has negative value of ΔS ?

1) Dissolution of sugar in water 2) Stretching of rubber band

3) Decomposition of lime stone 4) Evaporation of water

77. For the reaction $I_{2(g)} \rightleftharpoons I_{2(s)}; \Delta H = -ve$. Then choose the correct statement/s from the following

1) The process is spontaneous at all temperatures

2) The process is accompained by an increase entropy

3) The process is accompained by a decrease in entropy

4) The process is accompained by a decrease in enthalpy

The correct statements are

1) Only a, b and c 2) Only b and d 3) Only c and d 4) Only a, c and d

78. For a spontaneous process in a reaction

1) $\Delta S_{total} = (\Delta S_{\text{system}} + \Delta S_{\text{surroundings}}) < O$ 2) $\Delta S_{\text{total}} = (\Delta S_{\text{system}} + \Delta S_{\text{surroundings}}) = O$

3) $\Delta S_{\text{total}} = (\Delta S_{\text{system}} + \Delta S_{\text{surroundings}}) > O$ 4) $\Delta S_{sys} > O$ only

79. Some statements are given with regard to entropy. The incorrect statements are

1) The absolute entropy of substances cannot be determined

2) In standard state entropy of elements is always positive

3) The entropy of universe always decreases

4) In a spontaneous process, for Isolated system the entropy of a system generally increases

1) A, B 2) B, C 3) A, C 4) Only C

80. For an irreversible process, the value of $\left[\Delta S_{(\text{system})} + \Delta S_{(\text{surroundings})}\right]$ is (J & K PMT 2004)

1) > 0 2) < 0 3) 0 4) $2\Delta S_{(\text{surr})}$

81. A process is spontaneous at all temperatures when

1) $\Delta H = -ve, \Delta S = -ve$ 2) $\Delta H = +ve, \Delta S = -ve$

3) $\Delta H = -ve, \Delta S = +ve$ 4) $\Delta H = +ve, \Delta S = +ve$

82. $2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O_{(l)}$; $\Delta H = -ve$ and $\Delta G = -ve$ Then the reaction is

1) Spontaneous and instantaneous 2) Spontaneous and endothermic
3) Spontaneous and slow 4) Non spontaneous and slow

83. $H^+_{(aq)} + OH^-_{(aq)} \rightarrow H_2O_{(l)}$; $\Delta H = -ve$ and $\Delta G = -ve$ then the reaction is
1) Spontaneous and instantaneous 2) Spontaneous and endothermic
3) Spontaneous and slow 4) Non spontaneous and slow

84. What is necessary condition for spontanity of a process?
1) $\Delta S > O$ 2) $\Delta E < O$ 3) $\Delta H < O$ 4) $\Delta G < O$

85. Which of the following is the condition for a non spontaneous reaction at high temperature but spontaneous at low temperature

	ΔH	ΔS
1)	–	–
2)	+	+
3)	+	–
4)	–	+

86. Based on the third law of themodynamics, the entropy can be obtained using the equation.
1) $\Delta S = \frac{\Delta H}{T}$ 2) $\int_0^T T.C_P^{-1}dT = S$ 3) $\Delta G = T\Delta S$ 4) $\int_0^T C_pT^{-1}dT = S$

87. A chemical reaction cannot occur at all if its :
1) Δ H is (+)ve and Δ S is (–)ve 2) Δ H is (–)ve and Δ S is (+)ve
3) Δ H and Δ S are (+)ve but Δ H>TΔ S 4) Δ H and Δ S are (–)ve but Δ H>TΔ S

88. An equilibrium reaction $X + Y \rightleftharpoons W + Z$ ΔH =+ve is spontaneous in the forward direction. Then corresponding sign of ΔG and ΔS should be respectively
1) +ve, -ve 2) -ve, +ve 3) +ve, +ve 4) -ve, -ve

89. For the process Dry ice $\rightarrow CO_2(g)$
1) ΔH is positive and ΔS are negative 2) Both ΔH and ΔS are negative
3) Both ΔH and ΔS are positive 4) ΔH is negative whereas ΔS is positive

90. For which of the process, $\mathbf{\Delta S}$ is negative ?
1) $H_{2(g)} \rightarrow 2H_{(g)}$ 2) $N_{2(g)}$(1 atm) $\rightarrow N_{2(g)}$ (8 atm)
3) $2SO_{3(g)} \rightarrow 2SO_{2(g)} + O_{2(g)}$ 4) $C_{(diamon} \rightarrow$ 4) $C_{(graphite)}$

91. The process of evaporation of a liquid is accompanied by
1) Increase in enthalpy 2) Increase in entropy 3) Decrease in Gibbs energy
The correct statement (s) is or are
1) Only a and c 2) Only b and c 3) Only a and b 4) All

92. The favourable conditions for a spontaeous reaction are
1) $T\Delta S > \Delta H$, ΔH = +ve, ΔS = +ve 2) $T\Delta S > \Delta H$, ΔH = +ve, ΔS = -ve
3) $T\Delta S = \Delta H$, ΔH = +ve, ΔS = -ve 4) $T\Delta S = \Delta H$, ΔH = +ve, ΔS = +ve

93. A reaction has both DH and DS negative. The rate of reaction
1) Increase with increase of temperature 2) Increase with decrease of temperature
3) Remains unaffected by change of temperature
4) Cannot be predicted for change in temperature

94. At 27^{0}C the reaction, $C_6H_{6(l)} + \frac{15}{2}O_{2(g)} \rightarrow 6CO_{2(g)} + 3H_2O_{(l)}$. proceeds spontaneously

because the magnitude of

1) $\Delta H = T\Delta S$ 2) $\Delta H > T\Delta S$

3) $\Delta H < T\Delta S$ 4) $\Delta H > 0$ and $T\Delta S < 0$

95. Although the dissolution of ammonium chloride in water is an endothermic reaction, even then it is spontaneous because:

1) ΔH is positive, ΔS is –ve 2) ΔH is +ve, ΔS is zero

3) ΔH is positive, $T\Delta S < \Delta H$ 4) ΔH is +ve, ΔS is positive and $\Delta H < T\Delta S$

96. For the precipitation reaction of Ag^+ ions with NaCl which of the following statements is correct ?

1) ΔH for the reaction is zero 2) ΔG for the reaction is zero

3) ΔG for the reaction is negative 4) $\Delta G = \Delta H$

97. If an endothermic reaction is non-spontaneous at freezing point of water and becomes feasible at its boiling point, then

1) ΔH is -ve, ΔS is +ve 2) ΔH and ΔS both are +ve

3) ΔH and ΔS both are -ve 4) ΔH is +ve and ΔS is -ve

98. If an irreversible process taking place at constant T and P and in which only pressure - volume work is being done, the change on Gibb's free energy (dG) and change in entropy (dS), satisfy the criteria

1) $(dS)_{V,S} < 0, (dG)_{T,P} < 0$ 2) $(dS)_{V,E} > 0, (dG)_{T,P} < 0$

3) $(dS)_{V,E} = 0, (dG)_{T,P} = 0$ 4) $(dS)_{V,E} = 0, (dG)_{T,P} > 0$

99. Which one of the following has ΔS^0 greater than zero ?

1) $CaO(s) + CO_2(g) \rightleftharpoons CaCO_3(s)$ 2) $NaCl(aq) \rightleftharpoons NaCl(s)$

3) $NaNO_3(s) \rightleftharpoons Na^+(aq) + NO_3^-(aq)$ 4) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

100. For a spontaneous reaction, the DG, equilibrium constant, K and E^0_{cell} will be respectively

1) -Ve, >1, +Ve 2) +Ve, > 1, -Ve 3) -Ve, < 1, -Ve 4) -Ve, > 1, -Ve

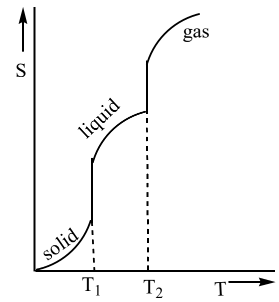
101. Which of the following relationship is correct ?

1) $DG^0 = -RT \text{ in } K$ 2) $K = e^{-\Delta G^0/RT}$ 3) $K = 10^{-\Delta G^0/2.303RT}$ 4) All are correct

102. For a reaction R_1, DG = x KJ mol^{-1}. For a reaction R_2, DG = y KJ mol^{-1}. Reaction R_1 is non - spontaneous but along with R_2 it is spontaneous. This means that

1) x is -ve , y is +ve but in magnitude x > y 2) x is +ve, y is -ve but in magnitude y > x

3) Both x and y are -ve but not equal 4) Both x and y are +ve but not equal.

103. 

Here T_1 and T_2 are

1) M.P, B.P 2) B. P, B. P 3) B. P, M. P 4) M.P, M.P

Assertion - Reason Type :

1) A and R are true, R explains A
2) A and R are true, R does not explain A
3) A is true, but R is false
4) A is false, but R is true

104. Assertion : The reaction $C + O_2 \rightarrow CO_2$ is an exothermic reaction

Reason : In this reaction the total enthalpy of the product is less than the total enthalpy of the reactants.

105. Assertion : The enthalpies of elements in their standard states are taken as zero.

Reason: It is impossible to determine the absolute enthalpy of any substance.

106. Assertion : Internal energy change in a cyclic process is zero

Reason : Internal energy is a state function.

107. Assertion : The enthalpy of neutration of a strong acid by a strong base is a constant.

Reason : The net reaction that takes place is the same.

108. Assertion : Heat of neutralization of $HClO_4$ with NaOH is same as that of HCl with NaOH.

Reason : Both HCl and $HClO_4$ are strong acids

109. Assertion : The enthalpy of formation of $H_2O(l)$ is greater than that of $H_2O(g)$

Reason : Enthalpy change is negative for the condensation reaction $H_2O(g) \rightarrow H_2O(l)$

110. Assertion: Entropy of a perfect crystalline substance at absolute zero is zero.

Reason : At absolute zero translational kinetic energy of a system is zero.

111. Assertion : Absolute values of internal energy cannot be determined.

Reason : It is impossible to determine the exact values of constituent energies of the substance.

112. Assertion : Mass and volume are extensive properties.

Reason : Mass / volume is also an extensiveproperty.

***Asserti*on : The heat absorbed during isothermal expansion of an ideal gas against vacuum is zero.

Reason : The volume occupied by the molecules is zero.

Match the following Type

114. LIST - 1 LIST - 2

LIST - 1	LIST - 2
A) $H_P > H_R$	1) Exothermic
B) $P\Delta V$	2) Total heat content
C) E + PV	3) ΔH is positive
D) $H_R > H_P$	4) Zero at constant volume

The correct match is

	A	B	C	D		A	B	C	D
1)	3	4	2	1	2)	2	3	1	4
3)	1	3	4	2	4)	1	3	4	2

115.

LIST - 1	LIST - 2
A) $HNO_3 + KOH$	1) –55. 22 KJ
B) $NH_4OH + CH_3COOH$	2) –58.7 KJ
C) $CH_3COOH + NaOH$	3) –57.3 KJ
D) HCl + NaOH	4) –49.3 KJ
	5) –51.46 KJ

The correct match is

	A	B	C	D		A	B	C	D
1)	1	2	3	4	2)	4	3	2	1
3)	3	4	1	3	4)	3	2	1	4

116.

List - I	List - II
(Freezing of water)	
A) Water at - 10^0C	I) $\Delta G = O$
B) Water at 0^0 C	II) $\Delta G + Ve$
C) Water at $+10^0C$	III) $\Delta G - Ve$

The correct match is

	A	B	C		A	B	C
1)	2	1	3	2)	3	1	2
3)	1	2	3	4)	3	2	1

117.

List - I	List - II
1) Work	1) Extensive propety
2) Enthalpy	2) Intensive property
3) Temperature	3) State variable
4) P, V, T and n	4) Path function

The correct match is

	A	B	C	D		A	B	C	D
1)	4	1	2	3	2)	1	2	3	4
3)	4	3	2	1	4)	4	3	1	2

118. List - I List -II

(Melting of Ice)	(Conditon)
1) Ice at -10°C	1) $\Delta G = O$
2) Ice at +10°C	2) $\Delta G + Ve$
3) Ice at 0°C	3) $\Delta G - Ve$

The correct match is

	A	B	C		A	B	C
1)	1	2	3	2)	3	2	1
3)	2	3	1	4)	1	3	2

WORK SHEET - II

First law of thermodynamics

1. A system absorbs 600J of energy and does work equivalent to 400J of energy. The internal energy change is

1) 1000J 2) 200J 3) 600J 4) 300J

2. During a process work equivalent to 400J is done on a system, which gives out of 125J of energy. The change in internal energy is

1) 525J 2) 375J 3) 275J 4) 200J

3. One litre-atmosphere is appromixmately equal to

1) 19.2 KJ 2) 101 J 3) 8.31 J 4) 831 J

4. One mole of an ideal gas at 300 K is expanded isothermally reversibly from an initial volume of 1 litre to 10 liters. The DE for this process is (R=2 cal mol^{-1} K^{-1})

1) 163.7 cal 2) Zero 3) 1381.1 cal 4) 9 lit atm

5. An ideal gas occuping a volume of 2 dm^3 and a pressure of 5 bar undergoes isothermal and irreversible expansion against external pressure of 1 bar. The final volume of the system and the work involved in the process is

1) 10 dm^3, 1000 J 2) 8 dm^3, –800 J 3) 10 dm^3, –800 J 4) 10 m^3, –1000 J

6. A system absorbs 10 KJ of heat at constant volume and its temperature rises from 27^0C to 37^0C. The DE of reaction is

1) 100 KJ 2) 10KJ 3) 0 4) 1 KJ

7. An ideal gas expands in volume from $1 \times 10^{-3} m^3$ to $1 \times 10^{-2} m^3$ at 300 K against a constant pressure at 1×10^5 Nm^{-1}. The work done is

1) –900 J 2) 900KJ 3) 270KJ 4) -900KJ

8. Two moles of an ideal gas is expanded spontaneously into a vaccume. The work done is

1) Zero 2) 2 J 3) 4 J 4) 8 J

E, H, heat capacities

9. Latent heat of vapourisation of a liquid at 500k and 1atm pressure is 10K.Cal/mole. What is the change is enthalpy when 3 mole liquid vapourised at the same temperature $(\text{HINT} : \Delta H = \Delta E + \Delta nRT)$

1) 27K.Cal 2) 7K.Cal 3) 33K.Cal 4) 25K.Cal

10. The molar heat capacity of waterat constant pressure, C, is 75 JK^{-1} mol^{-1}. When 1.0KJ of heat is supplied to 100g of water which is free to expand, the increase in temperature of water is:

1) 1.2K 2) 2.4K 3) 4.8K 4) 6.6K

11. Which statements is correct;

1) $\left(\frac{\delta H}{\delta T}\right)_P - \left(\frac{\delta U}{\delta T}\right)_V = R$ 2) $\left(\frac{\delta H}{\delta T}\right)_P > \left(\frac{\delta U}{\delta T}\right)_V$

3) $\left(\frac{\delta H}{\delta V}\right)_T$ for ideal gas is zero 4) All of these

12. For a gas having molar mass M, specific heat at constant pressure can be given as:

1) $\frac{\gamma R}{M(\gamma - 1)}$ 2) $\frac{\gamma}{RM}$ 3) $\frac{M}{R(\gamma - 1)}$ 4) $\frac{\gamma RM}{\gamma + 1}$

13. Molar heat capacity of water in equilibrium with the ice at constant pressure is:

1) Zero 2) Infinity (∞) 3) 40.45 KJK^{-1} mol^{-1} 4) 5.48 JK^{-1} mol^{-1}

Heat of formation and combustion

14. $N_2 + 3H_2 \rightarrow 2NH_3$; $\Delta H = -46$ K.Cals. From the above reaction, heat of formation of ammonia is

1) 46 K.Cals 2) –46 K.Cals 3) –23 K.Cals 4) 23 K.Cals

15. Given that $\frac{1}{2}S_8(s) + 6O_2(g) \rightarrow 4SO_3(g); \Delta H^0 = -1590\,kJ$ .The standard enthalpy of formation of SO_3 is

1) –1590 KJ mol^{-1} 2) –397.5 KJ mol^{-1} 3) –3.975 KJ mol^{-1} 4) +397.5 KJ mol^{-1}

16. The amount of heat evolved on combustion of 10 grams of benzoic acid is 10 K.Cals. The heat of combustion of Benzoic acid is

1) –122 K.Cals 2) –112 K.Cals 3) –132 K.Cals 4) –92 K.Cals

17. Heat of combustion of C_2H_4 is -337 K.Cal. If 5.6 lit O_2 is used at STP, in the combustion heat liberated is ...... K.Cal

1) 28.08 2) 14.04 3) 42.06 4) 56.16

18. Human body requires 2370 K. Cal of energy daily. The heat of combustion of glucose is –790 K.cal/mole. The amount of glucose required for daily consumption is

1) 650g 2) 540g 3) 327g 4) 490.5g

19. The heats of combustion of ethane, ethene and acetylene are -341.1KJ, -330 and –310.9K.Calmol^{-1} respectively. The best fuel among them is

1) Ethane 2) Ethene 3) Acetylene 4) All are equal

20. The heat of combustion of benzene at 27^{0}C found by bomb calorimeter i.e. for the reaction

$$C_6H_{6(l)} + 7\tfrac{1}{2}O_{2(g)} \rightarrow 6CO_{2(g)} + 3H_2O_{(l)}$$

is 780 K.Cal mol^{-1}. The heat evolved on burning 39g of benzene in an open vessel wil be

1) 390 K.Cal 2) 780.9 K.Cal 3) 390.45 K.Cal 4) 780 K.Cal

Heat of neutralization:

21. $H_2SO_{4(aq)} + 2KOH_{(aq)} \rightarrow K_2SO_{4(aq)} + 2H_2O_{(l)}$; ΔH for the above reaction is

1) –13.7 K.Cal 2) +57.3 K.J 3) –27.4 K.Cal 4) –137 K.J

22. For the reaction $2H_2O(l) \rightarrow H_3O^+(aq)+OH^-(aq)$, the value of DH is

1) 114.6 KJ 2) -114.6 KJ 3) 57.3 KJ 4) -57.3 KJ

23. Equal volumes of equi molar HCl and H_2SO_4 are separately neutralised by dilute NaOH solution, then heat liberated are 'X" K.Cal and "Y" K.Cal respectively. Which of the following is true

1) x = y 2) x = y/2 3) x = 2y 4) x = y/3

24. When 50cm^3 of 0.2 N H_2SO_4 is mixed with 50 cm^3 of 1 N KOH, the heat liberated is

1) 11.45 KJ 2) 57.3 KJ 3) 573 KJ 4) 573 KJ

25. Heat of neutralisation for the reaction $NaOH+HCl \rightarrow NaCl+H_2O$ is -57.1 K.J. mole^{-1}. The heat released when 0.25 moles of NaOH is treated with 0.25 moles of HCl is

1) 22.5 K.J/mole 2) 57.1 K.J/mole 3) 14.3 K.J/mole 4) 28.6 K.J/mole

26. Given that the data for neutralization of a weak acid (H1) and strong acid with a strong base is

$HA + OH^- \rightarrow A^- + H_2O$; $\Delta H = -41.80kJ$ $H^+ + OH^- \rightarrow H_2O$; $\Delta H = -55.90kJ$

The enthalpy of dissociation of weak acid would be

1) -97.20 KJ 2) +97.70 KJ 3) -14.10 KJ 4) 14.10 KJ

27. The heats of neutralisation of HCl with NH_4OH and that of NaOH with CH_3COOH are repectively -51.4 and -50.6 KJ eq^{-1}. The heat of neutralisation of acetic acid with NH_4OH will be

1) -44.6 KJ eq^{-1} 2) -50.6 KJ eq^{-1} 3) -51.4 KJ eq^{-1} 4) -57.4 KJ eq^{-1}

28. Heat liberated in the neutralisation of 500 ml of 1N HCl and 500 ml of 1N NH_4OH is -1.36 K.Cals. The heat of ionisation of NH_4OH is

1) 10.98 K.Cals 2) -12.34 K.Cals 3) -10.98 K.Cals 4) 12.34 K.Cals

29. In which of the following combinations of HCl and NaOH, the heat energy liberated is maximum

1) 10ml of 0.1M HCl+40 ml of 0.1 M NaOH 2) 30ml of 0.1M HCl+20 ml of 0.1 M NaOH
3) 25ml of 0.1M HCl+25 ml of 0.1 M NaOH 4) 35ml of 0.1M HCl+15 ml of 0.1 M NaOH

30. Under the same conditions how many mL of 1MKOH and 0.5MH_2SO_4 solutions, respectively when mixed for a total volume of 100 mL produce the highest rise in temperature:

1) 67:33 2) 33:67 3) 40:60 4) 50:50

31. Heat of neutralisation of HF with NaOH is:

1)57.32KJ 2) > 57.32KJ 3) < 57.32KJ 4) None of these

32. When 1 litre of 1M HCl is mixed with 1 lite of 1M NaOH, the rise in temperature was found to be T_1. In another experiment 1 litre of 0.5 M NaOH is mixed with 1 lit. of 0.5 M HCl. The rise in temperature was found to be T_2. Then

1) $T_1 = T_2$ 2) $T_1 < T_2$ 3) $T_1 = 2T_2$ 4) $T_2 = 2T_1$

Other heats of reactions, determination of ΔH & ΔE

33. $H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow H_2O_{(\ell)}; \Delta H = -286.2KJ$ $H_2O_{(\ell)} \rightarrow H^+_{(aq)} + OH^-_{(aq)}; \Delta H = +57.3KJ$

Enthalpy of ionization OH^- in aqueons solution is *(AIEEE – 2009)*

1) –228.5KJ 2) +228.5KJ 3) –343.5KJ 4) zero

34. Among the following ions, for which one standard anthalpy of ionisation is zero

1) $OH^-_{(aq)}$ 2) $Cl^-_{(aq)}$ 3) $H^-_{(aq)}$ 4) $H^+_{(aq)}$

35. $\frac{1}{2}H_{2(g)} + \frac{1}{2}Cl_{2(g)} \rightarrow HCl_{(g)}$; $\Delta H^0 = -92.4 KJ/mole$;

$HCl_{(g)} + nH_2O \rightarrow H^+_{(aq)} + Cl^-_{(aq)}$; $\Delta H^0 = -74.8 KJ/mole$

$\Delta H^0 f$ for $Cl^-_{(aq)}$ is

1) –17.6KJ/mole 2) –167.2 KJ/mole 3) +17.6KJ/mole 4) –35.2KJ/mole

36. Triple point pressures of four solids A,B,C and D are 10mm, 100mm, 200mm and 800mm ressectively. Which solid undergo sublimation on heating at atmospheric pressure

1) A 2) B 3) C 4) D

37. Work done during the combustion of one mole of CH_4 in bomb calorimeter is

1) zero 2) –101 J 3) –24.2J 4) –1J

38. A sample of CH_4 of 0.08g was subjected to combustion at 27^0C in a bomb calorimeter. The temperature of the calorimeter system was found to be raised by 0.25^0C. If heat capacity of calorimeter is 18KJ, ΔH for combustion of CH_4 at 27^0C is

1) –900KJ/mole 2) –905KJ/mole 3) –895KJ/mole 4) –890KJ/mole

39. For the reaction of one mole zinc dust with one mole sulphuric acid in a bomb calorimeter, ΔU and w correspond to:

1) $\Delta U < 0, w = 0$ 2) $\Delta U < 0, w < 0$ 3) $\Delta U > 0, w = 0$ 4) $\Delta U > 0, w > 0$

40. 100ml of water at 20^0C and 100ml of water at 40^0C are mixed in calorimeter untill constant temperature reached. Now temperature of the mixture is 28^0C. Water equivalent of calorimeter is

1) 50J 2) 104.5J 3) –24.2J 4) 209J

41. Heat of combustion of benzoic acid (C_6H_5 COOH) at Constant volume at 25^0C is –3233KJ/mole. When 0.5g of benzoic acid is burned in bomb calorimeter, the temperature of calorimeter increased by 0.53^0C. Now in the same bomb calorimeter 1g of C_2H_6 burned then temperature increased by 2.04^0C. ΔH for combustion of C_2H_6 is

1) –1530KJ/mole 2) –1536.2KJ/mole 3) –1522.8KJ/mole 4) +1536.2KJ/mole.

42. The dissociation energy fo CH_4 is 400K.Cal mol^{-1} and that of ethane is 670 K.Cal mol^{-1}. The C–C bond energy is:

1) 270K.Cal 2) 70K.Cal 3) 200K.Cal 4) 240K.Cal

43. The heat of atomisation of $PH_{3(g)}$ is 228 K.Cal mol^{-1} and that of $P_2H_{4(g)}$ is 355 K.Cal mol^{-1} The energy of the P–P bond is (in K.Cal);

1) 102 2) 51 3) 26 4) 204

Hess law

44. The enthalpies of HCl, NaOH, NaCl and H_2O are -120, -82, -148 and -68 K.Cals. respectively. Δ H of the following reaction is HCl + NaOH $\longrightarrow$ Na*Cl* + H_2O

1) -28.7 K.Cals 2) -18 K.Cals 3) -57.3 K.Cals 4) -14 K.Cals

45. ΔH^0_f for a reaction $F_2 + 2HCl \rightarrow 2HF + Cl_2$ is given as -352.8 KJ. ΔH^0_f for HF is –268.3KJ mol^{-1}, then ΔH^0_f of HCl would be

1) $-22\,KJmol^{-1}$ 2) $880\,KJmol^{-1}$ 3) $-91.9\,KJmol^{-1}$ 4) $-183.8\,KJmol^{-1}$

46. What is the heat of formation of C_6H_6, given that the heats of combustion of benzene, carbon and hydrogen are 782, 94 and 68K. Cal respectively.

1) +14 K.Cal 2) -14 K.Cal 3) +28 K.Cal 4) – 28 K.Cal

47. The heats of combustion of carbon, hydrogen and acetylene are -394K.J, -286K.J and -1301 K.J respectively. Calculate heat of formation of C_2H_2

1) 621 K.J 2) 454 K.J 3) -227 K.J 4) 227 K.J

48. The standard enthalpies of formation of $H_2O_2(l)$ and $H_2O(l)$ are -187.8K.J.mole^{-1} and -285.8 K.J. mole^{-1} respectively. The ΔH^0 for the decomposition of one mole of $H_2O_2(l)$ to $H_2O(l)$ and $O_2(g)$ is

1) -473.6 K.J. mole^{-1} 2) -98.0 K.J. mole^{-1} 3) +473.6 K.J. mole 4) +187.8 K.J. mole^{-1}

49. The enthalpies of combustion of carbon and carbon monoxide are -390 KJ mol^{-1} and –278 KJ mol^{-1} respectively. The enthalpy of formation of carbon monoxide is

1) 668 KJ mol^{-1} 2) 112 KJ mol^{-1} 3) -112 KJ mol^{-1} 4) -668 KJ mol^{-1}

50. Calculate the heat of formation of KOH from the following data

$$K_{(S)} + H_2O + aq \rightarrow KOH_{(aq)} + \tfrac{1}{2}H_2;\ \Delta H = -48.4\,K.Cal$$

$$H_{2(g)} + \tfrac{1}{2}O_{2(g)} \rightarrow H_2O_{(\ell)};\ \Delta H = -68.44\,K.Cal$$

$$KOH_{(s)} + aq \rightarrow KOH_{(aq)};\ \Delta H = -14.01\,K.Cal$$

1) +102.83 2) +130.85 3) – 102.83 4) – 130.85

51. If $S + O_2 \rightarrow SO_2; \Delta H = -398.2kJ$; $SO_2 + \tfrac{1}{2}O_2 \rightarrow SO_3; \Delta H = -98.7kJ$

$SO_3 + H_2O \rightarrow H_2SO_4; \Delta H = -130.2kJ$; $H_2 + \tfrac{1}{2}O_2 \rightarrow H_2O; \Delta H = -227.3kJ$

The enthalpy of formation of sulphuric acid at 298 K will be

1) -854.4 K.J 2) -754.4 K.J 3) -650.3 K.J 4) -433.7 K.J

52. $N_{2(g)} + 2O_{2(g)} \rightarrow 2NO_2 + X\,kJ$; $2NO_{(g)} + O_{2(g)} \rightarrow 2NO_{2(g)} + Y\,kJ$

The enthalpy of formation of NO is

1) (2X - 2Y) 2) X - Y 3) 1/2 (Y-X) 4) 1/2 (X-Y)

53. Given that $S_{(s)} + \tfrac{3}{2}O_{2(g)} \rightarrow SO_{3(g)} + 2x\,K.Cal$; $SO_{2(g)} + \tfrac{1}{2}O_{2(g)} \rightarrow SO_{3(g)} + y\,K.Cal$ Which would be the enthalpy of formation SO_2?

1) (2x – y) 2) (2x + y) 3) (y – 2x) 4) $\frac{2x}{y}$

54. Given $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}; \Delta H = -395kJ$; $S_{(s)} + O_{2(g)} \rightarrow SO_{2(g)}; \Delta H = -295kJ$;

$CS_{2(l)} + 3O_{2(g)} \rightarrow CO_{2(g)} + 2SO_{2(g)}; \Delta H = -1110kJ$, The heat of foramation of CS_2 (l) is

1) + 125 KJ mol^{-1} 2) 31.25 KJ mol^{-1} 3) 62.5 KJ mol^{-1} 4) 250 KJ mol^{-1}

55. 1) $C_{Graphite} + O_{2(g)} \rightarrow CO_{2(g)}; \Delta H = -94K.Cals$

2) $C_{Diamond} + O_{2(g)} \rightarrow CO_{2(g)}; \Delta H = -94.5 K.Cals$

From the above data the heat of transition of $C_{Diamond} \rightarrow C_{Graphite}$

1) -50 Cal 2) -100 Cal 3) -500 Cal 4) 100 Cal

56. DH of combustion of yellow P and Red P are -11 K.J and -9.78 K.J respectively DH of transition of yellow P to Red P is

1) –20.78 K.J 2) -1.22 K.J 3) +1.22 K.J 4) +20.78 K.J

57. How much energy is released when 6 mole of octane is burnt in air ? Given ΔH_f^0 for $CO_2(g)$, $H_2O(g)$ and $C_8H_{18}(l)$ respectively are -390, -240 and +160 KJ/mol

1) –32.6 MJ 2) -37.4 MJ 3) -35.5 MJ 4) -20.0 MJ

58. Given $C + 2S \rightarrow CS_2, \Delta Hf^0 = +117.0 KJ\, mol^{-1}$;

$C + O_2 \rightarrow CO_2, \Delta Hf^0 = -393.0 KJ\, mol^{-1}$ $S + O_2 \rightarrow SO_2, \Delta Hf^0 = -297.0 KJ\, mol^{-1}$.

The heat of combustion of $CS_2 + 3O_2 \rightarrow CO_2 + 2SO_2$ is

1) -807 KJ mol^{-1} 2) -1104KJ mol^{-1} 3) +1104KJ mol^{-1} 4) +807 KJ mol^{-1}

59. The standard heat of formation of sodium ions in aqueous solution from the following data :

Heat of formation of NaOH(aq) at 25^0C = – 470.7KJ;

Heat of formation of OH^- (aq) at 25^0C = –228.8KJ is:

1) –251.9KJ 2) 241.9KJ 3) –241.9KJ 4) 300KJmol^{-1}

60. The lattice energy of solid NaCl is 180 K.Cal per mol. The dissolution of the solid in water in the form of ions is endothermic to the extent of 1K.Cal per mol. If the solvation energyies of Na^+ and Cl^- ions are in ratio 6:5, what is the enthalpy of hydration of sodium ion?

1) –85.6K.Cal/ mol 2) –97.5K.Cal/ mol

3) 82.6K.Cal /mol 4) +100K.Cal/ mol

61. The enthalpy of solution of $BaCl_2$ (s) and $BaCl_2.2H_2O$(s) are –20.6 and 8.8KJ mol^{-1}, respectively, The enthalpy change for the reaction $BaCl_{2(s)} + 2H_2O \rightarrow BaCl_2.2H_2O_{(s)}$ is:

1) 29.8KJ 2) –11.8KJ 3) –20.6KJ 4) –29.4KJ

Second and third laws Entropy - Gibb's Energy

62. Enthalpy of vapourisation for water is 186.5KJ$mole^{-1}$. The entropy change during vapourisation is __ KJ$mole^{-1}$

1) 0.5 2) 1.0 3) 1.5 4) 2.0

63. $S^o_{H_{2(g)}}$ =130.6 J K^{-1} mol^{-1}; $S^o_{H_2O_{(l)}}$ =69.9JK^{-1} mol^{-1} $S^o_{O_{2(g)}}$ =205 J$K^{-1}$$mol^{-1}$, Then the absolute entropy change of $H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow H_2O_{(l)}$ is

1) -163.2 J $mol^{-1}K^{-1}$ 2) +163.2 J $mol^{-1}K^{-1}$

3) -303 J $mol^{-1}K^{-1}$ 4) +303J $mol^{-1}K^{-1}$

64. At 0^0C ice and water are in equilibrium and ΔH = 6.0KJ then ΔS will be

1) $22\, J\, K^{-1}mol^{-1}$ 2) $35\, J\, K^{-1}mol^{-1}$ 3) $48\, J\, K^{-1}mol^{-1}$ 4) $100\, J\, K^{-1}mol^{-1}$

65. One mole of ice is converted into water at 273 K. The entropies of H_2O (s) and H_2O(l) are 38.20

and 60.01 J mol^{-1} K^{-1} respectively. The enthalpy change for the conversion is:

1) 59.54 mol^{-1} 2) 5954 J mol^{-1} 3) 595.4J mol^{-1} 4) 320.6J mol^{-1}

66. Melting & boiling point of NaCl respectively are 1080 K & 1600 K. DS for stage -I & II in

$$NaCl_{(s)} \xrightarrow{I} NaCl_{(l)} \xrightarrow{II} NaCl_{(g)}$$
$$\Delta H_{fus} = 30KJ \quad \Delta H_{vap} = 160KJ$$

	DS (I) (KJ/mol/K)	DS (II) (KJ/mol/K)		DS (I) (KJ/mol/K)	DS (II) (KJ/mol/K)
1)	1/36	1/10	2)	36	100
3)	1/36	10	4)	36	1/10

67. DS for vapousization of 900 g water (in KJ/K) is [DH_{vap}=40KJ/mol]

1) (900 × 40) 2) $\frac{50 \times 40}{373}$ 3) $\frac{900 \times 40}{373}$ 4) $\frac{18 \times 40}{373}$

68. DS_{sys} for 4Fe(s) +3O_2 $\rightarrow$2Fe_2O_3(s) is -550 J/K/mol at 298 K. If enthalpy change for same process is –1600 KJ/mol, DS_{total} (in J/mol/K)

1) $\left[\frac{1600}{298} \times 10^3\right] + 550 > 0$ 2) $550 - \left[\frac{1600}{298}\right] < 0$

3) $\left[\frac{1600}{298} \times 10^3\right] - 550 > 0$ 4) $\left[\frac{1600 + 550}{298}\right] > 0$

69. DS_{sur} for H_2+1/2$O_2$$\rightarrow$$H_2O$, DH - 280 KJ at 400 K is

1) 700 J/g / K 2) 700 KJ / mol / K 3) 700 J/mol/K 4) 0.7 J / mol / K

70. For a certain reaction, DH^0 & DS^0 respectively are 400 KJ & 200 J/mol/K. The process is non-spontaneous at

1) 2100 K 2) 2010 K 3) 1990 K 4) 2020 K

71. At 27°C for the reaction $A_{(g)} \rightleftharpoons B_{(g)}$, the value of ΔG^0 is zero. Then the value of the equilibrium constant is

1) 2.5 × 10^{-3} 2) 10^{-2} 3) 1 4) 100

72. The direct conversion of A to B is difficult, hence it is carried out by the following shown path $A \rightarrow C \rightarrow D \rightarrow B$. Given $\Delta S_{A\rightarrow C} = 50eu$;

$\Delta S_{C\rightarrow D} = 30eu$; $\Delta S_{B\rightarrow D} = 20eu$

Where eu is entropy unit, then $\Delta S_{A\rightarrow B}$ is

1) +100eu 2) +60eu 3) –100eu 4) –60eu

EXERCISE - I ANSWERS

WORK SHEET - I

1) 1	2) 3	3) 3	4) 3	5) 2	6) 2	7) 1	8) 4	9) 1	10) 1
11) 2	12) 2	13) 4	14) 3	15) 1	16) 2	17) 3	18) 1	19)1	20) 2
21) 4	22) 3	23) 1	24) 4	25) 2	26) 3	27) 4	28) 1	29) 3	30) 2
31) 1	32) 4	33) 4	34) 2	35) 2	36) 1	37) 3	38) 1	39) 1	40) 1
41) 1	42) 3	43) 3	44) 4	45)1	46) 2	47) 4	48) 1	49) 1	50) 3
51) 3	52) 4	53) 3	54) 4	55) 4	56) 2	57) 4	58) 2	59) 2	60) 1
61) 3	62) 1	63) 4	64) 4	65) 3	66) 4	67) 3	68) 3	69) 3	70) 3
71) 3	72) 3	73) 4	74) 2	75)1	76) 2	77) 3	78) 3	79) 3	80) 1
81) 3	82) 3	83) 1	84) 4	85) 1	86) 4	87) 1, 3	88) 2	89) 3	90) 2
91) 4	92) 1	93) 1	94) 2	95) 4	96) 3	97) 2	98) 2	99) 3	100) 1
101) 4	102) 2	103) 1	104) 1	105) 2	106) 1	107) 1	108) 1	109) 1	110) 1
111) 1	112) 3	113) 3	114) 1	115) 3	116) 2	117) 1	118) 3		

WORK SHEET - II

1) 2	2) 3	3) 2	4) 2	5) 3	6) 2	7) 1	8) 1	9) 1	10) 2
11) 4	12) 1	13) 2	14) 3	15) 2	16) 1	17) 1	18) 2	19) 3	20)3
21) 3	22) 3	23) 2	24) 4	25) 3	26) 4	27) 1	28) 1	29) 3	30) 4
31) 2	32) 3	33) 1	34) 4	35) 2	36) 4	37) 1	38) 2	39) 1	40) 4
41) 2	42) 2	43) 2	44) 4	45) 3	46) 1	47) 4	48) 2	49) 3	50) 3
51) 1	52) 3	53) 3	54) 1	55) 3	56) 2	57) 1	58) 2	59) 3	60) 2
61) 4	62) 1	63) 1	64) 1	65) 2	66) 1	67) 2	68) 3	69) 3	70) 3
71) 3	72) 2								

EXERCISE - I

Introduction - Characteristics of Chemical Equilibrium

1. Attainment of "equilibrium state" with the help of "constancy in intensity of colour" is noticed in the case of ... in a closed vessel

   1) Decomposition of $CaCO_3$ 2) Reaction between N_2 & O_2

   3) Reaction between H_2 & I_2 4) Decomposition of PCl_5

2. At low temperature, Nitrogen dioxide, a reddish brown gas gets associated to form the colourless dinitrogen tetroxide as in the reaction $2NO_{2(g)} \rightleftharpoons N_2O_{4(g)}$. Then at equilibrium

   1) There would be an increase in colour intensity

   2) The mixture would become colourless

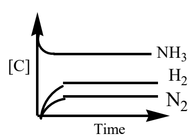
   3) There would be a decrease in colour intensity

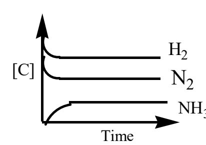
   4) There would be no change in colour intensity

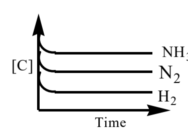
3. In the case of $CaCO_3 \rightleftharpoons CaO + CO_2$, attainment of equilibrium state is noticed with the help of constancy in

   1) $[CaCO_3]$ 2) $[CaO]$ 3) Pressure 4) Colour

4. Which of the following is correct for $N_2 + 3H_2 \rightleftharpoons 2NH_3$

   1) 

   2) 

   3) 

   4) All

5. $Fe^{+3}(aq) + SCN^{-}(aq) \rightleftharpoons [Fe(SCN)]^{+2}(aq)$ is an example of ....

   1) Heterogeneous equilibrium

   2) Homogeneous equilibrium

   3) Reversible process that never attains equilibrium state

   4) Irreversible process that attains equilibrium state

6. Which of the following is an irreversible reaction

   1) $PCl_5 \rightarrow PCl_3 + Cl_2$ 2) $2SO_2 + O_2 \rightarrow 2SO_3$

   3) $N_2 + 3H_2 \rightarrow 2NH_3$ 4) $2KClO_3 \rightarrow 2KCl + 3O_2$

7. An example of an irreversible reaction

   1) $CH_3COOC_2H_5 + H_2O \rightarrow CH_3COOH + C_2H_5OH$

   2) $N_2 + O_2 \rightarrow 2NO$

   3) $NH_4HS \rightarrow NH_3 + H_2S$ 4) $BaCl_{2(aq)} + K_2SO_{4(aq)} \rightarrow BaSO_{4(s)} + 2KCl_{(aq)}$

8. Which of the following is a characteristic property of equilibrium?

   1) Number of moles of reactants and products is always equal

   2) Catalyst affects the equilibrium state

   3) It never proceeds to completion

   4) Rate of forward and backward reactions are not equal

9. When a system is in equilibrium state
1) The concentration of products is equal to the concentration of the reactants
2) The ratio of the product of active masses of products and reactants is constant
3) Number of moles of reactants and products is the same
4) The ratio of rate constants of the forward and backward reaction is always unity

10. Attainment of equilibrium can be noticed with the help of constancy of which of the following physical properties ?
1) Intensity of colour 2) Density 3) Pressure 4) All the above

11. Change in volume of the system does not alter the number of moles in which of the following equilibrium ?
1) $N_2(g)+O_2(g) \rightleftharpoons 2NO(g)$ 2) $PCl_5(g) \rightleftharpoons PCl_3(g)+Cl_2(g)$
3) $N_2(g)+3H_2(g) \rightleftharpoons 2NH_3(g)$ 4) $SO_2Cl_2(g) \rightleftharpoons SO_2(g)+Cl_2(g)$

12. At equilibrium state
1) $\Delta H = $negative 2) $\Delta G = $negative 3) $\Delta G = $zero 4) ΔG is positive

13. A catalyst
1) Alters the equilibrium constant
2) Increases the equilibrium concentration of products
3) helps establishing the equilibrium quickly
4) Supplies energy to the reactants

14. Gas phase homogeneous equilibrium is involved in one of the following
1) Esterification
2) Haber's process
3) Dissociation of lime stone in a closed vessel
4) Cell reaction of Daniel cell

15. The following are some statements about chemical equilibrium.
1) The rate of forward reaction is equal to the rate of backward reation.
2) The chemical equilibrium can be established from reactant side only.
3) The concentration of the reactants and products remain same with time.
The correct statements are
1) A and B 2) A and C 3) B and C 4) All A, B, C

16. The reaction $3Fe_{(s)} + 4H_2O_{(l)} \rightleftharpoons Fe_3O_{4(s)} + 4H_{2(g)}$ is reversible if it is carried out
1) At constant pressure 2) At constant temperature
3) In an open vessel 4) In a closed vessel

17. In the lime-kiln; the reaction $CaCO_3 \Leftrightarrow CaO_{(s)} + CO_{2(g)}$
1) Attains a state of equilibrium after some time
2) Stops after some time
3) Does not take place at all
4) Goes to completion eventually

18. When H_2 and I_2 are mixed and equilibrium is attained, then
1) Amount of HI formed is equal to the amount of H_2 dissociated
2) HI dissociation stops 3) the reaction stops completely

4) Both forward and backward reactions proceed with same rate

19. $CaCO_3 \rightleftharpoons CaO + CO_2$ reaction in a lime kiln goes to completion because

1) It is a heterogeneous reaction
2) Backward reaction is very slow
3) CO_2 formed escapes out
4) K_C (or) K_P has no unit

20. When the rate of formation of reactants is equal to the rate of formation of products, this is known as

1) Chemical reaction
2) Chemical equilibrium
3) Chemical kinetics
4) Chemical energetics

Law of mass action - K_C, K_P - units - expressions & Characteristics of Equilibrium constant

21. According to law of mass action, for $CaCO_3 \rightleftharpoons CaO+CO_2$ (R_f = Rate of forward and R_b = Rate of backward reactions)

1) $R_f = K_b[CO_2]$
2) $R_b = K_b[CaCO_3]^2$
3) $R_f = K_f[CaO]^2$
4) $\frac{R_f}{R_b} = [CO_2]^1$

22. As per law of mass action, for $NH_4HS(s) \rightleftharpoons NH_3(g) + H_2S(g)$ ratio of rate constants of forward (K_f) & backword (K_2) reactions at equilibrium equals to

1) $[NH_4HS]$
2) $P_{NH_3} + P_{H_2S}$
3) $[H_2S] + [NH_3]$
4) $[NH_3]\,[H_2S]$

23. Law of mass action is not applicable to $C_{(graphite)} \rightleftharpoons C_{(diamon4)}$ because

1) it is a physical equilibrium
2) The process is not spontaneous
3) The process spontaneous
4) Both forms are crystalline

24. Units of K_C for $xA(g) \rightleftharpoons yB(g)$ is $lit^2\text{-}mol^{-2}$, then the values of x & y cannot be

1) 1, 2
2) 3, 2
3) 2, 3
4) All

25. Unit of K_P for $NH_4COONH_2(s) \rightleftharpoons 2NH_{3(g)} + CO_{2(g)}$ is

1) No units
2) atm^2
3) atm^3
4) atm^{-3}

26. K_C for $N_2+O_2 \rightleftharpoons 2NO$ is 'X', then for $NO \rightleftharpoons 1/2N_2 + 1/2\,O_2$, it is

1) X^2
2) $\sqrt{X}$
3) $\frac{1}{\sqrt{X}}$
4) $\frac{1}{X^2}$

27. Law of mass action can not be applied to

1) $2HI_{(g)} \rightleftharpoons H_{2(g)} + I_{2(g)}$
2) $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$
3) $S_{Rhombic} \rightleftharpoons S_{Monoclinic}$
4) $CaCO_{3(s)} \rightleftharpoons CaO_{(s)} + CO_{2(g)}$

28. Law of mass action is applicable to

1) Homogeneous chemical equilibrium only
2) Heterogeneous chemical equilibrium only
3) Both homogeneous and Heterogeneous chemical equilibria
4) Physical equilibrium

29. At a given temperature, for a reversible reaction, if the concentration of reactants is doubled then the equilibrium constant will

1) be doubled
2) be halved
3) change to 1/3
4) remain same

30. If $N_2+3H_2 \rightleftharpoons 2NH_3$...(I) & $N_2+3H_2 \xrightleftharpoons{Fe} 2NH_3$.... (II) are in equilibrium at same

temperature, then

1) K_C of I = K_C of II
2) K_C of I = K_P of II
3) K_C of I < K_C of II
4) K_P of II > K_P of I

31. A vessel (1) contains 1 mole each of N_2 & O_2 and another vesser (2) contains 2 mole each of N_2 & O_2. Both vessels are heated to same temperature till equilibrium established in both cases. Then, correct statement is

1) K_C for $N_2 + O_2 \rightleftharpoons 2NO$ in A & B are in the ratio 1:2

2) K_P for $N_2 + O_2 \rightleftharpoons 2NO$ in A & B are in the ratio 1:2

3) K_C for $N_2 + O_2 \rightleftharpoons 2NO$ in A & B are equal

4) K_P for $N_2 + O_2 \rightleftharpoons 2NO$ in A & B are in the ratio 2:1

32. The reaction $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$ is carried out in a 1 litre flask. If the same reaction is carried out in a 2 litre flask at the same temperature, the equilibrium constant will be

1) same
2) doubled
3) halved
4) decreased

33. The relationship between Kp and Kc is given by

1) $K_C = K_P(RT)^{Dn}$
2) $K_P = K_C(RT)^{Dn}$
3) $K_C = K_P + (RT)^{Dn}$
4) $K_P = K_C + (RT)^{Dn}$

34. For the equilibrium reaction, $3Fe_{(s)} + 4H_2O(g) \Leftrightarrow Fe_3O_{4(s)} + 4H_{2(g)}$ the relation between K_p and K_c is

1) $K_P > K_C$
2) $K_P < K_C$
3) $K_P = K_C \times (RT)^{-2}$
4) $K_P = K_C$

35. For which of the following reactions, $Kp\,(RT)^2 = Kc$

1) $PCl_{5(g)} \Leftrightarrow PCl_{3(g)} + Cl_{2(g)}$
2) $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$
3) $2SO_{2(g)} + O_{2(g)} \Leftrightarrow 2SO_{3(g)}$
4) $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$

36.
1) $N_2 + 2O_2 \Leftrightarrow 2NO_2$ $K_c = 2 \times 10^{-31}$
2) $2NO \Leftrightarrow 2N_2 + O_2$ $K_c = 2.2 \times 10^{-33}$
3) $2N_2O_5 \Leftrightarrow 2N_2 + 5O_2$ $K_c = 3.8 \times 10^{-32}$
4) $2N_2 + O_2 \Leftrightarrow 2N_2O$ $K_c = 4 \times 10^{-32}$

From the above data, the most stable oxide is

1) NO_2
2) NO
3) N_2O_5
4) N_2O

37. The ionisation constant of H_2CO_3 as an acid in aqueous solution at room temperature is X. If the first and second ionisation constants of H_2CO_3 are X_1 and X_2 respectively then

1) $X = \frac{X_1}{X_2}$
2) $X = \frac{X_2}{X_1}$
3) $X = X_1X_2$
4) $X = \frac{X_1X_2}{2}$

38. In which of the following cases, does the reaction go farthest to completion

1) $K = 10^2$
2) $K = 10^{-2}$
3) $K = 10$
4) $K = 1$

39. The units of equilibrium constant Kc for the following system $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$ is

1) $mole^{-1}$ lit
2) mol^{-2} litre
3) mole lit^{-1}
4) no units

40. $H_2 + I_2 \Leftrightarrow 2HI$, In this reaction,

1) $K_p \neq K_c$ 2) $K_p = K_c$ 3) $K_p > K_c$ 4) $K_p < K_c$

41. For the Chemical reaction $A_2(g) + B_2(g) \rightleftharpoons 2AB(g)$ the amount of AB at equilibrium is affected by

1) Temperature and pressure 2) Temperature only
3) Pressure only 4) Temperature, pressure and Catalyst

42. The following are some statements about equilibrium constant.

1) The value of K is affected by temperature
2) The equilibrium constant gives idea about the extent of completion of reaction
3) The equilibrium constant is affected by volume and pressure

The correct combination is.

1) A and B 2) B and C 3) C and A 4) all

43. The following are some statements about active masses.

1) Active mass of pure liquids and solids are taken as unity.
2) Active mass of electrolytes is taken as molality.
3) For 'dilute solutions of non-electrolytes, the active mass can be taken as molarity.

The correct combination is.

1) A and B 2) B and C 3) A and C 4) A, B, C

44. In which reaction, the concentration of product is higher than the concentration of reactant at equilibrium

1) $A \rightleftharpoons B \quad k = 0.01$ 2) $M \rightleftharpoons N \quad k = 10$ 3) $X \rightleftharpoons Y \quad k = 0.05$ 4) $K \rightleftharpoons P \quad k = 0.01$

45. Which one of the following has greater active mass

1) 200 gm of lime stone in 2 lit vessel 2) 90 gm of CS_2 liquid in 100 ml vessel
3) 56 gm of N_2 gas in 0.5 lit vessel 4) 1 mole of O_2 gas at STP

46. Which of the following expression is true for the system $2SO_{2(g)} + O_{2(g)} \Leftrightarrow 2SO_{3(g)}$

1) $K_p(K_c)^{-1} < 1$ 2) $K_p(K_c)^{-1} > 1$ 3) $K_p(K_c)^{-1} = 1$ 4) $K_p = K_c$

47. For the reaction $CO_{(g)} + \frac{1}{2}O_{2(g)} \rightleftharpoons CO_{2(g)}$, K_P / K_C is

1) RT 2) $(RT)^{-1}$ 3) $(RT)^{-1/2}$ 4) $(RT)^{1/2}$

48. The following are some statements about units of Kc and Kp.

1) Kp has always units. 2) Kc has no units at all times.
3) If $\Delta n = 0$, then Kp and Kc have no units.

The correct set is.

1) A and B 2) C only 3) C and A 4) A, B, C

49. If K_1 and K_2 are the equilibrium constants of equilibria A and B respectively, then the relationship between the two constants is

1) $SO_{2(g)} + \frac{1}{2}O_{2(g)} \Leftrightarrow SO_{3(g)} \rightarrow K_1$ 2) $2SO_{3(g)} \Leftrightarrow 2SO_{2(g)} + O_{2(g)} \rightarrow K_2$

1) $K_1 = K_2$ 2) $K_1 = \frac{1}{K_2}$ 3) $K_2 = K_1^2$ 4) $K_1^2 = \frac{1}{K_2}$

50. Starting from 'a' moles of H_2 and 'b' moles of I_2 an equilibrium $\mathbf{H_2 + I_2 \Leftrightarrow 2HI}$ is established

with 2x moles of HI. The equilibrium constant K_C is

1) $\frac{4x^2}{ab}$ 2) $\frac{4x^2}{(a-x)(b-x)}$ 3) $\frac{2x^2}{(a-x)(b-x)}$ 4) $\frac{4x^2}{(a-2x)(b-2x)}$

51. The equilibrium constants for the reactions $Zn_{(s)} + Cu^{2+}{}_{(aq)} \Leftrightarrow Zn^{2+}{}_{(aq)} + Cu_{(s)}$; $Cu_{(s)} + 2Ag^{+}_{(aq)} \Leftrightarrow Cu^{2+}_{(aq)} + 2Ag_{(s)}$ are K_1 and K_2 respectively then the equilibrium constant for the reaction $Zn_{(s)} + 2Ag^{+}_{(aq)} \rightleftharpoons Zn^{+2}_{(aq)} + 2Ag_{(s)}$ will be

1) K_1+K_2 2) $K_1 . K_2$ 3) K_1 / K_2 4) $K_1 - K_2$

52. The equilibrium constant, Kp for the reaction $\mathbf{A \Leftrightarrow 2B}$ is related to degree of dissociation α of A and total pressure P as

1) $\frac{4\alpha^2 P}{1-\alpha^2}$ 2) $\frac{4\alpha^2 P^2}{1-\alpha^2}$ 3) $\frac{4\alpha^2 P^2}{1-\alpha}$ 4) $\frac{4\alpha^2 P}{1-\alpha}$

53. The following equilibria are given

$N_2 + 3H_2 \rightleftharpoons 2NH_3;\ K_c = K_1;\ N_2 + O_2 \rightleftharpoons 2NO;\ K_c = K_2;$

$H_2 + \frac{1}{2}O_2 \rightleftharpoons H_2O;\ K_C = K_3$

The equilibrium constant of the reaction. $2NH_3 + \frac{5}{2}O_2 \rightleftharpoons 2NO + 3H_2O$ in terms of K_1,K_2 and K_3 is

1) $K_1K_2K_3$ 2) K_1K_2/K_3 3) $K_1K_3^2K_2$ 4) $K_2K_3^3/K_1$

54. For which of the following reactions, the degree of dissociation (α) and equilibrium constant (K_p) are related as $K_p = \frac{4\alpha^2 p}{(1-\alpha^2)}$

1) $N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$ 2) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$

3) $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ 4) $PCl_{3(g)} + Cl_{2(g)} \rightleftharpoons PCl_{5(g)}$

55. The equilibrium constants for the stepwise formation of MCl, MCl_2 and MCl_3 are a, b and c respectively. If the equilibrium contant of formation of MCl_3 is K, which of the following is correct?

1) K=a+b+c 2) $\frac{1}{K} = \frac{1}{a} + \frac{1}{b} + \frac{1}{c}$

3) $\log K = \log a + \log b + \log c$ 4) $K = \frac{1}{a} \times \frac{1}{b} \times \frac{1}{c}$

56. What is the equilibrium expression for the reaction, $P_{4(s)} + 5O_{2(g)} \rightleftharpoons P_4O_{10(s)}$? ***(AIEEE, 2004)***

1) $K_c = \dfrac{[P_4O_{10}]}{[P_4][O_2]^5}$ 2) $K_c = \dfrac{1}{[O_2]^5}$ 3) $K_c = [O_2]^5$ 4) $K_c = \dfrac{[P_4O_{10}]}{5[P_4][O_2]}$

57. For the reaction $CO_{(g)} + Cl_{2(g)} \rightleftharpoons COCl_{2(g)}$ .The K_p / K_c is equal to

1) $\dfrac{1}{RT}$ 2) 1.0 3) $\sqrt{RT}$ 4) RT

58. PCl_5 dissociates as follows in a closed reaction vessel $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$. If total pressure at equilibrium of the rea-ction mixture is P and degree of disso-ciation of PCl_5 is x, the partial pressure of PCl_3 will be

1) $\left[\dfrac{x}{x-1}\right]P$ 2) $\left[\dfrac{x}{1-x}\right]P$ 3) $\left[\dfrac{x}{x+1}\right]P$ 4) $\left[\dfrac{2x}{1-x}\right]P$

Lechatelier Principle - applications - Miscellaneous

59. High temperature and high pressure (as per Lechatelier principle) favour

1) $N_2+3H_2 \rightleftharpoons 2NH_3$, DH = - Q_1 2) $CaCO_3 \rightleftharpoons CaO + CO_2$,DH=+$Q_2$

3) $3O_2 \rightleftharpoons 2O_3$, DH = +$Q_3$ 4) $N_2+O_2 \rightleftharpoons 2NO$, DH= +$Q_4$

60. For $CaCO_3(s) \rightleftharpoons CaO(s)+CO_2(g)$, Δ H= +Q at equilibrium, to shift equilibrium towards right,

1) $[CO_2]$ should be increased 2) $[CO_2]$ should be decreased

3) Pressure should be increased 4) Temperature should be decreased

61. As per Braun's principle, yield of Ammonia will be more in Haber's process under .... conditions (L=Low ; H = high, T = Temp , P = Pressure)

1) LT ; LP 2) LT ; HP 3) HT ; HP 4) HT ; LP

62. For $2SO_2+O_2 \rightleftharpoons 2SO_3$, Δ H = -QKJ, as per Lechatelier's principle which of the following changes favours forward reaction yielding more SO_3

1) Adding more O_2 2) Removing SO_3 3) Applying high P 4) Change of catalyst

1) A, B, C, & D 2) A, B & D 3) A & D 4) A, B & C

63. I) $H_2O(l) \rightleftharpoons H_2O(g)$ II) $I_2(s) \rightleftharpoons I_2(vap)$ III) $H_2O(l) \rightleftharpoons H_2O$ (s) IV) $CO_2(g) \rightleftharpoons CO_2(aq)$

Rise of T shifts equilibrium towards right in the case of

1) I & IV 2) II, III & IV 3) I & II 4) I, II & III

64. K_C for $H_2+1/2\ O_2 \rightleftharpoons H_2O$ at 500 K is 2.4 x 10^{47}, Now backward reaction is fovoured by

1) High P 2) High T 3) Presence of Pt 4) Addition of He(g)

65. With increase in temperature, the value of equilibrium constant

1) Increases 2) Decreases

3) May increase or decrease 4) Remains constant

66. With increase in temperature generally the value of the equilibrium constant of endothermic

reversible reaction

1) Increases 2) Decreases

3) Change can not be predicated 4) Does not change

67. For a given reaction Kp < Kc. Increase of pressure favours

1) the backward reaction 2) no reaction

3) the forward reaction

4) both forward and backward reaction equally

68. Le chatelier's principle is applicable to

1) Chemical equilibria only 2) Physical equilibria only

3) Both physical and chemical equilibria 4) Gaseous systems only

69. Increase of pressure favours the forward reaction in the following equilibrium

1) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$ 2) $2NO_{2(g)} \rightleftharpoons N_2O_{4(g)}$

3) $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$ 4) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$

70. In the equilibrium $NH_4HS_{(s)} \Leftrightarrow NH_{3(g)} + H_2S_{(g)}$ The forward reaction can be favoured by

1) Adding some more NH_4HS 2) Adding some more NH_3

3) Removing some Ammonia from the reaction mixture

4) Adding some more H_2S

71. In the dissociation of $CaCO_3$ in a closed vessel, the forward reaction is favoured by

1) adding some more $CaCO_3$ 2) removing some CaO

3) increasing the pressure 4) removing CO_2

72. The following are some statements regarding dissociation of lime stone according to the equation $CaCO_{3(s)} \rightleftharpoons CaO_{(s)} + CO_{2(g)}$; $\Delta H = 110\,k.J.$ the reaction is carried in a closed vessel.

A)The pressure of CO_2 increases when temperature is increased.

B)The pressure of CO_2 increases when temperature is decreased.

3) The pressure of CO_2 increases when amount of $CaCO_3$ is decreased .

The incorrect statements are.

1) A and B 2) B and C 3) A and C 4) All A, B, C

73. Acetic acid dissociates as $CH_3COOH \Leftrightarrow CH_3COO^- + H^+$. If a little amount of sodium acetate is added to its aqueous solution

1) The acid dissociates further 2) The H^+ ion concentration increases

3) The acid dissocitaion is suppressed 4) The equilibrium is unaffected

74. $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_{3(g)}$. If some HCl gas is passed into the reaction mixture at the equilibrium of this reaction,

1) Equilibrium shifts towards left 2) Equilibrium shifts towards right

3) Concentration of H_2 increases 4) The equilibrium is not affected

75. K_C value of a gaseous reaction is 5mole / lit. If pressure is increased

1) Forward reaction is favoured 2) Backward reaction is favoured

3) Reaction is uneffected 4) K_C value increases

76. In a reversible reaction $K_c > K_p$ and $\Delta H = +40$ K.Cal . The product will be obtained in less amount on

1) Increasing both pressure & temperature
2) Decreasing both pressure & temperature
3) Decreasing pressure & increasing temperature
4) Increasing pressure & decreasing temperature

77. For the physical equilibrium ice $\Leftrightarrow$ water, the forward reaction is not favoured by

1) Increasing pressure
2) Increasing temperature
3) Keeping in contact with hot water
4) Taking more ice

78. If CO_2 is made to escape from the system $CO_2 + H_2O \rightleftharpoons H_2CO_3 \rightleftharpoons H^+ + HCO_3^-$ then for the system

1) p^H decreases
2) p^H increases
3) $[H^+]$ increases
4) p^{OH} increases

79. A reaction $N_2 + 3H_2 \rightleftharpoons 2NH_3 + 92$ k.j is at equilibrium. If the concentration of N_2 is increased the temperature of the system

1) decreases
2) increases
3) remains constant
4) becomes half

80. In the reversible reaction $CaF_{2(s)} \rightleftharpoons Ca^{+2}_{(aq)} + 2F^-_{(aq)}$, the concentration of fluoride ions was made halved, then equilibrium concentration of Ca^{+2}

1) increases by 2 times
2) decreases by 2 times
3) increases by 4 times
4) decreases by 4 times

81. $A_{(s)} + B_{(s)} + \text{heat} \rightleftharpoons 2C_{(s)} + 2D_{(g)}$. At equilibrium the pressure of 'B' is doubled. By what factor the concentration of 'D' should change to reattain the equilibrium

1) $\sqrt{2}$
2) 2
3) 3
4) $\sqrt{3}$

82. For the reaction $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$ the forward reaction at constant temperature is favoured by

1) Introduction of an inert gas at constant volume
2) Introduction of $PCl_{3(g)}$ at constant volume
3) Introduction of $PCl_{5(g)}$ at constant volume
4) Introduction of $Cl_{2(g)}$ at constant volume

83. In the reaction $N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}; \Delta H = +180\,kJ$.
On increasing the temperature the production of NO

1) Increases
2) Decreases
3) Remains constant
4) Cannot be predicted

84. Consider the reaction equilibrium, $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}; \Delta H^o = -198kJ$. On the basis of Le Chatelier's principle, the condition favourable for the forward reaction is

1) Lowering of temperature as well as pressure
2) Increasing of temperature as well as pressure
3) Lowering of temperature and increasing of pressure
4) Any value of temperature and pressure

85. The gaseous reaction $A + B \rightleftharpoons 2C + D + q$ KJ most favoured at :

1) High temperature and low pressure
2) Low temperature and low pressure
3) Low temperature and high pressure
4) High temperature and high pressure

86. Exothermic formation represented by equation $Cl_2(g) + 3F_2(g) \rightleftharpoons 2ClF_3(g)$, $\Delta H = -339$ KJ. Which of the following will increase the quantity of ClF_3 in equilibrium mixture ?

1) Increasing temperature
2) Removing Cl_2
3) Increasing volume of vessel
4) Adding F_2

Assertion and Reason Type Questions

Choose the correct option as :

1) both A & R are true, R is the correct explanation of A
2) both A & R are true, R is not correct explanation of A
3) A is true, R is false
4) A is false, R is true

87. Assertion : Introduction of catalyst does not affect position of equlibrium

Reason : For a reversible reaction, presence of a catalyst influences both forward & backward reaction reacts to same extent

88. Assertion : For $Zn(s) + Cu^{+2}(aq) \rightleftharpoons Zn^{+2}(aq) + Cu(s)$, DG = 0, but $K_C = 10^{37}$

Reason : For a process under equilibrium Gibb energy change is zero, but as this process proceeds more towards right if $K_C>1$

89. Assertion: For $N_2+3H_2 \rightleftharpoons 2NH_3$, DH = -Q KJ, high pressure yields more Ammonia

Reason : According to Lechatlier's principle, increase of pressure shifts equilibrium in a direction that proceeds in decrease in number of moles.

90. Assertion : The degree of decomposition of PCl_5 is more at low pressures.

Reason : In a reversible reaction, on increasing the pressure the equilibrium shifts in the direction in which decrease in volume takes place.

91. Assertion : $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ In this equilibrium system, the yield of ammonia is not altered in the presence of a catalyst.

Reason : A catalyst does not change the position of equilibrium.

92. A:The hydrolysis of an ester in acidic medium does not change with pressure.

Reason : Pressure does not show effect on equilibrium reactions taking place in solution.

93. A gas bulb is filled with NO_2 gas and immersed in an ice bath at 0^0C which becomes colourless after sometime. This colourless gas will be

1) NO_2
2) N_2O
3) N_2O_4
4) N_2O_5

94. In the case of gaseous homogeneous reaction, the active mass of the reactant is obtained by the expression ***[TN-2002]***

1) $\frac{PV}{RT}$
2) $\frac{P}{RT}$
3) $\frac{RT}{P}$
4) $\frac{n}{V}RT$

95. Under what conditions of temperature and pressure the formation of atomic hydrogen from molecular hydrogen will be favoured.

1) High temperature and high pressure
2) Low temperature and low pressure
3) High temperature and low pressure
4) Low temperature and high pressure

96. Of the following, which change will shift the reaction towards the product

$I_2(g) \rightleftharpoons 2I(g)\ \Delta H^o{}_f\left(298K\right) = +150\,kJ$

1) Increase in concentration of I
2) Decrease in concentration of I_2

3) Increase in temperature
4) Increase in total pressure

97. At constant temperature, the equilibrium constant (Kp) for the decomposition reaction $N_2O_4 \rightleftharpoons 2NO_2$ is expressed by $K_p=4x^2 P/(1-x^2)$ where P is pressure, x is extent of decomposition. Which of the following statement is true?
1) K_p increases with increase of P
2) K_p increases with increase of x
3) K_p increases with decrease of x
4) K_p remains constant with change in P or x

98. Consider the following equilibrium $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$ in a closed container. At a fixed temperature, the volume of the reaction container is halved. For this change, which of the following statements holds true regarding the equilibrium constant (K_p) and degree of dissociation(α)?
1) Neither K_p nor α changes
2) Both K_p and α change ***[IIT -2002]***
3) K_p changes, but α does not change
4) K_p does not change, but α changes

WORK SHEET - II

Active mass - K_C, K_P relationship

1. What is the equation for the equilibrium constant (K_3) for the following reaction ?

$$\tfrac{1}{2}A(g) + \tfrac{1}{3}B(g) \xrightleftharpoons{T(K)} \tfrac{2}{3}C_{(g)}$$

1) $K_C = \dfrac{[A]^{\frac{1}{2}}[B]^{\frac{1}{3}}}{[C]^{\frac{3}{2}}}$
2) $K_C = \dfrac{[C]^{\frac{3}{2}}}{[A]^2[B]^3}$
3) $K_C = \dfrac{[C]^{\frac{2}{3}}}{[A]^{\frac{1}{2}}[B]^{\frac{1}{3}}}$
4) $K_C = \dfrac{[C]^{\frac{2}{3}}}{[A]^{\frac{1}{2}}+[B]^{\frac{1}{3}}}$

2. Active mass of 5.6 lit N_2 at STP
1) 22.4M
2) 0.25M
3) $\dfrac{1}{22.4}$ M
4) 4M

3. Active mass of 0.64 g SO_2 in 10 lit vessel is
1) 10^{-2} M
2) 10^{-3} M
3) 10^{-1} M
4) 0.64g

4. K_P/K_C for $N_2+3H_2 \rightleftharpoons 2NH_3$ (gaseous phase) at 400 K is
1) 400 R
2) $(400R)^2$
3) $(400R)^{-2}$
4) $(127)^{-2}$

5. K_C for $N_2+O_2 \rightleftharpoons 2NO$ at certain temperature is 1.6×10^{-3}, then K_P for $NO \rightleftharpoons 1/2N_2+1/2O_2$ at same temperature will be
1) 25
2) 25 atm
3) 5 atm
4) 1.6×10^{-3} atm^{-1}

6. The equilibrium constant for the given reaction $N_{2(g)} + 2O_{2(g)} \rightleftharpoons 2NO_{2(g)}$ is 100. What is the equilibrium constant for the reaction given below :

$$NO_{2(g)} \rightleftharpoons \tfrac{1}{2}N_{2(g)} + O_{2(g)}$$

1) 10
2) 1
3) 0.1
4) 0.01

7. Equilibrium constant for the gaseous reaction $N_2+O_2 \rightleftharpoons 2NO$ is 4×10^{-4}. Now K_C for

$NO \rightleftharpoons 1/2N_2 + 1/2O_2$ at same temperature is

1) 2.5×10^2 2) 0.02 3) 4×10^{-4} 4) 50

Calculation of K_C & K_P

8. When the molar concentrations of SO_2, O_2 and SO_3 at equlbrium at certain temperature are 0.5, 0.25 & 0.25M respectively, K_C for $2SO_3 \rightleftharpoons 2SO_2 + O_2$ is

1) 1 lit-mol^{-1} 2) 1 lit^2-mol^{-2} 3) 1 mol-lit^{-1} 4) 1 mol^2-lit^{-2}

9. At certain temperature, a 10 lit vessel contains 0.4 mole H_2, 0.4 mole I_2 & 0.1 mole HI at equilibrium. Then K_P for $H_2 + I_2 \rightleftharpoons 2HI$ is

1) 16 2) 0.0625 3) 4 4) Data insufficient

10. For the gaseous phase reaction $2A + B \rightleftharpoons 2C + D$, initially there are 2 mole each of A&B. If 0.4 mol of D is present at equilibrium at a given T & P, <u>in-correct</u> relationship is

1) $P_A < P_B$ & $P_D < P_C$ 2) $P_A = P_C$ & $P_B = P_D$
3) $P_C = 2P_D$ & $P_A = 3P_B/4$ 4) $P_A > P_D$ & $P_B > P_C$

11. 2 mole each of CH_3OH & CH_3COOH are taken and heated in the presence of conH_2SO_4 so that equilibrium is established. If K_C for esterfication process is 4, mass of ester present at equilibrium (in gm) is

1) 98.4 2) 56.3 3) 224.0 4) 37.2

12. A mixture of 2 moles of N_2 and 8 moles of H_2 are heated in a 2 lit vessel, till equilibrium is established. At equilibrium, 0.4 moles of N_2 was present. The equilibrium concentration of H_2 will be

1) 2 mole/lit 2) 4 mole/lit 3) 1.6 mole/lit 4) 1 mole/lit

13. For the reaction $\mathbf{C(s) + CO_2(g) \Leftrightarrow 2CO(g)}$, the partial pressures of CO_2 and CO are 2.0 and 4.0 atm respectively at equilibrium. What is the value of Kp for this reaction? ***(Eamcet 1998)***

1) 0.5 2) 4.0 3) 8.0 4) 32

14. The equilibrium constant for the reaction $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$ is 2 at a certain temperature. The equilibrium concentrations of H_2 and HI are 2 mole.lit^{-1}. What is the equilibrium concentration(in mole.lit^1) of I_2?

1) 16 2) 4 3) 8 4) 1

15. For the gaseous reaction $3H_2 + N_2 \Leftrightarrow 2NH_3$, the equilibrium pressures of H_2 and N_2 are 0.4 atm and 0.8 atm respectively. The total pressure of the equilibrium system is 2.8 atm. The value of K_p is

1) 50 2) 5.0 3) 5.0×10^2 4) 5.0×10^{-2}

16. Initially 0.8 mole of PCl_5 and 0.2 mole of PCl_3 are mixed in one litre vessel. At equilibrium 0.4 mole of PCl_3 is present. The value of K_C for the reaction $PCl_{5(g)} \Leftrightarrow PCl_{3(g)} + Cl_{2(g)}$

1) 0.13molL^{-1} 2) 0.05molL^{-1} 3) 0.065molL^{-1} 4) 0.1molL^{-1}

17. The compounds A and B are mixed in equimolar proportion to from the products, $A + B \rightleftharpoons C + D$. At equilibrium, one third of A and B are consumed. The equilibrium constant for the reaction is

1) 0.5 2) 4.0 3) 2.5 4) 0.25

18. For the hypothetical reactions, the equilibrium constant (K) values are given

$A \rightleftharpoons B; K_1 = 2.0$ $B \rightleftharpoons C; K_2 = 4.0$ $C \rightleftharpoons D; K_3 = 3.0$

The equilibrium constant for the reaction A $\rightleftharpoons$ D is

1) 48 2) 6 3) 24 4) 12

19. 1 mole $CaCO_3$(s) is heated in 11.2 lit vessel so that equilibrium is established at 819 K. If K_P for $CaCO_3 \rightleftharpoons CaO + CO_2$ at this temperature is 2 atm, equilibrium concentration of CO_2 (in mol-lit^{-1})

1) 1/3 2) 1/11.2 3) 1/33.6 4) 1/22.4

20. 4g H_2 & 127g I_2 are mixed & heated in 10 lit closed vessel until equilibrium is reached. If the equilibrium concentration of HI is 0.05 M, total number of moles present at equilibrium is

1) 3.25 2) 1.75 3) 2.25 4) 2.5

21. A mixture of Nitrogen and Hydrogen is at an initial pressure of 200atm. If 20% of the mixture reacts by the time equilibrium is reached, the equilibrium pressure of the mixture is

1) Data insufficient 2) 180 atm 3) 170 atm 4) 160 atm

22. At a given temperature, Kc is 4 for the reaction $H_{2(g)} + CO_{2(g)} \Leftrightarrow H_2O_{(g)} + CO_{(g)}$. Initially 0.6 moles each of H_2 and CO_2 are taken in 1lit flask. The equilibrium concentration of $H_2O_{(g)}$ is

1) 0.4M 2) 0.46M 3) 0.2M 4) 0.8M

23. One mole of $A_{(g)}$ is heated to 300^{0}C in a closed one litre vessel till the following equilibrium is reached. $A_{(g)} \Leftrightarrow B_{(g)}$. The equilibrium constant of the reaction at 300^{0}C is 4. What is the conc. of B (in. mole. lit^{-1}) at equilibrium ?

1) 0.2 2) 0.6 3) 0.8 4) 0.1

24. A mixture of 0.3 mole of H_2 and 0.3 mole of I_2 is allowed to react in a 10 lit vessel at 500^{0}C. If K_C of $\mathbf{H_2 + I_2 \Leftrightarrow 2HI}$ is 64, the amount of unreacted I_2 at equilibrium is

1) 0.15 mole 2) 0.24 mole 3) 0.03 mole 4) 0.06 mole

25. The reaction $N_2 + 3H_2 \Leftrightarrow 2NH_3$ takes place at 450^{0}C. 1 mole of N2 and 2 mole of H_2 are mixed in a 1 litre vessel and 1mole of NH_3 is formed at equilibrium. Then Kc for the above reaction is

1) 4 2) 8 3) 16 4) 32

26. The reversible reaction $SO_{2(g)} + NO_{2(g)} \Leftrightarrow SO_{3(g)} + NO_{(g)}$ .... (1) takes place in two reversible steps (2 and 3) with equilibrium constant values 2.0 and 0.45 respectively $SO_{2(g)} + \frac{1}{2}O_{2(g)} \Leftrightarrow SO_{3(g)}$, K = 2.0............. (2)

$NO_{2(g)} \Leftrightarrow NO_{(g)} + \frac{1}{2}2O_{2(g)}$, K = 0.45 .... (3) The equilibrium constant K_c for the reaction (1) is

1) 0.9 2) 0.225 3) 4.44 4) 1/9

27. For the reaction A + B $\Leftrightarrow$ C + D, the initial conc.of A and B are equal. The equilibrium concentration of C is half the initial concentration of A. The equilibrium constant is

1) 1 2) 1/4 3) 9 4) 1/9

28. 20 gm of $CaCO_3$ is allowed to dissociate in a 5.6 litres container at 819^0 C. If 50% of $CaCO_3$ is dissocitated at equilibrium the 'K_p' value is

1) 5 atm 2) 1.6 atm 3) 4.8 atm 4) 10 atm

29. In the reaction A + 2B $\Leftrightarrow$ 2C + D the initial concentration of B is two times that of 'A'. But equilibrium concentration of B&C were found to be equal. Then the K_C for the above system is

1) 0.18 2) 0.11 3) 0.27 4) 1

30. At a certain temperature, the degree of dissociation of PCl_5 was found to be 0.25 under a total pressure of 15 atm. The value of Kp for the dissociation of PCl_5 is

1) 1 2) 0.25 3) 0.5 4) 0.75

31. $A(g)+3B(g) \rightleftharpoons 4C(g)$ Initial concentration of A is equal to that of B. The equilibrium concentration of A and C are equal. K_c is equal to,

1) 0.08 2) 8 3) 1/8 4) 80

32. At constant temperature 80% AB dissociates into A_2 and B_2, then the equilibrium constant for $2AB_{(g)} \rightleftharpoons A_{2(g)} + B_{2(g)}$ is

1) 1 2) 0.25 3) 16 4) 4

33. HI was heated in a sealed tube at 440^0C till the equilibrium was reached. HI was found to be 22% decomposed. The equilibrium constant for the dissociation of HI is [$2HI \rightleftharpoons H_2 + I_2$]

1) 0.282 2) 0.0796 3) 0.0199 4) 1.99

34. N_2O_4 at an initial pressure of 2atm. and 300K dissociates to an extent of 20% at the same temperature by the time equilibrium is established. Kp for the reaction $\mathbf{2NO_2 \rightleftharpoons N_2O_4}$ is

1) 0.4 2) 0.8 3) 2.5 4) 1.6

35. 2 mole of PCl_5 is heated in a one litre vessel. If PCl_5 dissociates to the extent of 80%, the equilibrium constant for the dissociation of PCl_5 is

1) 2 ´ 10^{-2} 2) 6.4 3) 0.67 4) 0.32

36. The initial concentrations of A and B are same for $A = 2B \rightleftharpoons 3C$ and when equilibrium concentrations of B and C are same then K_C is

1) 0.25 2) 0.75 3) 0.5 4) 1

37. For the reaction $\mathbf{N_2O_4 \rightleftharpoons 2NO_{2(g)}}$, the degree of dissociation at equilibrium is 0.2 at 1 atm. Then Kp will be

1) 1/2 2) 1/4 3) 1/6 4) 1/8

38. A vessel at 1000 K contains CO_2 with a pressure of 0.5 atm. Some of CO_2 is converted into CO on addtion of graphite. The value of 'K' at equilibrium when total pressure is 0.8 atm will be

1) 0.18 atm 2) 1.8 atm 3) 2 atm 4) 1 atm

39. 1.2 moles of SO_3 are allowed to dissociate in a 2 litre vessel the reaction is $2SO_{3(g)} \Leftrightarrow 2SO_{2(g)} + O_{2(g)}$ and the concent ration of oxygen at equilibrium is 0.1 mole per litre. The total number of moles at equilibrium will be

1) 2 2) 1.4 3) 0.8 4) 1.6

40. $3C_2H_2 \Leftrightarrow C_6H_6$ the above reaction is performed in a 1 lit vessel. Equilibrium is established when 0.5 mole of benzene is present at certain temperature. If equilibrium constant is 4 lit^2 $mole^{-2}$. The total number of moles of the substances present at equilibrium.

1) 0.5 2) 1 3) 1.5 4) 2

41. 1.0 mole of ethyl alcohol and 1.0 mole of acetic acid are mixed. At equilibrium, 0.666 mole of ester is formed. The value of equilibrium constant is

1) 1/4 2) 1/2 3) 4 4) 3

42. Kp value for $2SO_{2(g)} + O_{2(g)} \Leftrightarrow 2SO_{3(g)}$ is 5.0 atm^{-1}. What is the equilibrium partial pressure of O_2 if the equilibrium pressures of SO_2 and SO_3 are equal ?

1) 0.2 2) 0.3 3) 0.4 4) 0.1 atm

43. For the following reaction $NH_4HS_{(s)} \rightleftharpoons NH_{3(g)} + H_2S_{(g)}$, the total pressure at equilibrium is 30 atm. The value of Kp is

1) 15 atm^2 2) 225 atm^2 3) 30 atm^2 4) 15 atm

44. A vessel contains N_2O_4 & NO_2 in 2:3 molar ratio at 10 atm under equilibrium. Now, K_P for $N_2O_4 \rightleftharpoons 2NO_2$ is

1) 9 atm 2) 9 atm^{-1} 3) 4.5 atm^2 4) 10 atm

45. A vessel contains 1 mole PCl_5 (g) at 4 atm and 0.5 mole PCl_3 formed at equilibrium. Now, equilibrium pressure of mixture is (assume ideal behavior)

1) 16 atm 2) 6 atm 3) 2 atm 4) 4.5 atm

46. P_{eq} for $NH_4COONH_2(s) \rightleftharpoons 2NH_3(g) + CO_2(g)$ at certain temperature is 0.9 atm. Then, partial pressure of Ammonia at equilibrium (in atm)

1) 0.9 2) 0.81 3) 0.03 4) 0.6

47. 28 gms of N_2 and 6 gms of H_2 were heated in a closed 1 litre vessel. At equilibrium, 25.5 gms of NH_3 is present. The approximate value of K_C is

1) 5.55 2) 21.33 3) 2.54 4) 3.16

48 For the following three reactions a,b and c equilibrium constant are given (AIEEE - 2008)

1) $CO_{(g)} + H_2O_{(g)} \rightleftharpoons CO_{2(g)} + H_{2(g)}; K_1$ 2) $CH_{4(g)} + H_2O_{(g)} \rightleftharpoons CO_{(g)} + 3H_{2(g)}; K_2$

3) $CH_{4(g)} + 2H_2O_{(g)} \rightleftharpoons CO_{2(g)} + 4H_{2(g)}; K_3$ Which of the following relations is correct?

1) $K_2 K_3 = K_1$ 2) $K_3 = K_1K_2$ 3) $K_3 . K_2^3 = K_1^2$ 4) $K_1\sqrt{K_2} = K_3$

49. In a 500 ml flask, the degree of dissociation of PCl_5 at equilibrium is 40% and the initial amount is 5 moles. The value of equilibrium constant in mole lit^{-1} for the decomposition of PCl_5 is(E-08)

1) 3.33 2) 2.66 3) 5.32 4) 4.66

EXERCISE - I ANSWERS

WORK SHEET - I

1) 3	2) 4	3) 3	4) 2	5) 2	6) 4	7) 4	8) 3	9) 2	10) 4
11) 1	12) 3	13) 3	14) 2	15) 2	16) 4	17) 4	18) 4	19) 3	20) 2
21) 1	22) 4	23) 1	24) 4	25) 3	26) 3	27) 3	28) 3	29) 4	30) 1
31) 3	32) 1	33) 2	34) 4	35) 2	36) 2	37) 3	38) 1	39) 4	40) 2
41) 2	42) 1	43) 3	44) 2	45) 3	46) 1	47) 3	48) 2	49) 4	50) 2
51) 2	52) 1	53) 4	54) 1	55) 3	56) 2	57) 1	58) 3	59) 3	60) 2
61) 2	62) 4	63) 3	64) 2	65) 3	66) 1	67) 3	68) 3	69) 2	70) 3
71) 4	72) 2	73) 3	74) 2	75) 2	76) 2	77) 4	78) 2	79) 2	80) 3
81) 1	82) 3	83) 1	84) 3	85) 2	86) 4	87) 1	88) 1	89) 1	90) 1
91) 1	92) 1	93) 3	94) 2	95) 3	96) 3	97) 4	98) 4		

WORK SHEET - II

1) 3	2) 3	3) 2	4) 3	5)1	6) 3	7) 4	8) 3	9) 2	10) 2
11) 1	12) 3	13) 3	14) 4	15) 1	16) 1	17) 4	18) 3	19) 3	20) 4
21) 2	22) 1	23) 3	24) 4	25) 3	26) 1	27) 1	28) 2	29) 4	30) 1
31) 2	32) 4	33) 3	34) 3	35) 2	36) 2	37) 3	38) 2	39) 2	40) 2
41) 3	42) 1	43) 2	44) 1	45) 2	46) 4	47) 2	48) 2	49) 2	

EXERCISE - I

Theories of acids and bases

1. Which of the following is an Arrhenius acid?
1) NH_3 2) SO_2 3) $AlCl_3$ 4) HNO_3
2. Which of the following is relatively stronger acid ?
1) H_2S 2) HCN 3) HF 4) CH_3COOH
3. Arrhenius theory could not explain the acidic nature of
1) HCl 2) HCOOH 3) H_2S 4) CO_2
4. Which of the following is only Bronsted - Lowry acid but not an Arrhenius acid ?
1) HCl 2) NH_4^+ 3) BF_3 4) CH_3COOH
5. Which of the following species acts as Bronsted base but not as acid ?
1) CH_3COOH 2) HCO_3^- 3) $H_2PO_2^-$ 4) $H_2PO_3^-$
6. Which of the following can act as Lowry- Bronsted acid as well as base?
1) HCl 2) SO_4^{2-} 3) HPO_4^{2-} 4) Br^-
7. Which of the following is neither Bronsted acid nor Bronsted base ?
1) HI 2) HSO_4^- 3) Cl^- 4) BF_3
8. Which of the following is a Bronsted acid but not a Bronsted base ?
1) H_2O 2) NH_3 3) H_2S 4) HCO_3^-
9. The conjugate base of hydrazoic acid is
1) N^{3-} 2) N_3^- 3) NH_2^- 4) NH_4^+
10. Identify Bronsted - Lowry acids in the reaction given below ?
$\underset{A}{[Al(H_2O)_6]^{3+}} + \underset{B}{HCO_3^-} \rightleftharpoons \underset{C}{[Al(H_2O)_5(OH)]^{2+}} + \underset{D}{H_2CO_3}$ The correct answer is
1) A, C 2) A, D 3) B, D 4) B, C
11. Conjugate acid of HPO_4^{2-} is
1) H_3PO_4 2) $H_2PO_4^-$ 3) PO_4^{3-} 4) H_3PO_4
12. Conjugate base of HSO_4^- is
1) H_2SO_4 2) $H_2SO_4^{2-}$ 3) SO_4^{2-} 4) H^+
13. Of the given anions, the strongest Bronsted base is
1) ClO^- 2) ClO_3^- 3) ClO_2^- 4) ClO_4^-
14. Among the following, relatively weak base is
1) F^- 2) Cl^- 3) Br^- 4) I^-
15. Among the following relatively strong base is
1) HSO_4^- 2) NO_3^- 3) CH_3COO^- 4) Cl^-
16. O_2^{2-} is the conjugate base of
1) OH^- 2) H_2O 3) H_2O_2 4) HO_2^-
17. Weakest conjugate base is obtained from
1) HNO_3 2) CH_3COOH 3) HCN 4) H_2S
18. Which of the following is not a conjugate acid - base pair

1) HPO_3^{2-}, PO_3^{3-} 2) $H_2PO_4^-$, HPO_4^{2-} 3) $H_2PO_4^-$, H_3PO_4 4) $H_2PO_4^-$, PO_3^{3-}.

19. In aqueous solution , HCl and HNO_3 are equally strong. This is because
1) Their basicities are same 2) Both are oxy acids of non-metals
3) Both have lower molecular weights 4) Levelling effect of water

20. Which of the following acts as Lewis acid ?
1) H 2) He 3) S 4) B

21. Which of the following is a Lewis acid ?
1) CCl_4 2) BF_3 3) H_2O 4) SO_4^{2-}

22. Which of the following acts as a Lewis acid in the following reaction $SnCl_4 + 2Cl^- \rightarrow [SnCl_6]^{2-}$
1) Cl^- 2) $[SnCl_6]^{2-}$ 3) $SnCl_4$ 4) $2Cl^-$

23. Which of the following is relatively strong Lewis acid ?
1) BF_3 2) BCl_3 3) BBr_3 4) BI_3

24. Which of the following is not a Lewis acid?
1) $SnCl_2$ 2) NH_4^+ 3) NH_3 4) both NH_3 and NH_4^+

25. Which of the folowing is a Lewis acid ?
1) $HCOO^-$ 2) H_2SO_4 3) SiF_4 4) H_2S

26. In a complex compound ligand acts as
1) Lewis acid 2) Lewis base
3) Lowry-Bronsted acid 4) Arrhenius base

27. Al^{3+} is a Lewis acid , because
1) It has vacant orbital 2) It has completely filled orbitals
3) It can give H^+ 4) It can add with OH^-

28. Nitrogen trihalides are
1) Lewis acids 2) Arrhenius bases
3) Lewis bases 4) Bronsted and Lowry acids

29. Which of the following species acts as a Lewis acid and also as a Lewis base ?
1) SO_2 2) SCl_4 3) both SO_2 and SCl_4 4) SO_3

30. Strength of an weak acid or a weak base depends upon its
1) Temperature 2) Nature of solvent
3) Degree of dissociation 4) All the above

31. Conjugate base of $[Al(H_2O)_6]^{3+}$ is
1) $[Al(H_2O)_6]^{2+}$ 2) $[Al(H_2O)_5OH]^{2+}$ 3) $[Al(H_2O)_4OH]^2$ 4) $[Al(H_2O)_4(OH)_2]^{2+}$

32. Conjugate base of $[Cu(NH_3)_6]^{2+}$ is
1) $[Cu(NH_3)_3NH_2^-$ 2) $[Cu(NH_3)_5NH_2]^+$
3) $[Cu(NH_3)_4NH_2]^+$ 4) $[Cu(NH_3)_4NH_2]^{2+}$

33. In the reaction, $CH_3COOH + H_2O \rightleftharpoons H_3O^+ + CH_3COO^-$, H_3O^+ acts as
1) Weak acid 2) Weak base 3) Strong acid 4) Strong base

34. Which of the following is relatively strong base ?

1) CH_3O^- 2) $C_6H^-_5$ 3) CH_3^- 4) C_2H^-

35. Conjugate base of H_2 is

1) Electron 2) Hydride ion 3) Proton 4) Neutron

36. What is the decreasing order of strength of the bases OH^-, NH_2^-, $H\text{-}C\equiv C^-$ and $CH_3\text{-}CH_2^-$

1) $CH_3 - CH_2^- > NH_2^- > H - C \equiv C^- > OH^-$ 2) $H - C \equiv C^- > CH_3 - CH_2^- > NH_2^- > OH^-$

3) $OH^- > NH_2^- > H - C \equiv C^- > CH_3 - CH_2^-$ 4) $NH_2^- > H - C \equiv C^- > OH^- > CH_3 - CH_2^-$

37. Strongest conjugate base among the following is

1) NH_2^- 2) F^- 3) OH^- 4) ClO_4^-

38. Which of the following is an acidic salt ?

1) Na_3PO_4 2) $Na_2H\ PO_3$ 3) NaH_2PO_2 4) NaH_2PO_4

39. Which of the following is normal salt ?

1) Na_3PO_4 2) $CaSO_4$ 3) Na_2CO_3 4) all the above

40. Among the following, the stronger acid in basic medium is

1) Aniline 2) Phenol 3) Ammonia 4) Benzene

41. Which of the following does not turn blue litmus as red litmus ?

1) 1M HCl 2) Pure and dry HCl 3) dil.HCl 4) Conc.HCl

42. Aniline is a strong base in

1) H_2O 2) NaOH 3) CS_2 4) HCl

43. $HClO_4$ is a poor conductor in

1) Water 2) dil.NH_3 3) Acetic acid 4) NaOH solution

44. Which of the following has least tendency to act as Lewis acid ?

1) I^- 2) I^+ 3) $SnCl_2$ 4) $AlCl_3$

45. Which of the following relatively more strong acid in aqueous solutions ?

1) $HClO_4$ 2) H_2SO_4 3) HI 4) All are equally strong

46. Which of the following is relatively strong base in aqueous solution ?

1) NaOH 2) CsOH 3) $Ba(OH)_2$ 4) All are equally strong

47. Which of the following is strong Lewis base?

1) NF_3 2) NCl_3 3) NBr_3 4) NI_3

48. Which of the following is strong Lewis acid?

1) Na^+ 2) Mg^{2+} 3) Al^{3+}

4) All show equal strength

49. The Lewis acidic strength of SO_3 when compared to SO_2 is

1) Less 2) More 3) Equal 4) Can not be predicted

50. Which of the following failed to explain the relative strength of acids and bases ?

1) Arrhenius theory 2) Bronsted theory 3) Lowry theory 4) Lewis theory

51. Which of the following acts as Lewis acid ?

1) Zn^{2+} 2) $FeCl_3$ 3) CO_2 4) All the above

52. Which of the following acts as Lewis base ?

1) SCN^- 2) R_2O 3) RNH_2 4) All the above

53. Which of the following acts as Lewis base ?
1) C_2H_2 2) C_2H_4 3) Pyridine 4) All the above

54. Which of the following is wrong ?
1) All Bronsted bases are Lewis bases 2) All Lewis acids are Bronsted acids
3) All Arrhenius acids are Bronsted acids 4) All Arhenius bases are Bronsted bases

55. In the reaction, $AlCl_3 + Cl^- \rightarrow AlCl_4^-$, Cl acts as
1) Bronsted acid 2) Bronsted base 3) Lewis base 4) Lewis acid

56. The no.of conjugate acid-base pairs present in the aqueous solution of H_3PO_3 is
1) 2 2) 3 3) 4 4) 5

57. Glycine exists as the zwitter ion , $\overset{+}{N}H_3CH_2COO^-$. Its conjugate base is
1) NH_2CH_2COOH 2) $NH_2CH_2COO^-$ 3) $\overset{+}{N}H_3CH_2COOH$ 4) $NH_3CH_2COO\overset{+}{H}$

58. $CH_3COOH_2^+$ is present in the solution of acetic acid in
1) NH_3 2) Water 3) Benzene 4) HCl

59. The solution of acetic acid in benzene contains
1) CH_3COO^- 2) H^+ 3) H_3O^+ 4) $(CH_3COOH)_2$

60. The species which does not have a conjugate base is
1) H_3PO_4 2) $H_2PO_3^-$ 3) $H_2PO_2^-$ 4) HPO_4^{2-}

61. Which of the following is a Bronsted nutralisation reaction ?
1) $H^+ + OH^- \rightarrow H_2O$ 2) $HCl + NH_3 \rightarrow NH_4^+ + Cl^-$
3) $NH_3 + BF_3 \rightarrow [H_3N - BF_3]$ 4) $NaOH + HCl \rightarrow NaCl + H_2O$

62. H_2CO_3 ionises in two stages as represented below
$H_2CO_3 + H_2O \rightleftharpoons H_3O^+ + HCO_3^-$ $HCO_3^- + H_2O \rightleftharpoons H_3O^+ + CO_3^{2-}$
the no.of conjugate acid-base pairs in the above reaction are
1) 2 2) 3 3) 4 4) 5

63. The reaction, $NH_4^+ + CN^- \rightleftharpoons HCN\,(aq) + NH_3\,(aq)$ proceeds in
1) Forward direction 2) Backward direction
3) In both sides 4) Can not be predicted

64. Which of the following statements is true ?
1) HNO_3 is a stronger acid than HNO_2 2) H_3PO_3 is stronger acid than H_2SO_3
3) In aqueous solution HF is stronger acid than HCl
4) $HClO_4$ is a weaker acid than $HClO_3$

65. A : In water, HCl and HNO_3 have same strength. But their strengths in acetic acid are different .
R : Acetic acid is stronger acid than water.
1) Both (1) and (R) are true and (R) is the correct explanation of (A)
2) Both (1) and (R) are true and (R) is not the correct explanation of (A)
3) (1) is true but (R) is false 4) (1) is false but (R) is true

66. Assertion : HCl is not acidic in benzene
Reason : Benzene does not accept protons

67. Assertion : H_3O^+ is the strongest acid in aqueous solution
Reason : water levels the strength of hydronium ion.

68. Assertion : ClO_4^- is the weakest base
Reason : In ClO_4^-, chlorine atom is SP^3 hybridised.

69. Assertion : All Bronsted bases are Lewis bases
Reason : A species that accepts a proton necessarily should donate a lone pair of electrons.

70. Assertion : HNO_3 is not a Bronsted acid in $CHCl_3$
Reason : $CHCl_3$ is an example of aprotic solvent.

71. Assertion : Ethoxide ion acts as a strong base.
Reason : Ethyl alcohol is a week acid.

72. Assertion : $H_2PO_3^-$ is a Lowry - Bronsted acid and base
Reason : $H_2PO_3^-$ is a proton donor as well as proton acceptor.

73. Species acting as both Bronsted acid and base is
1) HSO^-_4 2) Na_2CO_3 3) NH_3 4) OH^-

74. The conjugat base of $H_2PO_4^-$ is
1) H_3PO_4 2) P_2O_5 3) PO_4^{3-} 4) HPO_4^{2-}

Ionic product of water

75. The units of ionic product of water is
1) Mole/ lit 2) Mole / kg 3) $Mole^2.lit^{-2}$ 4) No units

76. At 100^0 C , the value of P^{K_w} is
1) 14 2) < 14 3) > 14 4) $P^H - P^{OH}$

77. At 25^0C , for an acid
1) $[H^+] > 10^{-7}M$ 2) $[OH^-] < 10^{-7}M$ 3) pH < 7 4) All the above

78. At 298 K, the $[H_3O^+]$ of a solution is 2×10^{-9}M. The nature of the solution is
1) Acidic 2) Basic 3) Neutral 4) Can not be predicted

79. Ionic product of water depends on
1) Volume of the water 2) Amout of salt in water
3) Temperature 4) All the above

80. At a given temperature , When an acid is added to water then the value of K_w
1) Decreases 2) Increases
3) Remains same 4) First decreases then increases.

81. At any temperature, the proton concentration of water is
1) 10^{-7}M 2) < 10^{-7}M 3) > 10^{-7}M 4) $\sqrt{K_w}$

82. The value of ionic product of water increases with increase in
1) Acidic nature of solution 2) Basic nature of solution
3) Temperature 4) Volume of the solution

83. If the ionic product of water is 1.96×10^{-14} at 35^0C, What is its value at 10^0C
1) 1.96×10^{-14} 2) 3.92×10^{-14} 3) 2.95×10^{-15} 4) 1.96×10^{-13}

P^H, P^{OH} and ionization constants :

84. P^H of a solution is given by
1) $P^H = -\log [H^+]$ 2) $P^H = \log \frac{1}{[H^+]}$ 3) $P^H = P^{K_w} - P^{OH}$ 4) All the above

85. P^H of a solution is independent of

1) Temperature 2) Nature of the solution
3) Degree of dissociation of acid (or) base 4) Volume of the solution

86. Which of the following is wrong ?

1) At any temperature P^H of water is exactly equal to 7
2) At 25^0C, the P^H of an acid is less than 7
3) At 25^0C, the P^H of a base is greater than 7
4) At 25^0C, the P^{OH} of water is equal to 7

87. The P^H of an aqueous solution is zero. Then the nature of the solution is

1) Slightly acidic 2) Strongly acidic 3) Neutral 4) Basic

88. Among the following

1) P^H of water decreases with increase in temperature
2) P^H of water decreases by the addition of base
3) P^H of water increases by the addition of acid
4) At any temperature P^H of water is equal to $P^{K_{w/2}}$

1) All are correct 2) b,c,d are correct
3) a and d are correct 4) a,b and c are correct

89. Assertion :P^H of an aqueous solution of acetic acid remains unchanged on the addition of sodium acetate.

Reason : Dissociation of acetic acid is supressed by the addition of sodium acetate due to common ion effect.

90. Assertion : At 90^0C, the $P^H$of pure water is less than 7

Reason : Ionic product of water increases with increase in temperature.

91. At any temperature, $P^H + P^{OH}$ is equal to

1) 7 2) 0 3) 14 4) P^{KW}

92. The P^H of 40 ml of an 0.02 M HCl will not be changed by adding

1) 1 ml of 1M HCl 2) 2 ml of 1M NaOH
3) 20 ml of 0.1 M NaCl 4) 36 ml of same concentrated HCl solution

93. Among the following

1) On dilution, the P^H of an acid increases
2) A solution with $P^H = 5$ is 100 times more basic than a solution with $P^H = 3$
3) A solution with $P^H = 8$ is 1000 times more acidic than a solution with $P^H= 11$
4) The P^H of 10^{-9}M KOH is slightly greater than 7

1) All are correct 2) a,d are only correct
3) a,b,c are only correct 4) All are wrong

94. Each 10^{-3}M of following four acids are taken. Their P^H values are given in brackets. Which of the following is relatively strong acid ?

1) A (3.6) 2) B (4.2) 3) C (5.4) 4) D (6.8)

95. Which of the following is not correct ?

1) $P^H = \dfrac{1}{\log[H^+]}$ 2) $P^H = \log\left(\dfrac{1}{H^+}\right)$ 3) $[H^+] = 10^{-P^H}$ 4) $P^H = -\log[H^+]$

96. For a strong acid,

1) K_a is very high 2) P^{K_a} is very low 3) α is very high 4) All the above

97. For a conjugate acid-base pair , K_a and K_b are related as

1) $K_a.K_b = 1$ 2) $K_a.K_b = K_w$ 3) $K_a.K_b = 14$ 4) $K_a.K_b = 7$

98. For a dibasic acid, $H_2A \rightleftharpoons HA^- + H^+ \ (K_1)$, $HA^- \rightleftharpoons A^{2-} + H^+ (K_2)$, $H_2A \rightleftharpoons 2H^+ + A^{2-} (K)$ then

1) $K = K_1 + K_2$ 2) $K = K_2/K_1$ 3) $K = K_1/K_2$ 4) $K = K_1.K_2$

99. For H_3PO_4, $H_3PO_4 \rightleftharpoons H_2PO_4^- + H^+ (K_1)$, $H_2PO_4^- \rightleftharpoons HPO_4^{2-} + H^+ (K_2)$, $HPO_4^{2-} \rightleftharpoons PO_4^{3-} + H^+ (K_3)$ then

1) $K_1 > K_2 > K_3$ 2) $K_1 < K_2 < K_3$ 3) $K_1 < K_2 > K_3$ 4) $K_1.K_2.K_3 = K_w$

100. Which of the following is relatively stronger acid? K_a values are given in brackets

1) HA (2×10^{-4}) 2) HB (3×10^{-5}) 3) HC (1.8×10^{-3}) 4) HD (9.6×10^{-10})

101. Which of the following is relatively stronger base? P^{kb} values are given in brackets.

1) AOH (5.8) 2) BOH (6.8) 3) COH (2.4) 4) DOH (10.9)

102. For a weak acid (α is very small)

1) $K_a = C.\alpha^2$ 2) $\alpha = \sqrt{\frac{K_a}{C}}$ 3) $[H^+] = C.\alpha$ 4) all the above

103. Which of the following statement is not correct ?

1) Cl^- is a Lewis acid

2) The P^H of 10^{-8} M HCl solution is less than 7

3) The ionic product of water at 25^0C is10^{-14} M^2

4) Bronsted - Lowry theory could not explain the acidic nature of $AlCl_3$

104. Which of the following statement is correct?

1) Bronsted - lowry theory could not explain the acidic nature of BCl_3

2) The P^H of 0.01M NaOH solution is 2

3) The ionic product of water at 25^0C is 10^{-10} M^2

4) The P^H of a solution can be calculated using the equation $P^H = +\log[H^+]$

105. The P^H of a solution of H_2O_2 is 6.0 . Some Cl_2 gas is bubbled into this solution. Which of the following is correct?

1) The P^H of the resultant solution becomes 8 2) H_2 gas is liberated

3) The P^H of the resultant solution becomes less than 6.0 and O_2 gas is liberated.

4) Cl_2O is formed in the resultant solution.

106. Which of the following is correct.

1) The P^H of one liter solution containing 0.49g of H_2SO_4 is 2.0

2) The conjugate base of H_2S is S^{2-} 3) BF_3 is a Lewis base

4) Phenophthalein is colourless in basic medium

107. Which on of the following statements is not correct ?

1) $P^H + P^{OH} = 14$ for all aqueous solutions

2) The P^H of 10^{-8} M HCl is 8

3) 96, 500 coulombs of electricity diposits one gram equivelant weight of copper from $CuSO_4$ solution

4) The conjugate base of $H_2PO_4^-$ is HPO_4^{2-}

Strong and weak electrolytes

108. Which of the following is a weak electrolyte?
1) CH_3COONa 2) CH_3COOH 3) KOH 4) H_2SO_4

109. Which of the following is a strong electrolyte
1) NH_4OH 2) $Mg(OH)_2$ 3) $BaCl_2$ 4) H_3PO_4

110. Which of the following is the best conductor of electricity ?
1) 1M HNO_3 2) 1M H_2CO_3 3) 1M H_3PO_4 4) 1M H_2SO_4

111. Ostwald dilution law is applicable to
1) Strong electrolytes 2) Weak electrolytes
3) Non - electrolytes 4) All types of electrolytes

112. The correct expression for Ostwald's dilution law is
1) $K_a = \frac{\alpha^2}{(1-\alpha)V}$ 2) $K_a = \alpha^2.V$ 3) $K_a = \frac{\alpha^2}{1-V}$ 4) $K_a = \frac{\alpha^2}{C(1-\alpha)}$

113. For a weak acid, the concentration of H^+ ions is given by
1) $\sqrt{K_a.C}$ 2) K_a/C 3) $\sqrt{K_a/C}$ 4) $\sqrt{C/K_a}$

114. Which of the following is wrong ?
1) Degree of dissociation of a weak electrolyte increases with dilution.
2) Increase in temperature increases the ionisation.
3) Strong electrolytes are ionised completely even at moderate concentrations.
4) Addition of NH_4Cl to NH_4OH increases the ionisation of the latter.

115. Which of the following does not affect the degree of ionisation ?
1) Temperature 2) Current 3) Nature of solvent 4) Concentration

116. At infinite dilution , the percentage ionisation of both strong and weak electrolytes is
1) 1 % 2) 20 % 3) 50 % 4) 100 %

Buffer Solutions

117. A solution that has reserve acidity (or) alkalinity is called
1) Standard solution 2) Ideal solution 3) Non - ideal solution 4) Buffer solution

118. An acidic buffer contains
1) Excess of H^+ ions , few anions and excess of undissociated molecules of weak acid
2) Excess of cations , few OH^- ions and some undissociated molecules of weak acid.
3) Excess of anions ,few H^+ ions and some undissociated molecules of weak acid
4) Strong acid and its salt with a weak base

119. Which of the following is correct for buffer [Salt = S acid = A]

1) $P^{K_a} = P^H + \log \frac{[s]}{[A]}$ 2) $P^H = P^{K_a} + \log \frac{[s]}{[A]}$

3) $[H^+] = 10^{-P^{K_a}}$ 4) $P^H = -\log \frac{[s]}{[A]}$

120. Buffer capacity of acidic buffer solution is maximum when

1) $P^H = P^{K_a}$ 2) [salt] = [acid] 3) P^{K_a} =7 4) $[H^+] = P^{K_a}$

1) All are correct 2) b,c,d are correct 3) a and b are correct 4) c and b are correct

121. To a buffer solution of CH_3COOH and CH_3COONa , some HCl is added . Then the reaction involved is

1) $CH_3COOH + OH^- \rightarrow CH_3COO^- + H_2O$ 2) $CH_3COO^- + H^+ \rightarrow CH_3COOH$

3) $Na^+ + OH^- \rightarrow NaOH$ 4) $CH_3COO^- + Na^+ \rightarrow CH_3COONa$

122. For acetic acid and sodium acetate buffer , addition of which of the following increases the P^H ?

1) CH_3COONa 2) H_2O 3) CH_3COOH 4) None of these

123. A basic buffer solution contains a weak base B and its conjugate acid BH^+. On adding some HCl, which of the following reactions takes place to maintain constant P^H ?

1) $BH^+ \rightarrow B + H^+$ 2) $B + H_2O \rightarrow BH^+ + OH^-$

3) $H^+ + OH^- \rightarrow H_2O$ 4) $BH^+ + OH^- \rightarrow B + H_2O$

124. For the buffer solution containing NH_4OH and NH_4Cl , P^H of the buffer solution can be increased by

1) Adding some more NH_4Cl 2) Adding some more NH_4OH

3) Removing NH_4Cl 4) Both 2 and 3

125. A buffer solution contains a weak acid HA and A^- . When small quantity of NaOH is added , to keep P^H as constant, which of the following reaction takes place?

1) $HA \rightarrow H^+ + A^-$ 2) $H^+ + A^- \rightarrow HA$

3) $HA + OH^- \rightarrow H_2O + A^-$ 4) $A^- + H_2O \rightarrow HA + OH^-$

126. 1M NaCl and 1M HCl are present in an aqueous solution. The solution is (AIEEE -02)

1) Not a buffer solution with $P^H < 7$ 2) Not a buffer solution with $P^H > 7$

3) A buffer solution with $P^H < 7$ 4) A buffer solution with $P^H = 7$

127. Which of the following pair of solutions does not form a buffer solution ?

1) NaH_2PO_4 and Na_2HPO_4 2) H_2CO_3 and $NaHCO_3$

3) NH_4OH and NH_4Cl 4) KOH and K_2SO_4

128. From the following table

Buffer solution	Vol.of 0.1M weak acid (in ml)	Vol.of 0.1M sodium saltof weak acid (in ml)
I.	4.0	4.0
II.	4.0	40.0
III.	40.0	4.0
IV.	0.1	10

Which of the two sets of buffer solutions have least pH ?

1) I & II 2) I & III 3) II & III 4) II & IV

129. Few drops of HCl is added to acetic buffer. The P^H is maintained constant by

1) CH_3COOH 2) CH_3COO^- 3) Na^+ 4) CH_3COONa

130. A physician wishes to prepare a buffer solution at $P^H = 3.58$ that efficiently resists a change in P^H yet contains only small conc. of the buffering agents. Which one of the following weak acid together with its sodium salt would be best to use ?

1) m-chloro benzoic acid ($P^{K_a} = 3.98$) 2) p- chlorocinnamic acid ($P^{K_a} = 4.41$)

3) 2,5 - dihydroxy benzoic acid ($P^{K_a} = 2.97$) 4) Acetoacetic acid ($P^{K_a} = 3.58$)

131. Which of the following mixture acts as buffer solution ?

1) 100 ml 0.2 M CH_3COOH +100 ml 0.1M NaOH

2) 100 ml 0.1M CH_3COOH + 100 ml 0.2M NaOH

3) 100 ml 0.2M CH_3COOH + 100 ml 0.2 M NaOH

4) None of the above acts as buffer solution due to the presence of strong base, NaOH

Hydrolysis of salts

132. Aqueous solution of salt of strong acid and weak base

1) Undergoes cationic hydrolysis 2) Is acidic in nature

3) Has P^H less than 7 4) All the above

133. A salt of weak acid and weak base undergoes

1) Only cationic hydrolysis 2) Only anionic hydrolysis

3) Both cationic and anionic hydrolysis 4) No hydrolysis

134. The compound whose 0.1 M solution is basic is

1) Ammonium acetate 2) Ammonium chloride

3) Ammonium sulphate 4) Sodium acetate

135. Which of the following salts, does not undergo hydrolysis ?

1) KCN 2) $ZnSO_4$ 3) CH_3COONa 4) $NaClO_4$

136. The nature of aqueous solution of $CuSO_4$ is

1) Acidic 2) Basic 3) Neutral 4) Amphoteric

137. Aqueous solution of which of the following shows lower P^H ?

1) K_2SO_4 2) $ZnCl_2$ 3) KCN 4) CH_3COONH_4

138. The hydrolysis constant of CH_3COONa is given by

1) $K_h = \dfrac{K_w}{K_a}$ 2) $K_h = \dfrac{K_w}{K_b}$ 3) $K_h = \dfrac{K_w}{K_a \cdot K_b}$ 4) $K_h = K_a/K_b$

139. Which of the following salts undergoes anionic hydrolysis ? (IIT 1983)

1) $CuSO_4$ 2) NH_4Cl 3) $FeCl_3$ 4) Na_2CO_3

140. Which of the following shows relatively higher P^H ?

1) Aq. NaCl 2) Aq . NH_4Cl 3) Aq . Na_3PO_4 4) Aq.KOH

141. Aqueous solution of salt of weak acid and strong base

1) Has$[H^+] < [OH^-]$ 2) Is basic in nature

3) Has P^H grater than 7 4) All the above

142. MX is the salt of weak base, MOH and weak acid, HX. Aqueous solution of MX is

1) Acidic , if $K_a < K_b$ 2) Basic , if $K_a > K_b$ 3) Neutral , if $K_a = K_b$ 4) All the above

143. The P^H of an aqueous solution of a salt is 10. The salt is

1) NaCl 2) NH_4Cl 3) CH_3COONa 4) $(NH_4)_2SO_4$

144. Aqueous solution of potash alum is acidic due to the hydrolysis of

1) K^+ 2) Al^{3+} 3) SO_4^{2-} 4) Mg^{2+}

145. The hydrolysis constant of ammonium acetate is given by

1) $\frac{K_w}{K_a}$ 2) $\frac{K_w}{K_b}$ 3) $\frac{K_w}{K_a \cdot K_b}$ 4) $K_a . K_b$

146. Aqueous solution of KCl is neutral because

1) K^+ undergoes hydrolysis 2) Cl^- undergoes hydrolysis

3) Both K^+ and Cl^- undergo hydrolysis 4) No hydrolysis takes place

147. The P^H of 0.1M solution of the following compounds increases in the order

1) NaCl < NH_4Cl < NaCN < HCl 2) HCl < NH_4Cl < NaCl < NaCN

3) NaCN < NH_4Cl < NaCl < HCl 4) HCl < NaCl < NH_4Cl < NaCN

148. Nature of 0.1M solution of sodium bisulphate is

1) Acidic 2) Alkaline 3) Neutral 4) Amphoteric

149. The no.of hydroxyl ions produced by one molecule of Na_2CO_3 on hydrolysis is

1) 4 2) 2 3) 3 4) 0

150. Assertion: The aqueous solution of CH_3COONa is alkaline in nature

Reason : Acetate ion undergoes anionic hydrolysis.

151. Assertion : Aqueous solution of $ZnSO_4$ is neutral

Reason : Salt of strong acid and strong base does not undergo hydrolysis.

152. Assertion : Aqueous solution of ammonium acetate is neutral

Reason : Dissociation constants of NH_4OH (K_2) and that of CH_3COOH (K_1) are nearly equal.

153. Assertion : Aqueous solution of Na_2CO_3 shows P^H> 7.

Reason : Salt of strong base and weak acid undergoes anionic hydrolysis.

Common ion effect and solubility product

154. Dissociation of CH_3COOH is supressed by adding

1) HCl 2) H_2SO_4 3) CH_3COONa 4) Any of the above

155. Ionisation of NH_4OH is supressed by the addition of NH_4Cl, because

1) NH_4Cl is a salt of WB and SA 2) NH_4Cl is a salt of strong base and weak acid

3) Of the common ion effect of NH_4^+ ion 4) None of the above

156. The solubility product of the electrolyte of the type , A_2B_3 is (S is the solubility in mol/lit)

1) 108 S^5 2) 72 S^5 3) 108 S^2 4) 10 S^2

157. For the electrolyte of type , A_2B , K_{sp} is given. Then its solubility is calculated by

1) $K_{sp}/4$ 2) $\sqrt[3]{\frac{K_{SP}}{4}}$ 3) $\sqrt[3]{K_{sp}}$ 4) $\sqrt{K_{sp}}/4$

158. The solubility of calcium phosphate in water is x mol L^{-1} at 25^0C. Its solubility product is equal to

1) 108 x^2 2) $36x^3$ 3) 36 x^5 4) 108 x^5

159. At a certain temperature , the solubility of the salt $M_m A_n$ in water is 's' moles per litre. The solubility product of the salt is

1) $M^m A^n$ 2) $(m + n) s^{m+n}$ 3) $m^m n^n s^{m+n}$ 4) $M^m A^n s$.

160. Why only As^{+3} gets precipitated as As_2S_3 and not Zn^{2+} as ZnS when H_2S is passed through an acidic solution containing As^{+3} and Zn^{+2} ?

1) Solubility product of As_2S_3 is less than thatof ZnS

2) Enough As^{+3} are present in acidic medium

3) Zinc salt does not ionise in acidic medium

4) Solubility product changes in presence of an acid.

161. In qualitative analysis , to identify the II_A group sulphides , HCl is added to salt solution before the addition of H_2S . Because

1) Low S^{2-} ion concentration is required to get ppt

2) High S^{2-} ion concentration is required to get ppt

3) II_A group metal sulphides have higher values of K_{sp} than that of IV_A group metal sulphides

4) P^H value increases.

162. How do we differentiate between Fe^{3+} and Cr^{3+} in group III ?

1) By taking excess of NH_4OH 2) By increasing NH_4^+ ion concentration

3) By decreasing OH^- ion concentration 4) Both 2 and 3

163. The addition of NaCl to AgCl decreases the solubility of AgCl , because

1) K_{sp} of AgCl decreases 2) K_{sp} of AgCl increases

3) Solution becomes unsaturated 4) Ionic product exceeds the K_{sp} value

164. Out of Ca^{2+} , Al^{3+} , Bi^{3+} , Mg^{2+} and Zn^{2+} the reagents NH_4Cl and aqueous NH_3 will precipitate

1) Ca^{2+} , Al^{3+} 2) Al^{3+} , Bi^{3+} 3) Bi^{3+} , Mg^{2+} 4) Mg^{2+} , Zn^{2+}

165. Which pair will show common ion effect ?

1) $BaCl_2 + Ba(NO_3)_2$ 2) NaCl + HCl 3) $NH_4OH + NH_4Cl$ 4) AgCN + KCN

166. The correct representation for solubility product of SnS_2 is

1) $[Sn^{4+}] [S^{2-}]^2$ 2) $[Sn^{4+}] [S^{2-}]$ 3) $[Sn^{4+}] [2S^{2-}]$ 4) $[Sn^{4+}] [2S^{2-}]^2$

167. Which of the following has the lowest value of K_{sp} at 25^0C ?

1) $Mg (OH)_2$ 2) $Ca (OH)_2$ 3) $Ba (OH)_2$ 4) $Be (OH)_2$

168. Which of the following is most soluble ?

1) Bi_2S_3 ($K_{sp} = 1 \times 10^{-17}$) 2) MnS ($K_{sp} = 7 \times 10^{-16}$)

3) CuS ($K_{sp} = 8 \times 10^{-37}$) 4) Ag_2S ($K_{sp} = 6 \times 10^{-51}$)

169. In the following reaction , AgCl +KI $\rightleftharpoons$ KCl + Ag I . As KI is added , the equilibrium is shifted towards right giving more Ag I precipitate , because

1) Both AgCl and AgI are sparingly soluble. 2) The K_{sp} of AgI is lower than K_{sp} of AgCl

3) The K_{sp} of Ag I is higher than K_{sp} of AgCl

4) Both AgCl and AgI have same solubility product.

170. At 298 K , the K_{sp} value of $Fe(OH)_3$ in aqueous solution is 3.8×10^{-38}. The solubility of Fe^{3+}ions will increase when

1) P^H is increased 2) P^H is 7 3) P^H is decreased

4) Saturated solution is exposed to sun light

171. In which of the following, the solubility of AgCl will be maximum ? (CBSE PMT 1993)

1) 0.1 M $AgNO_3$ 2) Water 3) 0.1 M NaCl 4) 0.1 M NaBr.

172. Among the following statements

a)If two salts have equal solubility then their solubility products are equal.

2) $BaSO_4$ in more soluble in water than in dil.H_2SO_4 .

3) When KI is added to PbI_2 , then the $[Pb^{2+}]$ decreases

4) In any solution containing AgCl , the value of $[Ag^+] [Cl^-]$ is constant at constant temperature.

1) All are correct 2) a, b and d are correct

3) a, c and d are correct 4) b, c and d are correct

173. The molar solubility in mol.lit^{-1} of a sparingly soluble salt MX_4 is S. The corresponding solubility product K_{sp} is given by the relation.

1) $S = (K_{sp}/128)^{1/4}$ 2) $S = (218\ K_{sp})^{1/4}$ 3) $S = (256\ K_{sp})^{1/5}$ 4) $S = (K_{sp}/256)^{1/5}$

174. Let the solubility of an aqueous solution of $Mg(OH)_2$ be 'X' then its K_{sp} is

1) $4x^3$ 2) $108\ x^5$ 3) $27\ x^4$ 4) 9x

175. When HCl gas is passed through a saturated solution of common salt, pure NaCl is precipitated because

1) HCl is highly ionised in solution

2)HCl is highly soluble in water

3) The solubility product of NaCl is lowered by HCl

4) The ionic product of $[Na^+] [Cl^-]$ exceeds the solubility product of NaCl

176. To Ag_2CrO_4 solution over its own precipitate, CrO_4^{2-} ions are added. This results in

1) increase in Ag^+ concentration 2) decrease in Ag^+ concentration

3) increase in solubiity product

4) shifting of Ag^+ ions from the precipitate into the solution.

177. The least soluble compound (salt) of the following is

1) CsCl ($K_{sp} = 10^{-12}$) 2) HgS ($K_{sp} = 1 \times 10^{-52}$)
3) $PbCl_2$ ($K_{sp} = 1.7 \times 10^{-5}$) 4) ZnS ($K_{sp} = 1.2 \times 10^{-23}$)

WORK SHEET - II

Ionic product of water and P^H

1. The H^+ ion concentration of a solution is 4×10^{-5} M. Then the OH^- ion concentration of the same solution is

1) 4×10^{-5} M 2) 2.5×10^{-9} M 3) 1.0×10^{-7} M 4) 2.5×10^{-10} M

2. The $[OH^-]$ of 0.005 M H_2SO_4 is

1) 2×10^{-12} M 2) 5×10^{-3} M 3) 10^{-2} M 4) 10^{-12} M

3. At 25^0C , the hydroxyl ion concentration of a basic solution is 6.75×10^{-3}M .Then the value of K_w is

1) $13.5 \times 10^{-6}M^2$ 2) $13.5 \times 10^{-12}M^2$ 3) $13.5 \times 10^{-8}M^2$ 4) $10^{-14}M^2$

4. At certain temperature, the H^+ ion concentration of water is 4×10^{-7}M then the value of K_w at the same temperature is

1) 10^{-14} M^2 2) 4×10^{-14} M^2 3) 1.6×10^{-13} M^2 4) 4×10^{-7} M^2

5. The ionic product of water is 10^{-14}. The H^+ ion concentration in 0.1M NaOH solution is

1) 10^{-11} M 2) 10^{-13} M 3) 10^{-1} M 4) 10^{-4} M

6. The no.of H_3O^+ ions present in 10 ml of water at 25^0C is

1) 6.023×10^{-14} 2) 6.023×10^{14} 3) 6.023×10^{-19} 4) 6.023×10^{19}

7. Dissociation constant of water at 25^0C is

1) 1.0×10^{-14} 2) 1×10^{14} 3) 14 4) 1.8×10^{-16}

8. One litre of water contains 10^{-7} moles of H^+ ions. Degree of ionisation of water (in percentage) is

1) 1.8×10^{-7} 2) 1.8×10^{-9} 3) 3.6×10^{-7} 4) 3.6×10^{-9}

Problems on P^H concept

9. At some high temperature, K_w of water is 10^{-13}. Then the P^H of the water at the same temperature is

1) 7.0 2) 6.5 3) 7.5 4) 7.23

10. The P^H of 0.005 M $Ba(OH)_2$ is

1) 2.301 2) 11.699 3) 12 4) 7

11. The P^H of 0.001 M CH_3COOH is

1) 3 2) 11 3) Between 3 and 7 4) 7

12. The P^H of 10^{-8} M HCl is

1) 8 2) 6 3) 7 4) 6.98

13. The $[OH^-]$ of a solution is 10^{-10}. Its P^H is

1) 4 2) 10 3) 7 4) 9

14. Four grams of NaOH solid are dissolved in just enough water to make 1 litre of solution. What is the $[H^+]$ of the solution ?

1) 10^{-2} moles/litre 2) 10^{-1} moles/litre 3) 10^{-12} moles/litre 4) 10^{-13} moles/litre.

15. The P^H of a solution is 3.602. Its H^+ ion concentration is

1) 4×10^{-14} 2) 2.5×10^{-11} 3) 2.5×10^{-4} 4) 5.0×10^{-4}

16. The P^H of HCl is 3. Then the P^H of NaOH solution having same molar concentration is
1) 3 2) 6 3) 9 4) 11

17. When 100 ml of N/10 NaOH are added to 50 ml of N/5 HCl, the P^H of the resulting solution is
1) 7 2) greater than 7 3) less than 7 4) Zero

18. What is the P^H of a solution obtained by dissolving 0.0005 mole of the strong electrolyte, calcium hydroxide, $Ca(OH)_2$ to form 100 ml of a saturated solution (aqueous) ? ($K_w = 1.0 \times 10^{-14}$ mole^{2}litre^{-2})
1) 9.8 2) 11.7 3) 12.0 4) 3.0

19. Equal volumes of two solutions with P^H=3 and P^H = 11 are mixed. Then the P^H of resulting solution is
1) 8 2) 7 3) 6 4) 0

20. The P^H of a solution is 3.0. This solution is diluted by 100 times. Then the P^H of the resulting solution is
1) 5 2) 7 3) 1 4) 11

21. Equal volumes of 0.1 M potassium hydroxide and 0.1 M sulphuric acid are mixed. The P^H of resulting solution is
1) 7 2) 0 3) less than 7 4) greater than 7

22. The dissociation constant of a weak acid is 10^{-6}. Then the P^H of 0.01 N of that acid is
1) 2 2) 7 3) 8 4) 4

23. The P^H of 0.1M NaCl solution is
1) 1 2) 13 3) 7 4) Zero

24. At 100^0C , the P^H of pure water is
1) 7 2) Greater than 7 3) Less than 7 4) Zero

25. The P^H of HCl is 5. It is diluted by 1000 times. Its P^H will be
1) 5 2) 8 3) 2 4) 6-7

26. The P^H of a solution is 6. Its $[H_3O^+]$ is decreased by 1000 times. Its P^H will be
1) 9 2) 6.96 3) 7.04 4) 8

27. The P^H of 10^{-3}M mono acidic base, if it is 1% ionised is
1) 5 2) 8 3) 3 4) 9

28. The P^H of solution is 9. It is _______ times more basic than a solution with P^H = 6.
1) 3 2) 100 3) 1000 4) 15

29. The P^H of a weak mono basic acid is 5. The degree of ionisation of acid in 0.1 M solution is
1) 10^{-4} 2) 10^{-3} 3) 10^{-2} 4) 10^{-1}

30. The P^H of a 1 lit solution is 2. It is diluted with water till its P^H becomes 4. How many litres of water is added ?
1) 99 2) 9 3) 999 4) 9.9

31. The P^H of HCl is 1. The amount of NaOH to be added to 100 ml of such a HCl solution to get P^H of 7 is
1) 4g 2) 0.4g 3) 4 mg 4) 0.4 mg

32. To change the P^H of a solution from 1 to 1.301 Which of the following should be adopted ?
1) 1 lit of water is to be added 2) 1 kg of water is to be added
3) The volume of the solution should be doubled by adding water

4) The wt of the solute present in the solution should be doubled

33. The P^H of a solution is 11. It is diluted by 1000 times. Then the P^H of resulting solution is

1) 8 2) 14 3) 7 4) 7.04

34. A : The P^H of a solution changes from 5 to 8 when the solution is diluted by 1000 times.

R : When the conc.of H^+ ion decreases by 10 times , then P^H of the solution increases by one unit.

35. The P^H of a dibasic acid is 3.699 . Its molarity is

1) 2×10^{-4} M 2) 4×10^{-4} M 3) 2×10^{-3} M 4) 1×10^{-4} M

36. At certain temperature the K_w of D_2O is 10^{-16}M . Then the pD of pure D_2O at that temperature is

1) 7 2) 16 3) 8 4) 6

37. 50 ml of H_2O is added to 50 ml of 1×10^{-3} M barium hydroxide solution. What is the P^H of the resulting solution?

1) 3.0 2) 3.3 3) 11.7 4) 11.0

38. 20 ml of 0.4 M H_2SO_4 and 80 ml of 0.2 M NaOH are mixed . Then the P^H of the resulting solution is

1) 7 2) 1.097 3) 12.903 4) 11.903

39. The first and second dissociation constants of an acid H_2A are 1.0×10^{-5} and 5.0×10^{-10} respectively. The overall dissociation constant of the acid will be

1) 5×10^{15} 2) 5.0×10^{-15} 3) 0.2×10^{5} 4) 5.0×10^{-5}

40. A 0.2M solution of formic acid is 3.2% ionised. Its ionisation constant is

1) 9.6×10^{-3} 2) 2.1×10^{-4} 3) 1.25×10^{-6} 4) 4.8×10^{-5}

41. The hydrogen ion concentration of 0.2M CH_3COOH which is 4% ionised is

1) 0.008 N 2) 0.12 N 3) 0.8 N 4) 0.08 N

42. Degree of dissociation of 0.1 N CH_3COOH is ($K_a = 1.0 \times 10^{-5}$)

1) 10^{-5} 2) 10^{-4} 3) 10^{-4} 4) 10^{-2}

Buffer Solutions

43. An acidic buffer contains 0.06 M salt and 0.02 M acid. The dissociation constant of acid is 10^{-4}. The P^H of the buffer solution is

1) 4 2) 10 3) 4.48 4) 9.52

44. An acidic buffer contains equal concentrations of acid and salt. The dissociation constant of acid is 10^{-5}. The P^H of the buffer solution is

1) 5 2) 9 3) 4.49 4) 5.5

45. Solution of 0.1 N NH_4OH and 0.1 N NH_4Cl has P^H 9.25. Then P^{K_b} of NH_4OH is

1) 9.25 2) 4.75 3) 3.75 4) 8.25

46. 50 ml of 0.1 M solution of sodium acetate and 50 ml of 0.01 M acetic acid are mixed. The pKa of acetic acid is 4.76. The P^H of the buffer solution is

1) 3.76 2) 4.76 3) 5.76 4) 9.24

47. When 0.1 mole of an acid is added to 2 lit of a buffer solution, the P^H of the buffer decreases by 0.5. The buffer capacity of the solution is

1) 0.6 2) 0.4 3) 0.2 4) 0.1

48. A solution consists of 0.2 M NH_4OH and 0.2 M NH_4Cl. If K_b of NH_4OH is 1.8×10^{-5}, the $[OH^-]$ of the resulting solution is

1) 0.9×10^{-5} M 2) 1.8×10^{-5} M 3) 3.2×10^{-5} M 4) 3.6×10^{-5} M

49. (1) : The P^H of a buffer solution containing equal moles of acetic acid and sodium acetate is 4.8 (p^{K_a} of acetic acid is 4.8)

(R) : The ionic product of water at 25^0C is 10^{-14} $mol^2\ lit^{-2}$

Salt hydrolysis

50. The P^H of aqueous solution of NH_4CN (K_a of HCN is 9.2×10^{-10} & K_b of NH_4OH is 1.8×10^{-5})

1) > 7 2) < 7 3) 7 4) 14

51. The hydrolysis constant of NaX (K_a of HX is 2×10^{-6}) is

1) 5×10^{-9} 2) 2×10^{-10} 3) 2×10^{-6} 4) 10^{-7}

52. Hydrolysis constant of salt derived from strong acid and weak base is 2×10^{-5}. The dissociation constant of the weak base is

1) 5×10^{-8} 2) 5×10^{-9} 3) 5×10^{-10} 4) 2×10^{-19}

Solubility Product

53. The solubility product of $BaSO_4$ at 18^0C is 1.5×10^{-9}. Its solubility (mole lit^{-1}) at the same temperature is

1) 1.5×10^{-9} 2) 1.5×10^{-5} 3) 3.9×10^{-9} 4) 3.9×10^{-5}

54. The solubility of CaF_2 is 2×10^{-4} mole/litre. Its solubility product is

1) 2.0×10^{-4} 2) 4.0×10^{-8} 3) $4 \times 8.0 \times 10^{-12}$ 4) 3.2×10^{-4}

55. The solubility of AgCl in 0.1M NaCl is (K_{sp} of AgCl = 1.2×10^{-10})

1) 0.1M 2) 1.2×10^{-5} 3) 1.095×10^{-5} 4) 1.2×10^{-9}

56. If the solubility product of MOH is 1×10^{-10} $mol^2.\ dm^{-2}$. Then the P^H of its aqueous solution will be

1) 12 2) 9 3) 6 4) 3

57. The molar solubility of PbI_2 in 0.2M $Pb(NO_3)_2$ solution in terms of solubility product, K_{sp}

1) $(K_{sp}/0.2)^{1/2}$ 2) $(K_{sp}/0.4)^{1/2}$ 3) $(K_{sp}/0.8)^{1/2}$ 4) $(K_{sp}/0.8)^{1/3}$

58. The solubility product of a rare earth metal hydroxide M $(OH)_3$ at room temperature is 4.32×10^{-14}. Its solubility is

1) 2×10^{-3}M 2) 2.0×10^{-4} M 3) 2×10^{-5}M 4) 2.0×10^{-6} M

59. The solubility of $PbSO_4$ in 0.01M Na_2SO_4 solution is (K_{sp} of $PbSO_4$ is 1.25×10^{-9})

1) 1.25×10^{-7} M 2) 1.25×10^{-9} M 3) 1.25×10^{-10} M 4) 0.1 M

60. The K_{sp} of a salt, having the general formula MX_2, in water is 4×10^{-12}. The concentration of M^{2+} ions in the aqueous solution of the salt is

1) 2×10^{-6} M 2) 1×10^{-4} M 3) 1.6×10^{-4} M 4) 4×10^{-10} M

WORK SHEET - III

Single or more than one option questions

1. In which of the following solution the AgCl is least soluble?

1) Water 2) 0.1M NaCl 3) 0.05 M $CaCl_2$ 4) 0.2 M KCl

2. Which of the follwoing sulphides has maximum solubility in water?

1) $CdS(K_{sp} = 36 \times 10^{-30})$ 2) FeS $(K_{sp} = 11 \times 10^{-20})$
3) $HgS(K_{sp} = 36 \times 10^{-54})$ 4) $ZnS(K_{sp} = 11 \times 10^{-22})$

3. The volume of water needed to dissolve 1g of $BaSO_4$ $(K_{sp} = 1.1 \times 10^{-10})$ at 25^0 C is { M.W of $BaSO_4$ is 283 }

1) 820L 2) 450L 3) 205L 4) None of these

4. K_{sp} of $A_2B_{3\,(s)}$ in water at 25^0C is 1.1×10^{-23}. Concentration of A^+ ions is

1) 1×10^{-5} 2) 2×10^{-5} 3) 3×10^{-5} M 4) 5×10^{-11}

5. Number of moles of Cul $(K_{Sp} = 5 \times 10^{-12})$ that will dissolve in 1 L of 0.1 M Nal solution is

1) 2.2×10^{-6} 2) 5×10^{-11} 3) 5×10^{-10} 4) 2.2×10^{-5}

6. K_{sp} of MX = K_{sp} of MX_2. Which is more soluble?

1) Mx 2) MX_2

3) Equal 4) K_{sp} value is required

7. Solubility of AgCl $(K_{sp} = 1 \times 10^{-10})$ in 0.1M $BaCl_2$ is

1) 10^{-9}M 2) 5×10^{-9} M 3) 5×10^{-10} M 4) 0.05 M

8. 100mL each of 0.25 M NaF and 0.015M $Ba(NO_3)_2$ are mixed. K_{sp} of $BaF_2 = 1.7 \times 10^{-6}$

1) A ppt is formed 2) No ppt is formed

3) Cannot say 4) Some more data are needed

9. A saturated solution 0 - nitrophenol has a p^H equal to 4.53, then its solubility in water is $(P^{K_a} = 7.23)$

1) 2.085g/lit 2) 20.85g/lit 3) 10.425g/lit 4) 1.0425g/lit

10. $K_{sp}(BaSO_4)$ is 1.1×10^{-10}. In which case is $BaSO_4$ precipitated ?

1) 100 mL of 4×10^{-3}M of $BaCl_2$ + 300 mL of 6.0×10^{-4} M of Na_2SO_4

2) 100 mL of 4×10^{-4}M of $BaCl_2$ + 300 mL of 6×10^{-8} M of Na_2SO_4

3) 300mL of 4×10^{-4}M of $BaCl_2$ +100mL of 6.0×10^{-8} M of Na_2SO_4

4) in all cases.

More than one correct answers

11. $A(OH)_2$ is partially soluble substance and its Ksp value is 4×10^{-12} which of the following statement is / are correct?

1) The solubility is unaffected by pH of the medium
2) Its solubility has been increased in a buffered medium at pH at 2
3) Its solubility has been decreased in a buffered medium having pH at 9
4) Its saturated solution has pH is equal to 10.3

12. A solution contains 0.05 M of each of NaCl and Na_2CrO_4. Solid $AgNO_3$ is gradually added to it. Which of the following facts is true ?

Given : $K_{sp}(AgCl) = 1.7 \times 10^{-10} M^2$ and $K_{sp}(Ag_2CrO_4) = 1.9 \times 10^{-12} M^3$.

1) Cl^- ions are precipitated first
2) CrO_4^{2-} ions are precipitated first
3) Both Cl^- and CrO_4^{2-} ions are precipitated together
4) The second ion starts precipitating when $[Cl^-] = 2.758 \times 10^{-5}$

13. Which of the following are correct about the solubility ?
1) Solubility of CaF_2 is more in buffer solution of pH = 3 than in pure water
2) Solubility of ZnS in water depends upon the pH of solution
3) Solubility of AgCl increases in presence of sodium thiosulphate
4) Solubility of ZnS in presence of H^+ ion can be derived by $K = \frac{\left[Zn^{2+}\right]\left[H_2S\right]}{\left[H^+\right]^2}$ where K is equilibrium constant for the reaction, $ZnS_{(s)} + 2H^+_{(aq)} \rightleftharpoons Zn^{2+}_{(aq)} + H_2S_{(aq)}$

14. Acetic acid and aq. NH_3 are weak monobasic acid and weak monoacidic base respectively and Ka of acetic acid is equal to K_b of aq. NH_3. Which of the following statements are correct?
1) All the above mixing would result in neutral solution having pH = 7 at 25°C
2) If aq. NH_3 is exactly half neutralized by HCl, then pOH of resulting solution is equal to pK_b
3) If acetic acid is exactly half neutralized by NaOH, then pH of resulting solution is equal to pK_a
4) If acetic acid is exactly neutralized by aq. NH_3 then pH of resulting solution is equal 1/2 pkW.

15. Equal volumes of following solution are mixed, in which case the pH of resulting solution will be average value of pH of two solutions?
1) pH = 3(HNO_3) and pH = 5 (HNO_3)
2) pH = 2(HNO_3) and pH = 12(KOH)
3) pH = 4.5 (CH_3COOH) and pH = 9.5 (NH_3) (aq) K_a (CH_3COOH)= K_b (NH_4OH)
4) pH = 3 (HCN) and pH = 11 (NaOH) K_a of (HCN = 10^{-10})

16. Which of the following solution will have no effect on pH on dilution ?
1) 0.3 M CH_3COOK
2) 2.4 M CH_3COONH_4
3) 0.2 M NH_4OH + 0.2 M NH_4Cl
4) 0.3 H_2CO_3 + 0.3 M $NaHCO_3$

Linked Comprehension type questions

Passage -I

The pH of pure water at 25^0C and 60^0C are 7 and 6.5 respectively. HCl gas is passed through water at 25^0C till the resulting 1litre solution which acquires a pH of 3. Now 4×10^{-3} mole of NaCN are added into this solution and also a fresh 0.1M HCN solution has pH = 5.1936.

17. The volume of HCl passed through the solution at 25^0C and 1 atm is:
1) 24.46mL
2) 2.446mL
3) 244.6mL
4) 0.244 mL

18. The degree of dissociation of 0.1M HCN solution is:
1) 6.4×10^{-5}
2) 6.4×10^{-3}
3) 6.4×10^{-2}
4) 6.4×10^{-6}

19. The pH of solution contain $4x10^{-3}$ mol of NaCN and 10^{-3} mol of HCN is nearly

1) 10 2) 11 3) 9 4) 8

Passage : II

The solubility product of a soluble salt A_xB_y is given by : $K_{SP} = [A^{y+}]^x[B^{x-}]^y$.As soon as the product of concentration of A^{y+} and B^{x-} increases the n its K_{sp}, the salt starts precipitation.It may practically be noticed that AgCl is more soluble in water and its solubility decreases dramatically in 0.1 M Nacl or 0.1M $AgNO_3$ solution. It may therefore be concluded that in presence of a common ion, the solubility of salt decreases.

20. The salting out action of RCOONa in presence of NaCl is based on :

1) Common ion effect 2) Hydrolysis of salt
3) Solubility product 4) Complex formation.

21. The pH of a saturated solution of $Mg(OH)_2$ is (K_{sp} $Mg(OH)_2$ $= 1 \times 10^{-11}$) :

1) 0 2) 3.87 3) 10.43 4) 5

22. The volume of water needed to dissolve 1g $BaSO_4$ ($K_{sp} = 1 \times 10^{-10}$) is :

1) 230 litre 2) 429 litre 3) 500 litre 4) 320 litre

Match the following questions

23. Match the Column-I with Column-II :

Column - I	Column - II
1) pH of a basic buffer mixture	p) $pK_a + log\frac{[salt]}{[Acid]}$
2) pH of an acidic buffer mixture	q) $(pK_a)_{C.Acid} + log\frac{[Base]}{[salt]}$
3) pH of a salt solution of weak acid+strong base	r) $\frac{1}{2}[pK_w + pK_a + log\, c]$
4) pH of a salt solution of strong acid+ weak base	s) $\frac{1}{2}[pK_w - pK_b - log\, c]$

24.

Column-I	Column-II
(salt solution in water)	(Nature of hydrolysis)
1) NaCl	p) Cationic hydrolysis only
2) CH_3COONa	q) Anionic hydrolysis only
3) NH_4CN	r) Both cationic and anionic hydrolysis
4) CH_3COONH_4	s) Does not undergo hydrolysis

Integer answer type Questions

25. K_a for HCN is 5.0×10^{10} at 25^0C. For maintaining a constant pH of 9. Calculate the volume of 5.0M KCN is 5.0×10^{-10} at 25^0C. For maintaining a constant the pH of solution.

26. Calculate the pH at which an acid indicator with $K_a = 1.0 \times 10^{-5}$ changes colour when the

indicator concentrationi is 1.0×10^{-3}M.

27. K_{sp} Of M $(OH)_x$ is 27×10^{-12} and its solubility in water is 10^{-3} mol $litre^{-1}$. Find the value of X.

28. lf the equilibrium constant for the reaction of weak acid HA with strong base is 10^9, then calculate the pH of 0.1 M NaA.

29. If pK_a of acetic acid and pK_b of ammonium hydroxide are 4.76 each. Find the pH of ammonium acetate.

30. The solubility product of a springly soluble metal hydroxide $[M(OH)_2]$ is $5 \times 10^{-16} mol^3\ dm^{-9}$ at 298 K. Find the pH of its saturated aqueous solution.

3) pH is 5.00 when indicator is 75% red 4) pH is 4.05 when indicator is 75% blue

EXERCISE - I /ANSWERS

WORK SHEET - I

1) 4	2) 3	3) 4	4) 2	5) 3	6) 3	7) 4	8) 3	9) 2	10) 2
11) 2	12) 3	13) 1	14) 4	15) 3	16) 4	17) 1	18) 4	19) 4	20) 3
21) 2	22) 3	23) 4	24) 4	25) 3	26) 2	27) 1	28) 3	29) 3	30) 4
31) 2	32) 2	33) 3	34) 3	35) 2	36) 1	37) 1	38) 4	39) 4	40) 2
41) 2	42) 4	43) 3	44) 1	45) 4	46) 4	47) 4	48) 3	49) 2	50) 4
51) 4	52) 4	53) 4	54) 2	55) 3	56) 2	57) 2	58) 4	59) 4	60) 3
61) 2	62) 2	63) 1	64) 1	65) 1	66) 1	67) 1	68) 2	69) 1	70) 1
71) 1	72) 1	73) 1	74) 4	75) 3	76) 2	77) 4	78) 2	79) 3	80) 3
81) 4	82) 3	83) 3	84) 4	85) 4	86) 1	87) 2	88) 3	89) 4	90) 1
91) 4	92) 4	93) 1	94) 1	95) 1	96) 4	97) 2	98) 4	99) 1	100) 3
101) 3	102) 4	103) 1	104) 1	105) 3	106) 1	107) 2	108) 2	109) 3	110) 4
111) 2	112) 1	113) 1	114) 4	115) 2	116) 4	117) 4	118) 3	119) 2	120) 3
121) 2	122) 1	123) 3	124) 4	125) 3	126) 1	127) 4	128) 2	129) 2	130) 4
131) 1	132) 4	133) 3	134) 4	135) 4	136) 1	137) 2	138) 1	139) 4	140) 4
141) 4	142) 3	143) 3	144) 2	145) 3	146) 4	147) 2	148) 1	149) 2	150) 1
151) 4	152) 1	153) 1	154) 4	155) 3	156) 1	157) 2	158) 4	159) 3	160) 1
161) 1	162) 3	163) 4	164) 2	165) 3	166) 1	167) 4	168) 2	169) 2	170) 3
171) 2	172) 4	173) 4	174) 1	175) 4	176) 2	177) 2			

WORK SHEET - II

1) 4	2) 4	3) 4	4) 3	5) 2	6) 2	7) 4	8) 1	9) 2	10) 3
11) 3	12) 4	13) 1	14) 4	15) 3	16) 4	17) 1	18) 3	19) 2	20) 1
21) 3	22) 4	23) 3	24) 3	25) 4	26) 1	27) 4	28) 3	29) 1	30) 1
31) 2	32) 3	33) 1	34) 4	35) 4	36) 3	37) 4	38) 1	39) 2	40) 2
41) 1	42) 4	43) 3	44) 1	45) 2	46) 3	47) 4	48) 2	49) 2	50) 1
51) 1	52) 3	53) 4	54) 3	55) 4	56) 2	57) 3	58) 2	59) 1	60) 2

WORK SHEET - III

1) 4 2) 2 3) 2 4) 2 5) 2 6) 2 7) 3 8) 1 9) 1 10) 1

11) 234 12) 14 13) 1234 14) 1234 15) 23 16) 234

17) 1 18) 1 19) 1 20) 3 21) 3 22) 2 23) 1-q; 2-p; 3-r; 4-s

24) 1-s; 2-q; 3-r ; 4-r 25) 2 26) 5 27) 3 28) 9 29) 7 30) 9

EXERCISE - I

Laws of Chemical Combinations

1. Chemical equation is balanced according to the law of
   1) Multiple proportion 2) Reciprocal proportion
   3) Conservation of mass 4) Definite proportions

2. The law of multiple proportions was proposed by
   1) Lavoisier 2) Dalton 3) Proust 4) Gay Lussac

3. An unbalanced chemical equation is against the law of
   1) The law of gaseous volumes 2) The law of constant proportions
   3) The law of mass action 4) The law of conservation of mass

4. Which of the following pairs can be cited as an example to illustrate the law of multiple proportion?
   1) Na_2O, K_2O 2) CaO,MgO 3) Al_2O_3, Cr_2O_3 4) CO,CO_2

5. Percentage of copper and oxygen in samples of CuO obtained by different methods were found to be the same. This proves the law of
   1) Constant proportions 2) Reciprocal proportions
   3) Multiple proportions 4) Conservation of mass

6. The law of conservation of mass holds good for all of the following except
   1) All chemical reactions 2) Nuclear reactions
   3) Endothermic reactions 4) Exothermic reactions

7. Law of combining volumes was proposed by
   1) Lavoisier 2) Gay Lussac 3) Avogadro 4) Dalton

8. "The total mass of reactants is always equal to the total mass of products in a chemical reaction." This statement is known as
   1) Law of conservation of mass 2) Law of definite proportions
   3) Law of equivalent weights 4) Law of combining masses

9. In the reaction Hydrogen (g)+Oxygen(g) $\rightarrow$ water vapour, the ratio of volumes is 2:1:2. This illustrates the law of
   1) conservation of mass 2) combining weights 3) combining volumes
   4) all the above

10. In compound A, 1.00 g nitrogen combines with 0.57 g oxygen. In compound B, 2.00g nitrogen combines with 2.24 g oxygen. In compound C, 3.00 g nitrogen combines with 5.11 g oxygen. These results obey the following law.
    1) Law of constant proportion 2) Law of multiple proportion
    3) Law of reciprocal proportion 4) Dalton's law of partial pressure

11. The law of multiple proportions is ilustrated by the two compounds
    1) Sodium chloride and sodium bromide 2) Ordinary water and heavy water
    3) Caustic soda and caustic potash 4) Sulphur dioxide and sulphur trioxide.

12. Two samples of lead oxide were separately reduced to metallic lead by heating in a current of hydrogen. The weight of lead from oneoxide was half the weight of lead obtained from the other oxide. The data illustrates.
    1) Law of reciprocal proportions 2) Law of constant proportions

3) Law of multiple proportions
4) Law of equivalent proportions

13. **LIST - 1** / **LIST - 2**

A) Law of conservation of Mass — 1) $\frac{V_1}{V_2} = \frac{n_1}{n_2}$

B) Avogadro's Law — 2) $2H_{2(s)} + O_{2(g)} \rightarrow 2H_2O_{(s)}$

C) Gay-Lussac's Law of combining volumes — 3) 12g of C + 32g of O_2 = 44g CO_2

D) Law of conservation of Energy — 4) $H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_{(g)}$

5) $H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_{(g)}, \Delta H = -184.6 kJ$

The correct match is

	A	B	C	D		A	B	C	D
1)	3	1	4	5	2)	3	1	5	4
3)	3	1	2	5	4)	1	2	4	5

14. A sample of pure carbon dioxide, irrespective of its source contains 27.27% carbon and 72.73% oxygen. The data support
1) Law of constant composition
2) Law of conservtion of mass
3) Law of reciprocal proportions
4) Law of multiple proportions

15. Carbon and oxygen combine to form two oxides, carbon monoxide and carbon dioxide in which the ratio of the weights of carbon and oxygen is respectively 12:16 and 12:32 These figures illustrate the
1) Law of multiple proportions
2) Law of reciprocal proportions
3) Law of conservation of mass
4) Law of constant proportions

16. Two gaseous samples were analysed. One contained 1.2 g of carbon and 3.2 g of oxygen. The other contained 27.3% carbon and 72.7% oxygen. The experimental data are in accordance with
1) Law of conservation of mass
2) Law of definite proportions
3) Law of reciprocal proportions
4) Law of multiple proportions

Mole concept

17. The molar volume of any gas at STP is
1) 1 litre
2) 22.414 lit
3) 6.02×10^{23} lit
4) 22.414 ml

18. 1 gram - atom of oxygen is
1) 1 g of oxygen
2) 16g of oxygen
3) 22.4 g of oxygen
4) 8g of oxygen

19. One gram molecule of oxygen is
1) 16 gms of oxygen
2) 32 gms of oxygen
3) 8gms of oxygen
4) 1gm of oxygen

20. Avogadro number is
1) The number of atoms in one gram-atomic-weight
2) The number of molecules in one gram-molecular-weight
3) The number of atoms in 0.012 kg of C–12
4) all of these

21. A mole is
1) The amount of substance containing the same number of chemical units as the number of atoms in exactly 12g of C^{12}.

2) The amount of substance containing Avogadro number of chemical units.

3) The unit for expressing amount of a substance

4) all the above

22. The mass of a mole of hydrogen atoms is

1) 1.008 g 2) 2.016g 3) 6.02×10^{23}g 4) 1.008 amu

23. The molar mass of hydrogen is

1) 1.008 g 2) 2.016 g 3) 6.02×10^{23} g 4) 2.016 amu

24. One mole of atoms of oxygen represents

1) 6.02×10^{23} atoms of oxygen 2) 32 g of oxygen

3) 22.4L of O_2 at STP 4) 8g of oxygen

25. One mole of molecules of oxygen represents

1) 6.02×10^{23} molecules of oxygen 2) 8 gms of oxygen

3) 16g of O_2 4) 11.2L of O_2 at STP

26. One mole of sodium represents

1) 6.02×10^{23} atoms of sodium 2) 46 gms of sodium

3) 11g of sodium 4) 34.5g of sodium

27. The charge present on 1 mole electrons is

1) 96500 Coulombs 2) Coulomb

3) 1.60×10^{-19} C 4) 0.1 Faraday

28. The weight of 0.1 mole of Na_2CO_3 is

1) 106 g 2) 10.6 g 3) 5.3 g 4) 6.02×10^{22}g

29. The molar mass of a substance is 20g. The molecular mass of the substance is

1) 20g 2) 20 a.m.u 3) 10g 4) 10 a.m.u

30. Avogadro number of helium atoms have a mass of

1) 2g 2) 4g 3) 8g 4) $4\times6.02\times10^{23}$g

31. The volume of two moles of oxygen at STP is

1) 22.4 L 2) 11.2 L 3) 40 L 4) 44.8 L

32. The following property of a gas does not vary with pressure and temperature.

1) density 2) volume of a mole 3) volume 4) vapour density.

33. The ratio between the number of molecules in equal masses of nitrogen and oxygen is

1) 7:8 2) 1:9 3) 9:1 4) 8:7

34. The gas which is twice as dense as oxygen under the same conditions is

1) Ozone 2) Sulphur trioxide

3) Sulphur dioxide 4) Carbon dioxide

35. 1 mole of water vapour is condensed to liquid at 25°C. Now this water contains

i) 3 moles of atoms ii) 1 mole of hydrogen molecules

iii) 10 moles of electrons iv) 16 g of oxygen

The correct combination is

1) (i) & (ii) are correct 2) (i) & (iii) are correct 3) (i) & (iv) are correct 4) All are correct

36. A chemical equation is always balanced with respect which one of the following

i) Number of atoms ii) Number of molecules

iii) Number of moles iv) Mass

1) Only i is correct 2) Only iii correct 3) Only iv Correct 4) Both i & iv correct

Assertion & reason type questions

Note:1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false

4) (A) is false but (R) is true

37. **(A) :** 2 g of hydrogen contains Avogadro number of molecules

(R) : One mole of an ideal gas at STP occupies 22.4 lt.

38. **(A) :** One litre of water at 4°C contains 55.5 N molecules

(R) : Density of water at 4°C is 1 g/ml and 18g. of water represents one mole.

39. **(A) :** 2 g of Hydrogen contains Avogadro number of atoms

(R) : One mole of any gas contains Avogadro number of molecules

40. **(A) :** In Haber's process, N_2 and H_2 combine in 1 : 3 volume ratio

(R) : Gases combine in simple volume ratio

41. **(A) :** 1 c.c. of Nitrogen at STP contains 2.69×10^{19} molecules

(R) : Molar volume of an ideal gas at STP contains Avogadro number of molecules

42. **(A) :** 28 g of nitrogen occupies 22.4 lt. at STP

(R) : Vapour density of nitrogen is 14 at all temperatures and pressures.

43. **(A) :** 8 g CH_4 and 14 gr. nitrogen together occupy 11.2 lt. of volume at STP.

(R) : Equal volumes of all gases under the same conditions contain equal number of molecules.

44. **(A) :** 58.5 g of solid NaCl contains Avogadro number of Cl^- ions

(R) : Chlorine is a diatomic gas

45. Which of the following has highest mass?

1) One gram atom of Iron 2) 5 moles of N_2

3) 10^{24} carbon atoms 4) 44.8 lit of He at STP

46. 1 gram of hydrogen contains 6×10^{23} atoms. Then 4 grams of He contains

1) 6×10^{23} atoms 2) 12×10^{23} atoms 3) 24×10^{23} atoms 4) 1.5×10^{23} atoms

47. Elements 'A' and 'B' combine in the ratio of their

1) Atomic weights 2) Molecular weights

3) Equivalent weights 4) Mass numbers

Equivalent weights

48. Molecular weight of orthophosphoric acid is M. Its equivalent weight is

1) 3M 2) M 3) $\frac{M}{2}$ 4) $\frac{M}{3}$

49. Which of the following acid has the same molecular weight and equivalent weight

1) H_3PO_2 2) H_3PO_3 3) H_3PO_4 4) H_2SO_4

50. The equivalent weight of $CaCO_3$

1) 100 2) 50 3) 33.3 4) 25

51. The following is not a fixed quantity

1) atomic weight of an element 2) equivalent weight of an element (or) compound

3) molecular weight of a compound 4) formula weight of a substance

52. Equivalent weight of $K_2Cr_2O_7$ in acidic medium is

1) 24.5 2) 49 3) 147 4)296

53. The equivalent weight of Bayer's reagent is

1) 31.6 2) 52.6 3) 79 4) 158

54. Molecular weight of $KMnO_4$ is "M". In a reaction $KMnO_4$ is reduced to K_2MnO_4. The equivalent weight of $KMnO_4$ is

1) M **2)** $\frac{M}{2}$ **3)** $\frac{M}{3}$ **4)** $\frac{M}{5}$

55. When Ferrous sulphate acts as reductant, its equivalent weight is

1) twice that of its molecular weight 2) equal to its molecular weight

3) one-half of its molecular weight 4) one-third of its molecular weight

56. $2H_2O \rightarrow 4e^- + O_2 + 4H^+$. The equivalent weight of molecular oxygen is

1) 32 2) 16 3) 8 4) 4

57. **(A) :** Normality is always a multiple of molarity

(R) : Molarity is in no way related to normality

The correct answer is

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false

4) (A) is false but (R) is true

58. **(A) :** The equivalent weights of nitric acid and crystalline oxalic acid are same

(R) : The basicity is same for both the acids

The correct answer is

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false

4) (A) is false but (R) is true

59. **(A) :** The basicity of H_3PO_3 is 2

(R) : Three hydrogen atoms are attached to phosphorus through oxygen atoms

The correct answer is

1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false
4) (A) is false but (R) is true

60. In acidic medium Dichromate ion oxidises Ferrous ion to Ferric ion. If the gram-molecular weight of potassium dichromate is 294 gm, its equivalent weight is

1) 294 2) 147 3) 49 4) 24.5

61. The equivalent weight of Hypo in the reaction [M = molecular weight]

$2Na_2S_2O_3 + I_2 \rightarrow 2NaI + Na_2S_4O_6$ is

1) M 2) $\frac{M}{2}$ 3) $\frac{M}{3}$ 4) $\frac{M}{4}$

62. The equivalent weight of $CuSO_4$ when it is converted to Cu_2I_2 [M=mol.wt]

1) $\frac{M}{1}$ 2) $\frac{M}{2}$ 3) $\frac{M}{3}$ 4) 2 M

63. The equivalent weight of Iodine in the reaction $2Na_2S_2O_3 + I_2 \rightarrow 2NaI + Na_2S_4O_6$ is [M=mol. wt]

1) M 2) $\frac{M}{2}$ 3) $\frac{M}{3}$ 4) 2M

64. The equivalent weight of glucose in the reaction $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ is [M=mol. wt]

1) $\frac{M}{4}$ 2) $\frac{M}{12}$ 3) $\frac{M}{24}$ 4) $\frac{M}{48}$

65. Medium Equivalent weight of $KMnO_4$

Medium	Equivalent weight of $KMnO_4$
A) Acidic	a) 158
B) Neutral	b) 79
C) Strongly basic	c) 52.6
D) Weakly basic	d) 31.6

The correct match is

1) A - d, B - c, C - a, D - c
2) A - d, B - c, C - a, D - b
3) A - d, B - b, C - a, D - c
4) A - d, B - c, C - a, D - a

E.F & M.F , % calculations

66.

LIST - 1 (Molecules)	LIST - 2 (Empirical formula)
A) Glucose	1) BNH_2
B) Oxalic acid	2) CH_2O
C) Inorganic Benzene	3) CH
D) Oxygenated water	4) CHO_2
	5) HO

The correct match is

	A	B	C	D		A	B	C	D
1)	3	5	2	4	2)	2	4	1	5
3)	1	3	2	4	4)	4	2	1	3

67. **(A) :** Empirical formula of ethane is CH_3
(R) : Empirical formula of all alkenes is CH_2
The correct answer is
1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false
4) (A) is false but (R) is true

68. **(A) :** Empirical formula of glucose and acetic acid is CH_2O
(R) : If percentage composition is same, then empirical formula is same
The correct answer is
1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false
4) (A) is false but (R) is true

69. **(A) :** Acetylene on additional polymerization gives benzene
(R) : The empirical formulae of acetylene and benzene are same
The correct answer is
1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false
4) (A) is false but (R) is true

Oxidation states & balancing equations

70. Oxidation state of 'S' in S_8 molecule is
1) 0 2) +2 3) +4 4) +6

71. Oxidation state of N in N_3H is
1) +1/3 2) +3 3) –1/3 4) –1

72. Oxidation number of C in CH_2O is
1) –2 2) +2 3) 0 4) 4

73. Oxidation state of Ni in $Ni(CO)_4$ is
1) 0 2) 4 3) 8 4) 2

74. Oxidation state of Fe in $K_4[Fe(CN)_6]$
1) +6 2) +4 3) +2 4) +5

75. Oxidation number and valency of oxygen in OF_2 are
1) +1,2 2) +2, 2 3) +1, 1 4) +2, 1

76. In which of the following the oxidation state of chlorine is +5 ?
1) $HClO_4$ 2) $HClO_3$ 3) $HClO_2$ 4) HCl

77. All elements commonly exhibit an oxidation state of
1) +1 2) –1 3) zero 4) +2

78. The maximum oxidation state that fluorine exhibits is
1) –1 2) zero 3) +1 4) +2

79. The element that always exhibits a negative oxidation state in its compounds is

1) Nitrogen 2) Oxygen 3) Fluorine EQU 4) Chlorine

80. The minimum oxidation state that nitrogen exhibits is

1) –2 2) –3 3) –4 4) –5

81. In the conversion of $K_2Cr_2O_7$ to K_2CrO_4 the oxidation number of the following changes

1) K 2) Cr 3) Oxygen 4) None

82. The oxidation number of 'Mn' in potassium permanganate is

1) +6 2) +7 3) +5 4) +8

83. The oxidation number of 'N' in HN_3 is

1) +1/3 2) 0 3) –1/3 4) 1

84. What is the oxidation state of carbon in carbondioxide?

1) +2 2) +4 3) +6 4) +1

85. In which of the following compounds oxygen exhibits an oxidations state of +2?

1) H_2O 2) H_2O_2 3) OF_2 4) H_2SO_4

86. The oxidation number of sulphur in S_8, S_2F_2 and H_2S are

1) 0, + 1 and - 2 2) +2, +1 and - 2 3) 0, +1 and + 2 4) -2, + 1 and - 2

87. In the conversion of $CrO_4^{-2} \rightarrow Cr_2O_7^{2-}$, the oxidation number of chromium

1) increases 2) decreases 3) becomes zero 4) remains unchanged

88. Oxidation number of carbon is zero in the compound

1) methyl chloride 2) chloroform 3) glucose 4) carbon tetrachloride

89.

LIST - 1	**LIST - 2 (Oxidation state)**
A) + 3	1) Nitrogen
B) + 1	2) Nitrous oxide
C) 0	3) Nitrate ion
D) + 5	4) Hydroxylamine
	5) Nitrite ion

The correct match is

	A	B	C	D		A	B	C	D
1)	1	4	3	2	2)	5	2	4	3
3)	4	5	3	1	4)	5	2	1	3

90. If three electrons are lost by Mn^{+3}, its final oxidation state would be

1) 0 2) +6 3) +2 4) +4

91. Oxidation number and Covalency of sulphur in S_8 molecule are respectively

1) 6 and 8 2) 0 and 8 3) 0 and 2 4) 6 and 2

92. The oxidation state of phosphorus in $Ba(H_2PO_2)_2$ is

1) +3 2) +2 3) +1 4) –1

93. The number of electrons involved in the half-reaction $Cr_2O_7^{2-} \rightarrow 2Cr^{3+}$ is

1) 3 2) 6 3) 5 4) 10

94. Sum of the oxidation numbers of carbon in acetaldehyde is

1) – 2 2) +2 3) – 4 4) –1

95. In bleaching powder oxidation states of Cl are

1) –1, +2 2) –2, +1 3) –1, +1 4) –2,+1

96. Oxidation number of sulphur in oleum ($H_2S_2O_7$) is

1) +4 2) +2 3) –2 4) +6

97. The compound formed in the brown ring test has the formula $[Fe(H_2O)_5NO]SO_4$. The oxidation state of iron in it is

1) +1 2) +2 3) +3 4) zero

98. In the reaction of chlorine with dry slaked lime, the oxidation number of chlorine changes

i) from –1 to +1 ii) from + 1 to –1

iii) from zero to –1 iv) from zero to +1

The correct combination is

1) Only ii & iii are correct 2) iii & iv are correct

3) i & ii are correct 4) All are correct

99. When copper is added to a solution of silver nitrate, silver is precipitated. This is due to

i) oxidation of silver ii) oxidation of copper

iii) oxidation of silver iv) reduction of silver ion

The correct combination is

1) Only iii & iv are correct 2) i & ii are correct

3) ii, iv are correct 4) All are correct

100. **(A) :** Oxidation state of carbon in $C_6H_{12}O_6$ is zero

(R) : Oxidation state of carbon in all organic compounds is zero

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false

4) (A) is false but (R) is true

101. **(A) :** Oxidion number of fluorine is always – 1

(R) : Fluorine is the most electronegative element

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false

4) (A) is false but (R) is true

102. Oxidation numbers of sodium, mercury in sodium amalgam are

1) zero, zero 2) +1, –1 3) –2, +2 4) 0, +1

103. Chlorine is passed into dilute, cold KOH solution. What are the oxidation numbers of chlorine in the products formed?

1) –1, +5 2) –1, +3 3) +1, +7 4) +1, –1

104. The oxidation state of sulphur in $Na_2S_4O_6$ is

1) 3/2 2) 2/3 3) 5/2 4) 2/5

105. The oxidation number of sulphur in $S_2O_8^{2-}$ is
1) +7 2) +6 3) +4 4) +5

106. Phosphorous exhibits highest oxidation state in
1) PH_3 2) H_3PO_3 3) $Ca_3(PO_4)_2$ 4) H_3PO_2

107. Iron has the lowest oxidation state in
1) $FeSO_4$ 2) $K_4[Fe(CN)_6]$ 3) $Fe(CO)_5$ 4) FeO

108. The oxidation number of Cr in CrO_5 is
1) + 10 2) + 6 3) + 4 4) + 5

109.

LIST - 1	**LIST - 2**
A) NH_3	1) Oxidant
B) $KMnO_4$	2) Both oxidant and reductant
C) SO_2	3) Neither oxidant nor reductant
D) He	4) Reductant
	5) Dehydrating agent

The correct match is

	A	B	C	D		A	B	C	D
1)	4	3	1	5	2)	2	4	1	3
3)	4	1	2	3	4)	3	2	1	4

110. In the reaction, $I_2 + 2KClO_3 \rightarrow 2KIO_3 + Cl_2$
i) Iodine is oxidised ii) Chlorine is reduced
iii) Iodine displaces chlorine iv) $KClO_3$ is decomposed
The correct combination is
1) Only i & iv are correct 2) Only iii & iv are correct
3) i, ii, iii are correct 4) All are correct

111. Oxidation number of iron in $Na_2[Fe(CN)_5NO]$
1) +2 2) +3 3) +1 4) 0

112. The oxidation number of phosphorus in sodium hypophosphite is
1) +3 2) +2 3) +1 4) –1

113. **(A) :** In bleaching powder average oxidation no. of chlorine is zero
(R) : Oxidation no. of chlorine is always zero

114. **(A) :** In CrO_5 the oxidation number of chromium is +6
(R) : CrO_5 posses two peroxy bonds in its structure

115. Which of the following reactions does not involve the change in oxidation state of metal?
1) $VO^{-2} \rightarrow V_2O_3$ **2)** $Na \rightarrow Na^+$ **3)** $CrO_4^{2-} \rightarrow Cr_2O_7^{2-}$ **4)** $Zn^{2+} \rightarrow Zn$

116. Oxidation state of oxygen in potassium superoxide is
1) –1/2 2) –1 3) –2 4) 0

117. Average oxidation number of iodine in KI_3
1) +1/3 2) –1/3 3) +3 4) –1

118. The oxidation number of nitrogen in NCl_3 is
1) +3 2) –3 3) zero 4) –1/3

119. What are the oxidation numbers of 'N' in NH_4NO_3?
1) +3, –5 2) –3, +5 3) +3, +6 4) –2, +2

120. The oxidation number of phosphorus in Ba $(H_2PO_2)_2$ is
1) +3 **2) +2** **3) +1** **4) -1**

121. In which one of the following compounds the oxidation number of Iodine is fractional?
1) IF_3 2) IF_5 3) IF_7 4) KI_3

Types of redox reactions

122. K+Cl $\rightarrow$ KCl. This is an example of
1) oxidation 2) reduction 3) a redox reaction 4) none of these

123. The conversion $KMnO_4 \rightarrow K_2MnO_4$ is an example of
1) oxidation half reaction 2) reduction half reaction
3) oxidation and reduction 4) neither oxidation nor reduction

124. $PbS+H_2O_2 \rightarrow PbSO_4+4H_2O$. In this reaction PbS undergoes
1) oxidation 2) reduction 3) both 4) None

125. In the reaction $MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$, MnO_2 acts as
1) oxidant 2) reductant 3) both 4) None

126. In the reaction
$P_4 + 3OH^- + 3H_2O \rightarrow 3H_2PO_2^- + PH_3$ phosphorus is undergoing
1) oxidation 2) reduction 3) disproportionation 4) hydrolysis

127. Decomposition of H_2O_2 is an example of
1) neutralisation 2) precipitation 3) disproportionation 4) hydrolysis

128. Which of the following is an oxidation and reduction reaction?
1) $BaO_2+H_2SO_4 \rightarrow BaSO_4+H_2O_2$ 2) $N_2O_5+H_2O \rightarrow 2HNO_3$
3) $AgNO_3+KI \rightarrow AgI+KNO_3$ 4) $SnCl_2+HgCl_2 \rightarrow SnCl_4+Hg$

129. Which of the following is not a redox reaction?
1) $2BaO+O_2 \rightarrow 2BaO_2$ 2) $BaO_2+H_2SO_4 \rightarrow BaSO_4+H_2O_2$
3) $2KClO_3 \rightarrow 2KCl+3O_2$ 4) $SO_2+2H_2S \rightarrow 2H_2O+3S$

130. **(A) :** Reaction of NaOH with chlorine is a disproportionation reaction
(R) : All redox reactions are disproportion-ation reactions

131. $2CuI \rightarrow Cu+CuI_2$, the reaction is
1) disproportionation 2) Neutralisation 3) Oxidation 4) Reduction

132. In a reaction between zinc and iodine, in which zinc iodide is formed, what is being oxidised
1) Zinc ions 2) Iodide ions 3) Zinc atom 4) Iodine

133. Which one of the following reactions does not involve either oxidation or reduction
1) $VO_2^+ \rightarrow V_2O_3$ 2) $Na \rightarrow Na^+$ 3) $CrO_4^{2-} \rightarrow Cr_2O_7^{2-}$ 4) $Zn^{2+} \rightarrow Zn$

134. Which of the following is redox reaction
1) H_2SO_4 with NaOH
2) In atmosphere, O_3 from O_2 by lightning 3) Evaporation of H_2O
4) Nitrogen oxide from nitrogen and oxygen by lightning

135. $C+O_2 \rightarrow CO_2$ the reaction is
1) Chemical combination
2) Decomposition reactions
3) Displacement reactions
4) Disproportionation reactions

136. Which of the following is not chemical combinations
1) $C+O_2 \rightarrow CO_2$
2) $S+O_2 \rightarrow SO_2$
3) $2Al+N_2 \rightarrow 2AlN$
4) $2H_2O \rightarrow 2H_2+O_2$

137. Which of the following is decomposition reaction
1) $2HgO \rightarrow 2Hg + O_2$
2) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
3) $S + O_2 \rightarrow SO_2$
4) $Cl_2 + 2KBr \rightarrow 2KCl + Br_2$

138. Which of the following is not Decomposition reactions
1) $2HgO \rightarrow 2Hg +O_2$
2) $2H_2O \rightarrow 2H_2+O_2$
3) $2KClO_3 \rightarrow 2KCl+3O_2$
4) CH_4 (g) $+2O_2$(g) $\rightarrow CO_2$(g) + $2H_2O$ (1)

139. Following reaction describes the rusting of iron $4Fe + 3O_2 \rightarrow 4Fe^{3+}+6O^{2-}$. Which one of the following statement is incorrect
1) This is an example of a redox reaction
2) Metallic iron is reduced to Fe^{3+}
3) Fe^{3+} is an oxidising agent
4) Metallic iron is a reducing agent

140. Which one of the following is not prepared from halide by chemical oxidation process
1) F_2
2) Cl_2
3) Br_2
4) I_2

141. The reaction Br_2, Cl_2 , I_2 ,P_4 with NaOH involves
1) Decomposition
2) Displacement
3) Combination
4) Disproportionation

142. Which of the following is metal displacement reaction
1) $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$
2) $2Na + 2H_2O \rightarrow 2NaOH + H_2$
3) $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$
4) $2HgO \rightarrow 2Hg + O_2$

143. $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$, Zn can act as
1) Oxidising agent
2) Reducing agent
3) Reduced
4) Oxidant

144. Which of the following is a redox reaction?
1) $NaCl+KNO_3 \rightarrow NaNO_3+KCl$
2) $CaC_2O_4+2HCl \rightarrow CaCl_2+H_2C_2O_4$
3) $Mg(OH)_2+2NH_4Cl \rightarrow MgCl_2+2NH_4OH$
4) $Zn+2AgCN \rightarrow 2Ag + Zn(CN)_2$

145. Which of the following is not an example of disproportionation reaction?
1) $Cl_2 + 2NaOH \rightarrow NaCl + NaOCl + H_2O$
2) $P_4+3NaOH+3H_2O \rightarrow PH_3+3NaH_2PO_2$
3) $2NaOH+2F_2 \rightarrow 2NaF+OF_2+H_2O$
4) $2H_2O_2 \rightarrow 2H_2O+O_2$

146. In the reaction $3Mg+N_2 \rightarrow Mg_3N_2$
1) Magnesium is reduced
2) Magnesium is oxidized
3) Nitrogen is oxidized
4) None of these

147. Which one of the halogn is prepared by only electrolysis method
1) Cl_2
2) Br_2
3) F_2
4) I_2

148. Which of the following disproportionation reaction
1) $2H_2O_2 \rightarrow 2H_2O + O_2$
2) $2H_2O \rightarrow 2H_2 + O_2$
3) $2HgO \rightarrow 2Hg + O_2$
4) $Mg CO_3 \rightarrow MgO + CO_2$

149. Layer test is used for determination of
1) Chalogens 2) Pnicogens 3) Halogens 4) Noble gases

150. Br_2,I_2 dissolve in
1) C_6H_6 2) CO_2 3) CCl_4 4) NH_3

151. Which of the following is not metal displacement
1) $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$ 2) $2Na + 2H_2O \rightarrow 2NaOH + H_2$
3) $TiCl_4 + 2Mg \rightarrow Ti + 2MgCl_2$ 4) $3Fe_3O_4 + 8Al \rightarrow 4Al_2O_3 + 9Fe$

152. In the reaction $2Al + N_2 \rightarrow 2AlN$, Al is
1) Reduced 2) Oxidised 3) Oxidising agent 4) None of the above

153. When P reacts with caustic soda. The products are PH_3 and NaH_2PO_2. This reaction is an example of
1) Oxidation 2) Reduction
3) Oxidation and reduction (Redox) 4) Neutralization

154. Among the following ion the one that cannot undergo disproportionation
1) ClO^- 2) ClO_2^- 3) ClO_3^- 4) ClO_4^-

155. $3Cl_2 + 6NaOH \rightarrow 5NaCl + NaClO_3 + 3H_2O$, chlorine gets
1) Oxidised 2) Reduced 3) Both 1& 2 4) None of the above

156. Which reactions are useful to prepare Hydrogen in the laboratory
1) Decomposition 2) Displacement 3) Combination 4) Disproportionation

157. In which of the following reaction there is no change in valency
1) $CaCO_3 \rightarrow CaO + CO_2$ 2) $2H_2O_2 \rightarrow 2H_2O + O_2$
3) $2H_2O \rightarrow 2H_2 + O_2$ 4) $2HgO \rightarrow 2Hg + O_2$

158. In $C + H_2O \rightarrow CO + H_2$, H_2O acts as
1) Oxidising agent 2) Reducing agent 3) (1) and (2) both 4) None of these

159. The reaction is Decomposition but it's not redox reaction
1) $2HgO \rightarrow 2H_2 + O_2$ 2) $2H_2O \rightarrow 2H_2 + O_2$
3) $Mg\,CO_3 \rightarrow MgO + CO_2$ 4) $2\,KClO_3 \rightarrow 2KCl + 3O_2$

160. Which one of the following generally gets displaced by more electro positive metals in nonmetal displacement reactions.
1) H_2 2) N_2 3) F_2 4) Cl_2

161. Which of the following statement is correct for a galvanic cell?
1) Reduction occurs at cathode 2) Oxidation occurs at anode
3) Electrons flow from anode to cathode 4) All the statements are correct

162. Fluorine does not undergo disproportionation because
1) Fluorine is always exhibit -1 oxidation state
2) Fluorine exhibit only two oxidaion numbers
3) Fluorine exhibit three oxidation numbers 4) None of the above

163. $2HgO \rightarrow 2Hg + O_2$, Hg act as
1) Oxidising agent 2) Reducing agent 3) Oxidised 4) none of the above

164. $2H_2O_2 \rightarrow 2H_2O + O_2$ the reaction is
1) Decomposition 2) Combination
3) Disproportionation reactions 4) 1 and 3

165. Correct order of tendency to loss of electrons
1) Zn>Cu>Ag 2) Zn<Cu<Ag 3) Zn>Cu<Ag 4) Cu>Zn>Ag

Redox titrations

166. The strength of an aqueous solution of I_2 can be determined by titrating the solution with standard solution of :
1) Oxalic acid 2) Sodium thiosulphate
3) Sodium hydroxide 4) Mohr's salt

167. Equivalent weight of As_2O_3 in the following equation $As_2O_3 + 2I_2 + 2H_2O \rightarrow As_2O_5 + 4HI$ [arsenic at.wt = 75]
1) 49. 5 2) 156. 6 3) 94 4) None

168. Excess of KI reacts with $CuSO_4$ solution and then $Na_2S_2O_3$ solution is added to it. Which of the statements is incorrect for this reaction?
1) $Na_2S_2O_3$ is oxidised 2) CuI_2 is formed 3) Cu_2I_2 is formed
4) Evolved I_2 is reduced

Redox reactions and electrode processes

169. In Cu – Zn cell
1) Reduction occurs at the copper cathode 2) Oxidation occurs at the copper cathode
3) Reduction occurs at the anode 4) Chemical energy is converted to light energy

170. In a electrochemical cell
1) Potential energy changes into kinetic energy
2) Kinetic energy changes into potential energy
3) Chemical energy changes into electrical energy
4) Electrical energy changes into chemical energy

171. Which one of the following is different from others?
1) Daniell cell 2) Voltaic cell 3) Galvanic cell 4) Electrolytic cell.

172. The electrode potential of an electrode is
1) The potential applied to the electrode
2) The ionization potential of the material of the electrode
3) The tendency of the electrode to loose or gain electrons when it is in contact with its ions
4) The potential energy of the electrons in an electrode.

173. Which of the following may not be present in all galvanic cells
1) Electrolyte 2) Cathode 3) Anode 4) Saltbridge

174. Daniel cell is shown as
1) $Zn(s)/Zn^{2+}(aq)//Cu(s)/Cu^{2+}(aq)$ 2) $Zn(s)/Zn^{2+}(aq)//Cu^{2+}(aq)/Cu(s)$
3) $Cu(s)/Cu^{2+}(aq)//Zn^{2+}(aq)/Cu(s)$ 4) $Cu^{2+}(aq)/Cu(s)//Zn^{2+}(aq)/Zn(s)$

175. Which of the following metals will not react with solution of $CuSO_4$?

1) Fe 2) Zn 3) Mg 4) Ag

176. The primary reference electrode for the measurement of electrode potential is :

1) SHE (Standard hydrogen electrode) 2) Normal calomel electrode

3) Glass electrode 4) none of these

177. Equal quantities of zinc are separately treated with caustic soda solution and dilute sulphuric acid. Then

1) more hydrogen is liberated in the first case

2) more hydrogen is liberated in the second case

3) equal amount of hydrogen is liberated in both cases.

4) no reaction takes places

WORK SHEET - II

Topic : Mole Concept

SECTION - A

Single correct answer Type Questions

1. 7.5 gm of a gas occupies 5.6 litres at STP. The gas is

1) NO 2) NO_2 3) CO 4) CO_2

02. Which of the following pair contain same number of molecules

1) 44 gm CO_2, 32 gm SO_2 2) 32 gm SO_2, 80 gm SO_3

3) 32 gm SO_2, 40 gm SO_3 4) 44 gm CO_2, 40 gm SO_3.

03. The density of a gas at STP is 2.5 gm / lit. Its molecular weight is

1) 22.4 2) 33.6 3) 2.5 4) 56

04. Which of the following contain more number of molecules

1) 1 gm H_2 2) 1 gm CO_2 3) 1 gm SO_3 4) 1 gm N_2

05. The ratio of number of molecules in equal masses of nitrogen to oxygen is

1) 7 : 8 2) 8 : 7 3) 1 : 1 4) 2 : 1.

06. The elements 'A' and 'B' combine together to give two compounds B_2A_3 and B_2A. The weight of 0.05 moles of B_2A_3 is 9 gm and the weight of 0.1 mole of B_2A is 10 gm. The atomic weights of A and B are respectively

1) 30, 40 2) 50, 50 3) 80, 20 4) 40, 30.

07. The weight of 600 ml of a mixture of ozone and oxygen is 1 gm at STP. The volume of oxygen in the mixture is

1) 200 ml 2) 500 ml 3) 400 ml 4) 300 ml.

08. Which of the following is heaviest ?

1) 50 gm of Iron 2) 5 moles of nitrogen

3) 0.1 gram atom of silver 4) 10^{23} atoms of carbon.

09. The equivalent mass of an element is 4. Its chloride has vapour density 59.25. Then the valency of the element is ___

1) 1 2) 2 3) 3 4) 4

10. There are as many notes as number of oxygen atoms in 24.8 gm $Na_2S_2O_3.5\,H_2O$ (Mw = 248). A not counting machine counts 48 million notes per day. Days taken to count notes are

1) 10^{17} 2) 10^{16} (3) 10^{10} 4) 10^{12}

SECTION - B

Matching Type Questions

11.

Column I	Column II
1) 16g of O_2	p) 1gm atom of O
2) Gram equivalent volume of H_2	q) 22.4 lit at STP
3) 18 g of H_2O	r) 18 ml
4) 1/2 mole O_2 + 1 gm atm of H_2	s) 11.2 lit at STP

12.

Column - I	Column - II
1) One gram molecules of oxygen gas	p) 11.2 lit at STP
2) Gram equivalent volume of H_2	q) one mole of O_2
3) 44 gm of CO_2	r) 22.4lit at STP
4) 18 gm water	s) $3N_A$ atoms

EXERCISE - I

WORK SHEET - I

1) 3	2) 2	3) 4	4) 4	5) 1	6) 2	7) 2	8) 1	9) 3	10) 2
11) 4	12) 3	13) 1	14) 1	15) 1	16) 2	17) 2	18) 2	19) 2	20) 4
21) 4	22) 1	23) 2	24) 1	25) 1	26) 1	27) 1	28) 2	29) 2	30) 2
31) 4	32) 4	33) 4	34) 3	35) 4	36) 4	37) 2	38) 1	39) 4	40) 1
41) 1	42) 2	43) 4	44) 2	45) 2	46) 1	47) 3	48) 4	49) 1	50) 2
51) 2	52) 2	53) 2	54) 1	55) 2	56) 3	57) 3	58) 3	59) 3	60) 3
61) 1	62) 1	63) 2	64) 3	65) 1	66) 2	67) 2	68) 1	69) 2	70) 1
71) 3	72) 3	73) 1	74) 3	75) 2	76) 2	77) 3	78) 2	79) 3	80) 2
81) 4	82) 2	83) 3	84) 2	85) 3	86) 1	87) 4	88) 3	89) 4	90) 2
91) 3	92) 3	93) 2	94) 1	95) 3	96) 4	97) 1	98) 2	99) 3	100) 3
101) 4	102) 1	103) 4	104) 3	105) 2	106) 3	107) 3	108) 2	109) 3	110) 3
111) 1	112) 3	113) 3	114) 1	115) 3	116) 1	117) 2	118) 2	119) 2	120) 3
121) 4	122) 3	123) 2	124) 1	125) 1	126) 3	127) 3	128) 4	129) 2	130) 3
131) 1	132) 3	133) 3	134) 4	135) 1	136) 4	137) 1	138) 4	139) 2	140) 1
141) 4	142) 1	143) 2	144) 4	145) 3	146) 2	147) 3	148) 1	149) 3	150) 3
151) 2	152) 2	153) 3	154) 4	155) 3	156) 1	157) 2	158) 1	159) 3	160) 1
161) 4	162) 2	163) 1	164) 4	165) 1	166) 2	167) 1	168) 3	169) 1	170) 3
171) 4	172) 3	173) 4	174) 2	175) 3	176) 1	177) 3			

WORK SHEET - II

1) 1	2) 3	3) 4	4) 1	5) 2	6) 4	7) 3	8) 2	9) 3	10) 2

3) 1-PS;2-S;3-PR;4-PQ 24) 1-QR; 2-P; 3-QRS; 4-S

EXERCISE - I

IIIA GROUP ELEMENTS

General introduction and variation of properties :

1. Least basic among the following are
   1) In OH 2) TIOH 3) $B(OH)_3$ 4) $Al(OH)_3$
2. IIIA group element with highest density is
   1) B 2) Al 3) In 4) Tl
3. Electronegativity is least for
   1) Tl 2) Al 3) Ga 4) B
4. (1) : Ga is used as a thermometric liquid
   (R) : The liquid range of Ga is very wide
   1) Both (1) and (R) are true and (R) is the correct explanation of (A)
   2) Both (1) and (R) are true and (R) is not the correct explanation of (A)
   3) (1) is true but (R) is false 4) (1) is false but (R) is true
5. The most abundant metal in earth's crust is
   1) Oxygen 2) Aluminium 3) Iron 4) Silicon
6. Among the following most metallic element is
   1) A*l* 2) Ga 3) In 4) T*l*
7. $Al_2O_3$is
   1) Neutral 2) Amphoteric 3) Basic 4) Acidic
8. The correct order of ionization potential [IP_1] among the IIIA group elements is:
   1) B > Ga > A*l* > T*l* > In 2) B > Tl > Al > Ga > In
   3) B > Tl > Al > Ga = In 4) B > Tl > Ga > Al > In
9. The incorrect statement among the following is
   1) Among IIIA group elements the densities increases from B to Tl
   2) TlCl is more stable than $TlCl_3$
   3) Boron has 2 penultimate electrons where as Aluminium has 18 penultimate electrons
   4) Boron exhibit allotropy
10. Al and Ga have nearly the same covalent radii, because of
    1) Greater shielding effect of 's' electrons of 'Ga' atoms
    2) Poor shielding effect of 's' electrons of 'Ga' atoms
    3) Poor shielding effect of 'd' electrons of 'Ga' atoms
    4) Greater shielding effect of 'd' electrons of 'Ga' atoms
11. The ionisation energies from Ga to Tl do not decrease due to
    1) Shielding effect 2) Improper shielding effect
    3) Increase in atomic size 4) Decrease in nuclear charge
12. The corect statement among the following is
    1) Tl^+ is a powerfull reducing agent 2) Al^{3+} is a powerfull oxidising agent
    3) Al^{3+} is a reducing agent 4) Tl^{3+} is an oxidisng agent
13. The maximum covalency of aluminium is '6' where as that of boron is '4' because
    1) Aluminium is more electropositive thant boron

2) 'Al' can form a cation where as boron can not

3) 'Al' contains vacant 'd' orbitals in its valence shell where as boron does not

4) 'Al' is a metal where as boron is a non metal

14. (1) : The atomic size of gallium is less than expected

(R) : In gallium the $3d^{10}$electrons do not shield effectively

1) A and R are true, R explains A
2) A and R are true, R does not explains A
3) A is true, but R is false
4) A is false, but R is true

15. Indium and thallium of IIIrd group have nearly similar atomic radii due to screening effect shown by f-electrons in the

1) Penultimate shell of thallium
2) Anti penultimate shell of indium
3) Anti penultimate shell of thallium
4) Penultimate shell of indium

16. Which one of the following has the lowest melting point

1) B
2) Al
3) Ga
4) Tl

EXERCISE - I

WORK SHEET - I

1) 3 2) 4 3) 2 4) 1 5) 2 6) 1 7) 2 8) 4 9) 3 10) 3

11) 2 12) 4 13) 3 14) 1 15) 3 16) 3

EXERCISE - I

Introduction and Variation of Properties

1. The most abundant IVA group element in the earth's crust is
   1) Germanium 2) Carbon 3) Silicon 4) Tin

2. Among the following amphoteric is
   1) C 2) S 3) Ge 4) Pb

3. Which of the following is a semi conductor
   1) C 2) Si 3) Ge 4) both Si and Ge

4. The following bond has highest energy
   1) Si–Si 2) C–C 3) Sn–Sn 4) Pb–Pb

5. Which has the highest melting point
   1) Si 2) Pb 3) Sn 4) C

6. Carbon has the highest catenation character because
   1) C is more electronegative
   2) C has higher ionisation potential value
   3) C has only one stable isotope
   4) C–C bond is strong

7. (1) : CCl_4 does not undergo hydrolysis, where as $SiCl_4$ is readily hydrolysed.
   (R) : Carbon has no d-orbitals in its valence shell, but silicon has vacant d-orbitals in its valence shell.
   1) Both (1) and (R) are true and (R) is the correct explanation of (A)
   2) Both (1) and (R) are true and (R) is not the correct explanation of (A)
   3) (1) is true but (R) is false
   4) (1) is false but (R) is true

8. Which of the following is a reducing agent and undergoes hydrolysis
   1) CH_4 2) C_2H_6 3) C_3H_8 4) SiH_4

9. The general trend in the properties of elements of carbon family shows that, with the rise in atomic number.
   1) The tendency towards catenation increases
   2) The tendency to show +2 oxidation state increases
   3) The metallic character decreases
   4) The tendency to form complexes with covalency higher than four decreases

10. The least abundant IV A group element in earths crust is
    1) C 2) Ge 3) Pb 4) Sn

11. Cassiterite is the natural source of
    1) C 2) Si 3) Sn 4) Pb

12. Reducing capacity is highest for
    1) CH_4 2) SiH_4 3) SnH_4 4) PbH_4

13. Which of the IVA group element do not exhibit allotropy
    1) C 2) Si 3) Sn 4) Pb

Carbon :

14. Which is not an allotrope of carbon?
    1) Graphite 2) Diamond 3) Carborundum 4) Coke

15. When diamond is heated in vaccum at 2000^0C, the substance formed is

1) Amorphous carbon 2) Coal 3) Graphite 4) Carbon monoxide

16. All atoms are sp^3 hybridised in the following substsance

1) Methane 2) Ethane 3) Diamond 4) Graphite

17. Graphite and gas carbon are a pair of

1) Isosters 2) Allotropes 3) Isomers 4) Compounds

18. Layer structure is present in

1) Graphite 2) Coal 3) Diamond 4) Coke

19. The allotrope of Carbon not used in the making of electrodes is

1) Gas Carbon 2) Petroleum Coke 3) Graphite 4) Diamond

20. Diamond $\xrightarrow[\text{vacuum}]{1800-2000^0C}$ X. The product, X is used as

1) lubricant 2) in the manufacture of lead pencils
3) in electrotyping and electroplating 4) all the above

21. The correct statement regarding Graphite is
1) Graphite is not a conductor because, it does not contain free electrons
2) Graphite is a three dimensional conductor because, the p–electrons are delocalised three dimensionally
3) Graphite is a two dimensional conductor because p-electrons are delocalised two dimensionally
4) In graphite all the carbon atoms under go sp^3 hybridization

22. Regarding diamond

I) C–C bond length is 1.54A° II) It has least refractive index among solids

III) It has a 3-dimensional structure.
The correct combination is
1) all are correct 2) I & III are correct 3) I & II are correct 4) II & III are correct

EXERCISE - I

WORK SHEET - I

1) 3 2) 3 3) 4 4) 2 5) 4 6) 4 7) 1 8) 4 9) 2 10) 2

11) 3 12) 4 13) 4 14) 3 15) 3 16) 3 17) 2 18) 1 19) 4 20) 4

21) 3 22) 2

WORK SHEET - I

V A Group Elements:

1. The valence shell electronic configuration of VA group elements is :
   1) ns^2np^2 2) ns^2np^1 3) ns^2np^3 4) ns^2np^5
2. The most abundant element in the atmosphere is
   1) O_2 2) N_2 3) F_2 4) Ar
3. The most abundant VA group element in the earth's crust is
   1) Nitrogen 2) Phosphorous 3) Arsenic 4) Bismuth
4.

LIST - 1	LIST - 2
A) Phosphorite	1) KNO_3
B) Bengal salt petre	2) $Ba(NO_3)_2$
C) Fluoroapatite	3) $NaNO_3$
D) Chili salt petre	4) $3Ca_3(PO_4)_2.CaF_2$
	5) $Ca_3(PO_4)_2$

The correct match is

	A	B	C	D		A	B	C	D
1)	1	2	3	5	2)	2	4	3	1
3)	4	3	5	2	4)	5	1	4	3

5. The following can exist as a diatomic molecule
   1) N 2) P 3) As 4) Bi
6. The following VA group element occurs even in free state
   1) Bi 2) As 3) Sb 4) N
7. The VA group element having more number of allotropes is
   1) N 2) P 3) Bi 4) Sb
8. The following element doesn't have allotropes
   1) N 2) P 3) As 4) Bi
9. Most reactive allotropic form of Phosphorous is
   1) Yellow 2) Red 3) Black 4) Scarlet
10. (A): P_4 is more reactive than N_2
    (R): $P-P$ bonds are relatively weaker than $N \equiv N$
    1) Both (A) and (R) are true and (R) is the correct explanation of (A)
    2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
    3) (A) is true but (R) is false 4) (A) is false but (R) is true
11. Diphosphine is
    1) PH_3 2) P_2H_6 3) PH_4^+ 4) P_2H_4
12. In nitrogen molecule, the two atoms of nitrogen are joined by
    1) One sigma bond and one pi bond 2) Two sigma bonds and one pi bond
    3) One sigma bond and two pi bonds 4) Three sigma bonds
13. The chemical inertness of nitrogen is due to
    1) half-filled '2p' orbitals of Nitrogen 2) high bond dissociation energy
    3) completely filled d-orbitals 4) its gaseous nature
14. The maximum covalency of nitrogen is
    1) 2 2) 3 3) 4 4) 5

15. The VA group element which exhibits wide range of oxidation states is

1) P 2) As 3) Bi 4) N

16. The oxidation state of nitrogen in hydrazine is

1) –1 2) –2 3) +1 4) +2

17. The stable oxidation state of Bismuth is

1) +1 2) + 5 3) – 3 4) + 3

18.

Substance	Oxidation state of N
A) HNO_3	1) –3, +5
B) NH_4NO_3	2) –1/3
C) N_3H	3) + 5
D) H_3PO_3	4) + 3
	5) + 1/3

The correct match is

	A	B	C	D		A	B	C	D
1)	3	1	2	4	2)	5	2	3	4
3)	1	2	3	4	4)	4	3	2	5

19. The atomicity of white Phosphorous is 'x' and the $\mathbf{P}-\hat{\mathbf{P}}-\mathbf{P}$ bond angle in the molecule is 'y'. What are 'x' and 'y' ?

1) x = 4 ; y = 90° 2) x = 4 ; y = 60° 3) x = 3 ; y = 120° 4) x = 2; y = 180°

EXERCISE- I / ANSWERS

WORK SHEET- I

1) 3	2) 2	3) 2	4) 4	5) 1	6) 4	7) 2	8) 4	9) 1	10) 1
11) 4	12) 3	13) 2	14) 3	15) 4	16) 2	17) 4	18) 1	19) 2	

EXERCISE - I
WORK SHEET - I

VIA-Group Elements:

1. Which of the following set of atomic numbers belongs to group 16 elements
   1) 56, 37, 20 2) 52, 8, 84 3) 14, 32, 50 4) 36, 9, 17
2. Oxygen and Sulphur have same
   1) outer electronic configuration 2) Atomic size
   3) electronic configuration 4) electron affinity
3. Element with the lowest atomicity
   1) Te 2) S 3) Se 4) O
4. The number of atoms present in one molecule of rhombic sulphur is
   1) 2 2) 4 3) 6 4) 8
5. The total number of covalent bonds present in one S_8 molecule is
   1) 4 2) 6 3) 8 4) 10
6. The S - S - S bond angle in S_8 molecule is
   1) 109.5^0 2) 105^0 3) 120^0 4) 60^0
7. The decreasing tendency to exist in puckered 8 - membered ring structure is
   1) S > Se > Te > Po 2) Se > S > Te > Po
   3) S > Te > Se > Po 4) Te > Se > S > Po
8. Which of the following form of sulphur can be prepared by pouring liquid sulphur into cold water
   1) Monoclinic 2) Rhombic 3) Plastic 4) Colloidal
9. α, β and γ forms of sulphur differ in
   1) Overal packing of rings 2) Molecular weight
   3) Atomicities 4) Their ring structure
10. The oxidation state of oxygen is zero in
    1) CO 2) O_3 3) SO_2 4) H_2O_2
11. In which of the following compounds, oxygen exhibits +2 oxidation state
    1) H_2O 2) H_2O_2 3) OF_2 4) H_2SO_4
12. Which of the following element does not show an oxidation state of +4 ?
    1) Oxygen 2) Sulphur 3) Selenium 4) Tellurium
13. Generally oxygen is converted into its ion by
    1) Losing electrons 2) Increasing oxidation number
    3) Decreasing atomic size 4) Gaining electrons
14. If X is a member of chalcogen family, the highest stability of X^{-2} is exhibited by
    1) Oxygen 2) Selenium 3) Tellurium 4) Sulphur
15. Oxygen is always divalent while sulphur can form 2, 4 and 6 bonds because
    1) Oxygen is more electronegative than sulphur
    2) Sulphur has vacant d-orbitas while oxygen does not
    3) Sulphur has large atomic radius than oxygen
    4) Sulphur is more electronegative than oxygen.
16. In sulphate ion the oxidation state of sulphur is +6 and the hybridization state of sulphur is

1) sp 2) sp^2 3) sp^3 4) sp^2 or sp^3d^2

17. The second most electronegative element in periodic table is
1) F 2) O 3) Cl 4) N

18. Which of the following has higher IP_1?
1) Oxygen 2) Sulphur 3) Selenium 4) Tellurium

19. Element with higher catenation capacity is
1) S 2) Se 3) Te 4) Po

20. The order of abundance of VI A group elements is
1) O > S > Se > Te > Po 2) S > Se > Te > o > Po
3) O > Se > S > Te > Po 4) O > Te > Se > S > Po

21. The most common oxidation state of VI A group elements is
1) -2 2) +2 3) +4 4) +6

22. Chair form of S_6 rings are present in
1) α - sulphur 2) β - sulphur 3) Engle's sulphur 4) γ - sulphur

EXERCISE - I / ANSWERS

WORK SHEET - I

1) 2	2) 1	3) 4	4) 4	5) 3	6) 2	7) 1	8) 3	9) 1	10) 2
11) 3	12) 1	13) 4	14) 1	15) 2	16) 3	17) 2	18) 1	19) 1	20) 1
21) 1	22) 3								

EXERCISE - I

WORK SHEET - I

VIIA Group Elements:

1. The number of unpaired electrons present in the first excited state of chlorine atom is

   1) 1 2) 3 3) 5 4) 2

2. Which of the following halogens has metallic character ?

   1) F_2 2) CI_2 3) Br_2 4) I_2.

3. The name of the radioactive VII A group element and its atomic number are respectively

   1) Astatine, 84 2) Astatine, 86 3) Astatine, 85 4) Astatine, 87

4. Super halogen is

   1) F_2 2) Cl_2 3) Br_2 4) I_2

5. The element which never acts as reducing agent in a chemical reaction is

   1) O 2) Li 3) F 4) C

6. The high reactivity of fluorine is mainly due to

   1) high heat of hydration 2) small size

   3) low bond dissociation energy of the F-F bond 4) high ionisation potential

7. According to mulliken, there is no possibility of multiple bonding in

   1) Cl_2 2) F_2 3) Br_2 4) I_2.

8. In the reaction of I_2 with water, change in free energy is

   1) Negative 2) Positive

   3) zero 4) cannot be predicted

9. The type of forces present among halogen molecules

   1) H-bonds 2) Covalent bonds 3) Vander waal's forces 4) Ionic bond

10. The correct order of Vander Waals radius of F, Cl and Br is :

    1) Cl > F > Br 2) Br > Cl > F 3) F > Cl > Br 4) Br > F > Cl

11. Liquid and solid halogens are

    1) Br_2 and Cl_2 2) I_2 and Br_2 3) Br_2 and I_2 4) Cl_2 and I_2

12. The halogen that undergoes sublimation is

    1) F_2 2) Cl_2 3) Br_2 4) I_2

13. Ionisation potential of fluorine is abnormally high. It is due to

    1) Its high EN value 2) Its high EA value 3) Its small size 4) Its big size

14. The elements with the highest electron affinity and electronegativity respectively are

    1) Cl and Cl 2) F and F 3) F and Cl 4) Cl and F

15. An element M has an atomic mass 19 and atomic number 9. Its ion is represented by

    1) M^+ 2) M^{2+} 3) M^- 4) M^{2-}

16. General oxidation states of halogens are

1) -1, + 1 2) -1, +1, +3 3) -1, +1, +3, +5 4) -1, +1, +3, +5, +7

17. Which one of the following elements can show both positive and negative oxidation state ?

1) F 2) I 3) Li 4) He.

18. The maximum oxidation state that can be exhibited by a halogen in its second excited state

1) +1 2) +3 3) +5 4) +7

19. Which one of the following elements show different oxidation states ?

1) Sodium 2) Fluorine 3) Chlorine 4) Potassium

20. Enthalpy of dissociation is low for

1) F_2 2) Cl_2 3) Br_2 4) I_2

21. F_2 absorbs .... portion of light and appear yellow and I_2 absorbs .... portion of light and appears violet

1) Red and Green 2) Violet and Yellow 3) Blue and Orange 4) Green and Red

EXERCISE - I / ANSWERS

WORK SHEET - I

1) 2	2) 4	3) 3	4) 1	5) 3	6) 3	7) 2	8) 2	9) 3	10) 2
11) 3	12) 4	13) 3	14) 4	15) 3	16) 4	17) 2	18) 3	19) 3	20) 4
21) 2									

EXERCISE - I

WORK SHEET - I

NOBLE GASES:

1. The chemistry of zero group elements is little known because
   1) They are less abundant　　2) They have low ionisation potential
   3) They have octet configuration　　4) They have low boiling points

2. The gaseous mixture present in the 'sun' atmosphere
   1) Ar,Kr,Xe　　2) Ne, Kr　　3) Kr,Xe　　4) He, H_2

3. Helium gives characteristic spectrum with orange light which is similar to that of
   1) Li^+　　2) H^+　　3) Li　　4) Be^+

4. The forces that make the molecules of a noble gas in liquid state
   1) Dipolar forces　　2) Dipole - induced dipole forces
   3) Van der waal's force　　4) Repulsive forces

5. **(1) :** Helium was discovered in chromosphere of the sun
   (R) : D_3 line is observed along with D_1 and D_2 in the solar spectrum
   The correct answer is
   1) Both (1) and (R) are true and (R) is the correct explanation of (A)
   2) Both (1) and (R) are true and (R) is not the correct explanation of (A)
   3) (1) is true but (R) is false　　4) (1) is false but (R) is true

6. The first ionization energy of neon is 2080.7 KJ/mole. The first ionisatioin energy of helium may be
   1) 2080.7 KJ/mole　　2) 2372.3 KJ/mole　　3) 1520.5 KJ/mole　　4) 1800.4 KJ/mole

7. The noble gas which behaves abnormally in liquid state is
   1) Xe　　2) Ne　　3) He　　4) Ar

8 Solubility of noble gases in water shows the order
   1) He > Ne > Ar > Kr > Xe　　2) He > Ne > Kr > Ar > Xe
   3) Xe > Kr > Ar > Ne > He　　4) None

WORK SHEET - II

1. When a Radioactive substance is kept in a vessel, the atmosphere around it is rich with
   1) He　　2) Ne　　3) Ar　　4) Xe

2. Which element disintegrates to give two noble gases
   1) Ra　　2) Th　　3) Rn　　4) He

3. The actual density of nitrogen is 1.251g lit^{-1}. The density of nitrogen obtained from the atmosphere is 1.2572 g lit^{-1}. This is because of the fact that atmospheric nitrogen contains
   1) Argon and other noble gases　　2) Carbon dioxide
   3) Neon　　4) Carbon monoxide

4. The percentage by volume of Argon in atmosphere
   1) 1%　　2) 2%　　3) 10%　　4) 0.2%

5. Noble gases exists only in monoatomic state. This is due to
   1) Non availability of unpaired electrons　　2) high ionization energy
   3) large size　　4) zero electron affinity

6. If one litre of air is passed repeatedly over heated copper and magnesium till no further reduction in volume takes place, the volume finally obtained is

1) 800ml 2) 990 ml 3) 10 ml 4) 100 ml

7. When 1 lit of air is burnt with a mixture calcium carbide and anhydrous calcium chloride, the reduction in volume of air is about

1) 10ml 2) 990ml 3) 100ml 4) 900ml

8. The incorrect statement regarding to Noble gases is

1) Their Electron affinity and Electronegetive are zero
2) They are held together by Van der waals forces
3) They occupy the Peaks in the graphs of ionisation potential and atomic number
4) Their boiling points decrease from He to Xe

9. The maximum valency (=8) is shown by

1) Xe, Os 2) Xe, Ru 3) Xe,Os,Ru 4) Xe,Os, Ru,Mn

10. Which of the following is diamagnetic in nature?

1) O_2 2) NO_2 3) He 4) Fe^{2+}

EXERCISE - I / ANSWERS

WORK SHEET - I

1) 3 2) 4 3) 1 4) 3 5) 1 6) 2 7) 3 8) 3

WORK SHEET - II

1) 1 2) 1 3) 1 4) 1 5) 1 6) 2 7) 1 8) 4 9) 3 10) 3

Nomenclature

EXERCISE - I

1. Secondary butyl group is

   1) $CH_3-CH_2-CH_2-CH_2-$ 2) $CH_3-\underset{|}{CH}-CH_2-CH_3$

   3) $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-$ 4) $CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-$

2. The correct IUPAC name of $CH_3–CH_2–CH(CH_3)–CH(C_2H_5)_2$ is

   1) 4-Ethyl -3-methyl hexane 2) 3-Ethyl-4-methyl hexane

   3) 4-Methyl-3-ethyl hexane 4) 2, 4, -Diethyl pentane

3. Which of the following respresents 2,2,3– Trimethyl hexane ?

   1) $CH_3–C(CH_3)_2–CH_2–CH_2–CH(CH_3)_2$ 2) $CH_3–CH(CH_3)–CH_2–CH(CH_3)–CH_2–CH_3$

   3) $CH_3–C(CH_3)_2–CH(CH_3)–CH_2–CH_2–CH_3$ 4) $CH_3–C(CH_3)_2–CH_2–C(CH_3)_2–CH_3$

4. The IUPAC name of the compund $C_2H_5-\underset{\underset{CH_2}{\|}}{C}-CH_2OH$

   1) 2-Ethyl prop-2-en-1-ol 2) 2-Hydroxy methyl butan-1-ol

   3) 2-Methylene butan-1-ol 4) 2-Ethyl -3-hydroxy prop-1-ene

5. The correct IUPAC name of $H-\overset{\overset{O}{\|}}{C}-CHO$ is

   1) Formyl methanal 2) 1,2-Ethanedione 3) 2-Oxoethanal 4) Ethanedial

6. The IUPAC name of the following compound is $CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-CH=CH_2$

   1) 2- Methylpentane 2) 4- Methyl pentene -1

   3) 1- Hexene 4) 3- Methyl pentene

7. The IUPAC name of the compound is $CH_3–CH(C_2H_5)–CH_2–CH(OH)–CH_3$

   1) 4-Ethyl pentanol-2 2) 4-Methyl hexanol-2

   3) 2-Ethyl pentanol -2 4) 3-Methylhexanol-2

8. The structure of 4-methyl pentene-2 is

   1) $(CH_3)_2CH–CH_2CH=CH_2$ 2) $(CH_3)_2CH–CH = CH–CH_3$

   3) $(CH_3)_2CH–CH_2–CH=CH–CH_3$ 4) $(CH_3)_2C =CH–CH_2–CH_3$

9. The IUPAC name of $CH_3 – C \equiv C – CH(CH_3)_2$ is

   1) 4 - Methyl-2-pentyne 2) 4,4, -Dimethyl -2- butyne

   3) Isopropylmethyl acetylene 4) 2-Methyl-4-pentyne

10. The IUPAC name of $(CH_3)_2$ CH–COOH is

    1) 2- propanoic acid 2) Isobutanoic acid

    3) 2-Methyl propanoic acid 4) 2-Methyl butanoic acid

11. The IUPAC name of $CH_3-\overset{CH_3}{\overset{|}{C}H}-\overset{O}{\overset{\|}{C}}-CH_2-CH_2OH$ is

1) 1-Hydroxy-4-methyl-3-pentanone 2) 2-Methyl -5-hydroxy-3-pentanone
3) 4-Methyl -3-oxo-1-pentanol 4) Hexanol-1-one-3

12. The IUPAC name of the formula $CH_3-\overset{CH_3}{\overset{|}{C}}=\overset{H}{\overset{|}{C}}-COOH$ is

1) 2- Methyl-2-butenoic acid 2) 3- Methyl-3- butenoic acid
3) 3- Methyl -2-butenoic acid 4) 2-Methyl-3- butenoic acid

13. The correct IUPAC name of Cl_3C-CH_2CHO
1) 3,3,3-Trichloro propanal 2) 1,1,1-Trichloro propanal
3) 2,2,2-Trichloro propanal 4) Chloral

14. IUPAC name of $CH_2=CH-CH=CH_2$ is
1) 1, 2-Butadiene 2) 1,3-Butadiene 3) 1, 4-Butadiene 4) Butadiene

15. IUPAC name of $CH_2=C=CH_2$ is
1) Propadiene 2) 1, 1-propadiene 3) 2, 2-propadiene 4) 1, 3-propadiene

16. IUPAC name of $CH_2=CH-CH(CH_3)_2$ is
1) 1,1-Dimethyl-2-propane 2) 3-Methyl -1- butene
3) 2-vinyl propane 4) 1-Isopropyl ethylene

17. IUPAC name of $CH_3-\underset{CH_3}{\underset{|}{\overset{CH_3}{\overset{|}{C}}}}-CH=CH_2$ is

1) 3,3,3 - Trimethyl -1- propene 2) 1,1,1- Trimethyl -3- propene
3) 3,3 -Dimethyl -1- butene 4) 1,1- Dimethyl -3 - butene

18. IUPAC name of $(CH_3)_3CCH_3$ is
1) 1,1,1-Trimethyl ethane 2) 2,2,2 - Trimethyl propane
3) 2,2,2- Trimethyl ethane 4) Dimethyl propane

19. The IUPAC name of $CH_3-CH_2-\underset{CH_3}{\underset{|}{C}H}-\underset{O}{\underset{\|}{C}}-CH_3$

1) Isohexanone 2) 3-methyl 2-pentanone
3) either (1) or 2 4) 3- Methyl -4- pentanone

20. IUPAC name of $CH_3-CHCl-CH_2-CHO$ is
1) 2-chloro-4-butanol 2) 3-chloro butane 3) 2-chloro-4-butanal 4) 3-chloro butanal

21. The structural formula of 3 - ethyl - 2 - methyl hexane is
1) $CH_3-CH(CH_3)-CH(C_2H_5)-CH_2-CH_2-CH_3$ 2) $CH_3-CH_2-CH(C_2H_5)-CH(CH_3)-CH_2-CH_3$
3) either (1) or (2) 4) None of these

22. The systematic name of the organic compound having the structure

$$CH_3-CH_2-CH_2-\underset{\underset{CH_3\quad CH_3}{\underset{\diagup\quad\diagdown}{CH}}}{\underset{|}{C}H}-CH_2-CH_2-CH_3$$

is ....

1) 4 - Isopropyl hexane 2) 2-methyl–3-propyl hexane

3) Isodecane 4) 4-(1-Methyl ethyl)heptane

23. IUPAC name of $CH \equiv C{-}CH = CH_2$ is

1) But-1-yne-3-ene 2) But-1-en-3-yne 3) But-1-yne -2-ene 4) None of the above

24. The IUPAC name of $(CH_3)_3C{-}CH{=}CH_2$ is

1) 2,2-dimethyl but -3-ene 2) 2,2-dimethyl pent-4-ene
3) 3,3-dimethyl but-1-ene 4) 3,3-dimethyl pent-1-ene

25. The compound $\begin{array}{l} CH_3-\underset{|}{C}=CH-CH_3 \\ \quad\quad\; CH_2-CH_3 \end{array}$ is

1) 2-ethyl-2-butene 2) 3-methyl-3-pentene 3) 3-methyl-2-pentene 4) 3-ethyl-2-butene

26. IUPAC name of $\begin{array}{c} \quad\; OH \\ \quad\; | \\ CH_3-C-CH_2-CH_2-CH_3 \\ \quad\; | \\ \quad\quad\quad CH_2-CH_3 \end{array}$

1) 3-methyl-3-hexanol 2) 2-ethyl-2-pentanol
3) 2-ethyl-2-hydroxy pentane 4) Any of these

27. $\begin{array}{l} CH_3-CH_2-\underset{|}{CH}-(CH_2)_3-CH_3 \\ \quad\quad\quad\quad\quad\; CH_3 \end{array}$ The IUPAC name

1) 3-methyl hexane 2) 4-methyl hexane
3) 5-methyl heptane 4) 3-methyl heptane

28. IUPAC name of $(CH_3)_2CH{-}CHBr_2$

1) 1,1-dibromo -2-methyl propane 2) 2-methyl-3-Bromo propane
3) iso propyl Bromide 4) 3^o butyl bromide

29. $\begin{array}{c} \quad C_2H_5 \\ \quad | \\ CH_3-C-CH_3 \\ \quad | \\ \quad C_2H_5 \end{array}$ IUPAC name is

1) 2, 2-Diethyl propane 2) 3, 3-Dimethyl pentane
3) 3-ethyl-3-methyl butane 4) 3-ethyl-2-methyl butane

30. $\begin{array}{l} \quad\quad\quad\quad\quad\quad\; CH_3 \\ \quad\quad\quad\quad\quad\quad\;\; | \\ CH_3-CH_2-C-C=CH-CH_3 \\ \quad\quad\quad\quad\quad\quad\;\; |\quad | \\ \quad\quad\quad\quad\quad\quad CH_3\; C_2H_5 \end{array}$ The IUPAC name is

1) 3-ethyl-4, 4-dimethyl-2-hexene 2) 4-ethyl-3, 3-dimethyl-2-hexene
3) 4 - ethyl - 3,3 - dimethyl - 4 - hexene 4) all of these

31. $\begin{array}{l} CH_3-\underset{|}{CH}-CH_2-\underset{|}{CH}-CH_3 \\ \quad\quad\;\; C_2H_5 \quad\quad\quad C_2H_5 \end{array}$ IUPAC name is

1) 2, 4 - diethyl pentane 2) 3, 5- dimethyl heptane
3) 3 - methyl 5 -ethyl hexane 4) 5 - ethyl -3- methyl hexane

32. $CH_3-\underset{\underset{CH_2}{\|}}{C}-CH_2-\underset{\underset{CH_2}{\|}}{C}-CH_3$ IUPAC name is

1) 2, 4-pentadiene
2) 2, 4-dimethyl-1, 4-pentadiene
3) 2, 4, - butadine
4) None of the above

33. The IUPAC name of isobutanol is

1) 2-methyl propanol
2) 2-methyl-2-propanol
3) 2-butanol
4) 2-methyl-1-propanol

34. IUPAC name of $CH_3-O-\underset{\underset{CH_3}{|}}{CH}-CH_3$

1) methyl propyl ether
2) methyl isopropyl ether
3) 2-methoxy propane
4) all the above

35. IUPAC name of n-amyl alcohol is

1) butanol - 1
2) pentanol - 2
3) pentanol - 3
4) pentanol -1

36. IUPAC name of $CH_3-CH_2-CH_2-\underset{\underset{CH_3-CH-CH_3}{|}}{CH}-CH_3$ is

1) 2, 3 - dimethyl hexane
2) 2 - methyl - 3 - propyl butane
3) 2 - isopropyl pentane
4) Nonane

37. IUPAC name of $CH_3-\underset{\underset{CH_3}{|}}{C}(OH)-CH_3$

1) sec- butyl alcohol
2) pri-butyl alcohol
3) 2-methyl propanal
4) 2-methyl propanol-2

38. The compound in which C uses only sp^3 hybrid orbitals for bond formation is

1) HCOOH
2) $(NH_2)_2CO$
3) $(CH_3)_3COH$
4) CH_3 CHO

39. The compound having only one type of hybrid obitals in all carbon atoms is ....

1) Ethane dial
2) 2, 4 - pentadine
3) Propene
4) Butyne

40. The maximum number of linear atoms in propyne molecule are

1) 3
2) 4
3) 2
4) 6

41. 2, 3– dimethyl hexane contains .... tertiary............... secondary and .... primary carbon atoms, respectively. (2003)

1) 2,2,4
2) 2,4,3
3) 4,3,2
4) 3,2,4

42. IUPAC name of Allyl chloride

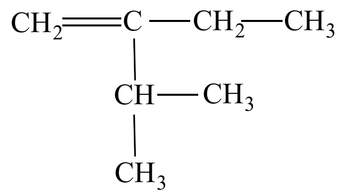
1) 1–chloro –1 – propene
2) 1 – chloro – 2 – propene
3) 3 – chloro – 2 – propene
4) 3 – chloro – 1 – propene

43. Among the following which one represent the correct name of the compound

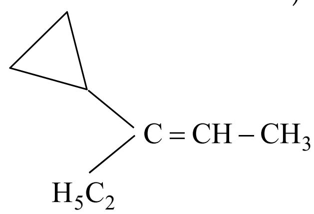
1) methyl pentane
2) 2 – propene
3) 1 – pentanone
4) none

44. The IUPAC name of is $\underset{\underset{CHO}{|}}{CH}=\underset{\underset{NH_2}{|}}{CH}$

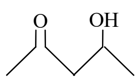
1) 1-Amino prop-2-enal
2) 3-Amino prop -2-enal
3) 1-Amino-2-formyl ethene
4) 3-Amino-1-oxoprop-2-ene

45. The IUPAC name of  is

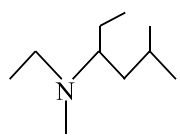
1) 2-Ethyl-3-methyl butene-1
2) 2-Isopropyl butene-2
3) 2-Methyl-3-ethyl butene-3
4) Ethyl isopropyl ethane

46. The IUPAC name of 

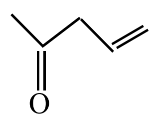
1) 3- Cyclopropyl -3- ethyl -2- propene
2) 1-Cyclopropyl -1- ethyl propene
3) 3-Cyclo propyl -2- pentene
4) (1-ethyl -1- propenyl) cyclo propane

47.  IUPAC name is

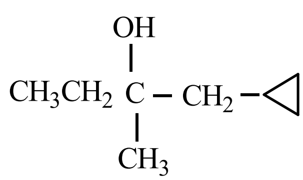
1) 4-one -2- pentenol
2) 4-hydroxy-2-pentanone
3) Pentane-4-ol-2-one
4) Pentane-2-one-4-ol

48. The IUPAC name of  is

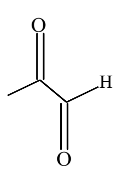
1) N -ethyl - N,2 - di methyl 4- hexanamine
2) N, 4-di ethyl–N–2-dimethyl 4 - butananine
3) N-ethyl–N-methyl-5-methyl -3-Hexanamine
4) 3- (ethyl methyl amino) -5-methyl hexane

49. The correct IUPAC name of the compound 

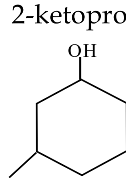
1) Pent-4-en-2-one
2) 3-Buten-1-al
3) 3-Acetyl propene-1
4) Formyl propene

50. IUPAC name of the compound  is

1) tert-pentanol cyclo propane
2) 2-cyclobutyl butan-2-ol
3) 1-cyclopropyl-2-methyl butan-2-ol
4) 2-cyclobutyl butan-2-ol

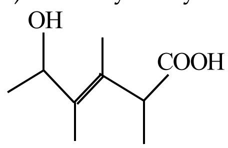
51. The correct IUPAC name of  is

1) ethanedial
2) 2-ketopropanal
3) 2,3-Butane dione
4) ethane dione

52. Correct IUPAC name of 

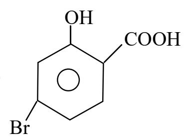
1) 1-Methyl-3-cyclohexanol
2) 3-Methy-1-cyclohexanol

3) 1-Methyl-3-hydroxy cyclohexane 4) 1-Hydroxy-3-methyl cyclo hexane

53.  Correct IUPAC name of this compound is

1) 5-Hydroxy-2,3,4-trimethyl-3-hexenoicacid 2) 2-Hydroxy-2,3,4-trimethyl-3-hexene-1-oic acid

3) 2-Hydroxy-2,,3,4-trimethyl-3-hexene-5-oic acid 4) 2-Hydroxy-2,3,4-trimethyl-3-hexene-1-oic acid

54. IUPAC name of  is

1) 4-Bromo-2-hydroxy benzoic acid 2) 1-Bromo-3-hydroxy benzoic acid

3) 1-Bromo-3-hydroxy-4-benzoic acid 4) 1-Carboxy -2-bromo phenol

WORK SHEET - II

Bonding-Hybridization

1. The bond between carbon atom (1) and carbon atom (2) in compound $N \equiv C^1 - C^2H = CH_2$ involves the hybridization

1) sp^2 and sp^2 2) sp^3 and sp 3) sp and sp^2 4) sp and sp

2. The ratio of the number of sp, $sp^2$and sp^3 carbons in the compound given below is

$H_2C = C = CH - CH_3$

1) 1 : 2 : 1 2) 2 : 1 : 1 3) 1 : 1 : 2 4) 1 : 2 : 3

3. The ratio of the number of sp, sp^2 and sp^3 orbitals in the compound is

$CH_3 - CH = C = CH - C \equiv C - CH_3$

1) 1 : 1 : 1 2) 2 : 2 : 1 3) 3 : 2 : 1 4) 3 : 3 : 4

4. Which compound given below has sp^3, sp^2 and sp orbitals in the ratio of 6 : 3 : 2

1) $CH_3 - CH = CH - CH_2 - C \equiv C - CH_3$ 2) $CH_3 - CH = CH - CH_2 - C \equiv CH$

3) $CH_3 - CH_2 - C \equiv C - CH = CH_2$ 4) $CH_3 - CH = CH - C \equiv CH$

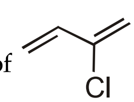
5. How many "methyl groups" are present in 2, 3-dimethyl-4-ethyl heptane

1) 2 2) 8 3) 4 4) 5

6. In which of the following species is the underlined carbon having sp^3 hybridisation?

1) $CH_3\underline{C}OOH$ 2) $CH_3\underline{C}H_2OH$ 3) $CH_3\underline{C}OCH_3$ 4) $CH_2 = \underline{C}H - CH_3$

Nomenclature :

7. Give the IUPAC name of  is

1) iso prene 2) chloroprene

3) 2–methyl-1,3-butadiene 4) 2–chloro-1,3-butadiene

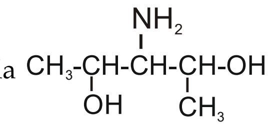
8. IUPAC name of the compound having the formula $C_6H_5 - CH = CH - COOH$

1) 3–benzyl propanoic acid 2) 3–phenyl propanoic acid

3) 3–benzyl–2–propenoic acid 4) 3–phenyl prop–2–enoic acid

9. IUPAC name of the compound having the formula $CH_3-CH_2-N(CH_3)-CH\begin{matrix}\diagup CH_3\\ \diagdown CH_3\end{matrix}$

1) N–ethyl, N–methyl isopropane
2) N–ethyl, N–methyl amino propane
3) N–ethyl, N–methyl–1–amino propane
4) N–ethyl, N–methyl–2–propanamine

10. IUPAC name of the compound having the formula  is

1) 3–amino, 1–methyl, 2–hydroxy, –1– butanol
2) 3 – amino - 4 – hydroxy –2– pentanol
3) 3 – amino –1– methyl, 1, 3 – butanediol
4) 3 – amino – 2, 4– pentanediol

11. $CH_3-CH_2-CO-\overset{CN}{\overset{|}{C}}H-COOH$ The IUPAC name of the compund is

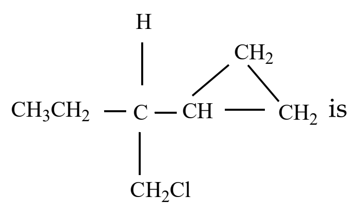
1) 3 - Ketonic -2- cyano pentanoic acid
2) cyanoketohexanoic acid
3) 3 - oxo -2 - cyano pentanoic acid
4) 2 - cyano -3 -oxo pentanoic acid

12. The IUPAC name of the compound CH_2 (OH) $CH(NH_2)COOH$ isA

1) 2-Amine-3-hydroxy propanoic acid
2) 1-Hydroxy-2-amino propan-3-oic acid
3) 2-Amino-3-hydroxy propanoic acid
4) 1-Amino-2-hydroxy propanoic acid

13. The IUPAC name of $CH_3\ CH_2O\ CH_2\overset{O}{\overset{\|}{C}}\text{-H}$ is

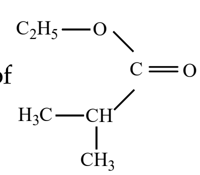
1) Formyl methyl ethyl ether
2) Ethyl aldo methyl ether
3) 2-Ethoxy formate
4) 2- Ethoxy ethanal

14. The correct IUPAC name of  is

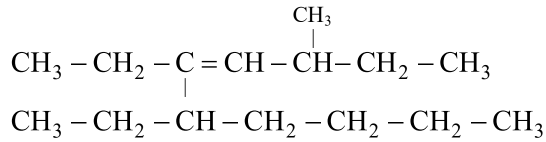
1) 1-Chloro -2-butyl cyclo propane
2) 1-Chloro-2-cyclopropyl butane
3) 1-Chloro methyl-1-ethyl cyclo propane
4) 3-Chloro methyl-1,2-methylene pentane

15. The correct IUPAC name of $CH_3-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-H$ is

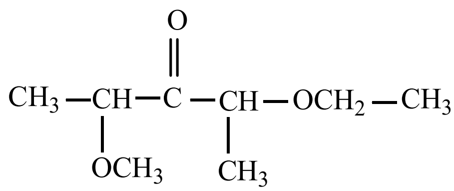
1) Acetyl methanoate
2) Keto ethanoate
3) Ethoxy methanoate
4) Ethanoic methanoic anhydride

16. The IUPAC name of 

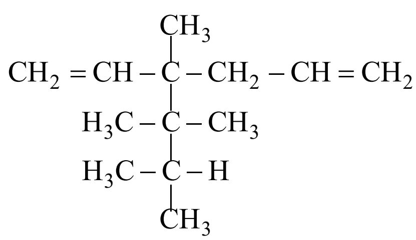
1) Ethoxy methanone
2) Ethoxy propanone
3) Ethyl-2-methyl propanoate
4) 2-methyl ethoxy propanone

17. Correct IUPAC name of  is

1) 5,6-Diethyl-3-methyl dec-4-ene
2) 5,6-Diethyl-8-methyl dec-6-ene
3) 6-Butyl-5-ethyl-3-methyl oct-4-ene
4) 2,4,5-triethyl-3-nonene

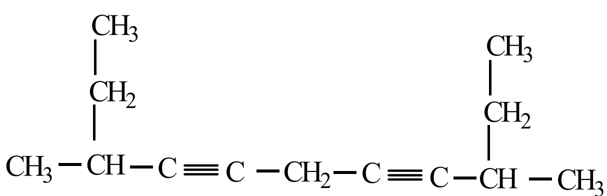
18. IUPAC name of 

1) 2-Methoxy-4-ethoxy-3-pentanone
2) 2-Ethoxy-4-methoxy-3-pentanone
3) 2,4-Dimethoxy hexanone
4) 2-Ethoxy-3-methoxy-3-pentanone

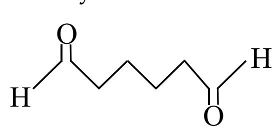
19. IUPAC name of 

1) 3-(1,1,2-trimethyl) propyl-1,5 hexadiene
2) 3-methyl-3-(1,1,2-trimethyl propyl) -1,5 hexadiene
3) 4-methyl-4-vinyl-5,5,6-trimethyl hept-1-ene
4) 4,5,5,6-tetra methyl-4-vinyl hept-1-ene

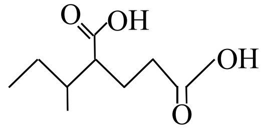
20. The correct IUPAC name of



1) 2,8-Diethyl-3,6-nonadiyne
2) 1,5-secondary butyl-1,4-pentadiyne
3) 1,8-dimethyl-4,7-undecadiyne
4) 3,9-dimethyl-4,7-undecadiyne

21. Write IUPAC name of 

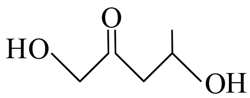
1) 5 - formyl Pentaneal
2) Hexanedial
3) Hexanol
4) 2 Methyl Hexeneal

22.  IUPAC name is

1) 4 - Corboxy - 5 methyl heptanoic acid.
2) 1, 3 dicarboxy4 - methyl hexane
3) 4-(1- Methyl Propyl) pentane dioicacid
4) 2-(1- methyl propyl) -1,5- pentane dioic acid.

23. The IUPAC name of $Ph-\overset{\overset{\displaystyle O}{\|}}{C}-CH_2-CH_2-CH_3$ is

1) Phenyl Propyl Ketone
2) 4 - Phenyl - 4-butanone
3) 1-Phenyl -1 - butanone
4) 1-oxol butyl benzene

24.  IUPAC name is

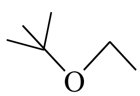
1) 3-hydroxy butanoic acid
2) 4-methyl -2- oxo-1,4 butane diol
3) 1,4 dihydroxy - 2-Butanone
4) 1,4 dihydroxy - 2- pentanone

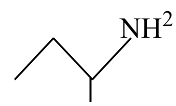
25. The IUPAC name of

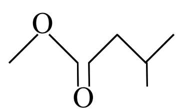
$CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-O-CH_2-CH=CHCH_3$

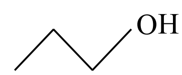
1) 1- acetyloxy -2- butane
2) 4-acetoxy 2-butane
3) 2-butenyl ethanoate
4) Methyl - 2-butanoate

26. Which of the following structure is not correctly named according of IUPAC

1)  2-Ethoxy-2 - methyl propane

2)  2 - Butanamine

3)  Methyl-3-Methyl Propanoate

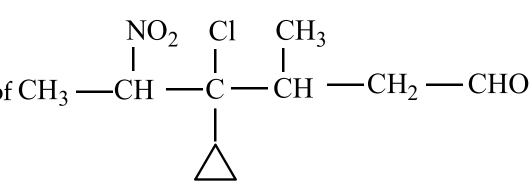
4)  1-Butanol

27. The IUPAC name of $\begin{array}{l} CH_2-COOH \\ | \\ C-(OH)\,COOH \\ | \\ CH_2COOH \end{array}$ is

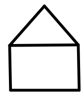
1) 2-hydroxy 1,2,3-propanetricarboxylic acid
2) 3-hydroxy 1,2,3 - Pentane trioic acid
3) 3-Carboxy -3-hydroxy-1,5-pentandioic acid
4) 1,2,3 - tri carboxy 2- propanol

28. The IUPAC name of $\begin{array}{ll} CH & = CH \\ | & \;\;| \\ CHO & NH_2 \end{array}$ is

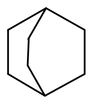
1) 1- amino-2-propenol
2) 1- amino-2-formyl ethene
3) 3-amino propenal
4) 1-oxo-3-propen amine

29. IUPAC name of 

1) 3-Chloro-3-cyclopropyl-2-methyl-4-nitro hexanal
2) 1-formyl-2-methyl-3-chloro-3-cyclopropyl 4-nitro pentane
3) 4-chloro -4-cylcopropyl-3-methyl-5-nitro hexanal
4) 3-chloro-3-cyclopropyl-2-nitro-4-methyl hexanal

30. The IUPAC name of the compound 

1) Bicyclo [2, 1, 0] pentane 2) 1, 2 cyclopropyl cyclo butane
3) cyclopentane (4, 3 annulene) 4) 1, 2 methyl cyclobutane

31. The compound  is known by which of the following names.

1) Bicyclo [2, 2, 1] octane 2) Bicyclo [2, 2, 2] octane
3) Bicyclo [1, 2, 1] octane 4) Bicyclo [1, 1, 1] octane

EXERCISE - I

WORK SHEET - I

1) 2	**2) 2**	**3) 3**	**4) 1**	**5) 4**	**6) 2**	**7) 2**	**8) 2**	**9) 1**	**10) 3**
11) 1	**12) 3**	**13) 1**	**14)2**	**15) 1**	**16) 2**	**17) 3**	**18) 4**	**19) 2**	**20) 4**
21) 1	**22) 4**	**23) 2**	**24) 3**	**25) 3**	**26) 1**	**27) 4**	**28) 1**	**29) 2**	**30) 1**
31) 2	**32) 2**	**33) 4**	**34) 3**	**35) 4**	**36) 1**	**37) 4**	**38) 3**	**39) 1**	**40) 2**
41) 1	**42) 4**	**43) 4**	**44) 2**	**45) 1**	**46) 3**	**47) 2**	**48) 3**	**49) 1**	**50) 3**
51) 2	**52) 2**	**53) 1**	**54) 1**						

WORK SHEET - II

1) 3	**2) 1**	**3) 4**	**4) 1**	**5) 1**	**6) 2**	**7) 4**	**8) 4**	**9) 4**	**10) 4**
11) 4	**12) 3**	**13) 4**	**14) 2**	**15) 4**	**16) 3**	**17) 1**	**18) 2**	**19) 2**	**20) 4**
21) 2	**22) 4**	**23) 3**	**24) 4**	**25) 3**	**26) 3**	**27) 1**	**28) 3**	**29) 3**	**30) 1**
31) 2									

ISOMERISM

EXERCISE - I

WORK SHEET - I

Isomerism

1. n-propyl amine and isopropyl amine are examples of
1) Position isomerism 2) Chain isomerism
3) Tautomerism 4) Geometrical isomerism

2. The number of primary alcoholic isomers with the formula $C_4H_{10}O$ is
1) 1 2) 2 3) 3 4) 4

3. The total number of structural and stereo isomers for the compound of the formula $C_4H_{10}O$ is
1) 7 2) 8 3) 4 4) 3

4. The type of isomerism that is not found in alkenes is
1) Metamerism 2) Chain isomerism
3) Geometrical isomerism 4) Position isomerism

5. An organic compound of structure $CH_3-CH_2-CH_2-CO-CH_3$ shows functional isomerism with another organic compound of structural formula---
1) $CH_3-CH_2-CO-CH_2-CH_3$ 2) $CH_3CH_2CH_2CH_2CHO$
3) $CH_3-CH=CH-CH_2-CH_2OH$ 4) 2 & 3

6. The number of possible isomers for C_3H_5N is
1) 2 2) 3 3) 4 4) 5

7. The number of Aromatic isomers for C_8H_{10}?
1) 1 2) 2 3) 3 4) 4

8. The number of isomeric amines possible for the formula C_3H_9N
1) 4 2) 3 3) 5 4) 6

9. Number of Structural isomers with the formula $C_4H_{11}N$
1) 2 2) 8 3) 6 4) 5

10. Compounds with $C_4H_{11}N$ as molecular formula can exhibit
1) Position isomerism 2) Metamerism 3) Functional isomerism 4) All the three

11. Ortho, meta and para dichlorobenzenes are
1) Chain isomers 2) Position isomers 3) Functional isomers 4) Tautomers

12. Primary, secondary and tertiary amines are
1) Chain isomers 2) Position isomers 3) Functional isomers 4) Tautomers

13. Which pair of isomers given below are position isomers
1) Propanal and propanone 2) 1^o Butyl alcohol and Isobutyl alcohol
3) 3^o butyl alcohol and Isobutyl alcohol 4) 2^o Butyl alcohol and 3^o Butyl alcohol

14. Which pair does not represent isomers ?
1) CH_3COOH and $HCOOCH_3$ 2) CH_3-CHO and $CH_2=CH-OH$
3) CH_3-CHO and $CH_3-CO-CH_3$ 4) $CH_3-CO\ CH_3$ and CH_3-CH_2-CHO

15. Number of isomers for the compound dihydroxy benzene
1) 1 2) 2 3) 3 4) 4

16. Which of the following is a pair of functional isomers ?
1) CH_3COCH_3. CH_3CHO 2) $C_2H_5CO_2H$, $CH_3CO_2CH_3$
3) $C_2H_5CO_2H$, $CH_3CO_2C_2H_5$ 4) CH_3CO_2H, CH_3CHO

17. Number of structural isomers which can be obtained theoretically on monochlorination of 2-methylbutane is
1) 1 2) 2 3) 3 4) 4

18. How many cyclic isomers of C_5H_{10} are possible ?
1) 4 2) 3 3) 6 4) 5

Optical isomerism :-

Organic Chemistry - Nomenclature

19. In the representation of specific rotation $\left([\alpha]_D^{25^0 C}\right)$, 'D' indicates

1) Dextro
2) Configuration of - OH group
3) Configuration of - NH_2 group
4) Wave length of light

20. A molecule as a whole is asymmetric if it does not passes

1) Plane of symmetry only
2) Centre of symmetry only
3) Axis of symmetry and alternating axis of symmetry only
4) All

21. **(1) :** CH_3 CH(OH) COOH is optically active

(R) : CH_3 CH(OH) COOH do not possess any element of symmetry.

The correct answer is

1) Both A and R are true and R explains A
2) Both A and R are true and R does not explains A
3) A is true, R is false
4) A is false, R is true

22. For an optically active compound 'αobs' depends on

1) Concentration
2) Length of polarimeter tube
3) Nature of solvent
4) Temperature

1) Only a and b 2) Only a, c and d 3) Only a and d 4) a, b, c and d

23. For an optically active compound specific rotation $\left([\alpha]_D^{25}\right)$ depends on

1) Length of the polarimeter tube
2) Concentration of solution
3) Temperature
4) Nature of the compound

1) All 2) Only b and c 3) Only a and c 4) Only d

24. Which will have enantiomers

1) n - butyl chloride 2) ter - butyl chloride 3) sec - butyl chloride 4) iso - butyl chloride

25. Optically active among the following is

1) Meso tartaric acid
2) dl - tartaric acid
3) Meso - 2, 3 - butanediol
4) Erythro - 2, 3 - dihydroxy butanoic acid

26. **(1) :** Meso tartaric acid is optically inactive

(R) : Meso tartaric acid has no asymmetric carbon

27. **(1) :** Meso - 2, 3 - butanediol is optically inactive

(R) : Meso - 2, 3 - butanediol has plane of symmetry

28. The number of optically active forms of the compound $CH_3CHBrCHBrCOOH$ is

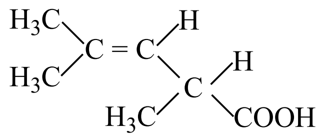
1) 0 2) 1 3) 3 4) 4

29. Which of the following will have a meso isomer

1) 2 - chlorobutane
2) 2, 3 - dichlorobutane
3) 2, 3 - dichloropentane
4) 2 - hydroxypropanoic acid

30. $(\pm)$ lactic acid is optically inactive due to

1) Internal compensation
2) External compensation
3) Presence of plane of symmetry
4) Absence of asymmetric carbon

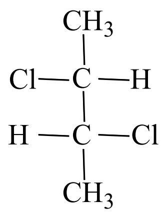
31. The structure can exhibit 

1) Geometrical isomerism 2) Optical isomerism
3) Geometrical and optical isomerism 4) Tautomerism

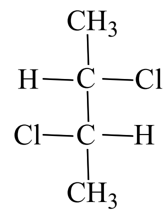
32. The molecule H_3C - CH = CH - CH - COOH can exhibit
1) Geometrical isomerism only 2) Optical isomerism only
3) Geometrical and optical isomerism 4) Tautomerism

33. If the racemic mixture of a carboxylic acid is treated with a dextro rotatory amino acid then the products formed are
1) a mixture of enantiomers 2) a mixture of diastereomers
3) a mixture of optically inactive compounds
4) a mixture of compounds having same melting point and solubility

34.

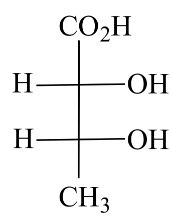


(I)



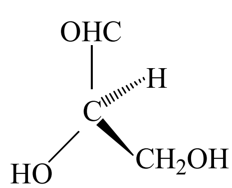
(II)

If the specific rotation produced by the compound 'I' is $+52^0$, then the specific rotation of compound 'II' is
1) -52^0 2) $+52^0$ 3) 0 4) Unpredictable

35. The incorrect statement about 

1) It is erythro diastereomer 2) It has 2R, 3R configuration
3) It is meso form 4) 1 and 2

36. Which statement is incorrect about diasteriomers
1) Both are non super imposable non mirror images
2) Physical properties are different
3) Both are always chiral molecules 4) Both may or may not opticall acitve

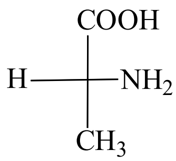
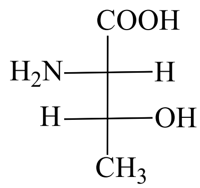
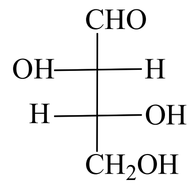
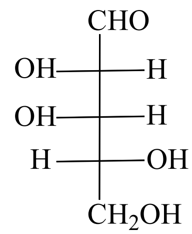
37. The configuration of 

1) D 2) L 3) E 4) Z

38. In case of carbohydrates D,L indicates the
1) Configuation of – OH at last chiral carbon
2) Configuration of – OH at first chiral carbon
3) Configuration of – OH at second chiral carbon

4) Configuration of – OH at at all chiral carbon

39. Among the following which has L – configuration.

1)  2)  3)  4) 

40. If a compound has 'n' different types of asymmetric carbon atoms then the number of possible sterio isomers are

1) 2^{n-1} 2) 2^n 3) 3^n 4) 2n

41. $CH_3CH(OH)CH(OH)COOH$. Total number of possible sterio isomers (configurational only) are

1) 4 2) 3 3) 2 4) 8

42. For tartaric and total number of possible sterio isomers (configurations only) and total no.of possible optically active isomers are

1) 4,4 2) 3,3 3) 4,2 4) 3,2

43. Total number of possible isomers (configuartion only) for 2,3,4 – trichlorohexane are

1) 2 2) 4 3) 8 4) 16

44. Maximum number of possible stereoisomers (configuration only) with the formula $CH_3CH = CHCH(CH_3)COOH$

1) 2 2) 3 3) 4 4) 6

45. Maximum number of possible sterioisomers (configurational only) with the molecular formula $C_4H_{10}O$ are

1) 1 2) 2 3) 4 4) 7

46. Type of isomerism not possible with the molecular formula $C_4H_{10}O$ is

1) Chain 2) Optical 3) Functional group 4) Geometrical

47. The number of possible enantiomeric pairs that can be produced during the monochlroination of n - pentane is (are)

1) 1 2) 2 3) 3 4) 4

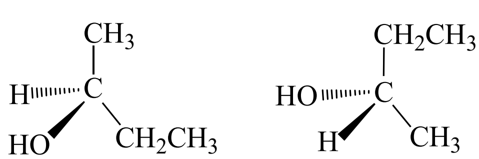
48. Number of possible geometrical isomers for 2, 4 - hexadine are

1) 8 2) 4 3) 3 4) 2

49. The number of optical isomers of the compound is ? $CH_3CHCl-CHBr-CH_3$

1) 0 2) 1 3) 3 4) 4

50. The pair of structures given below represent



1) Enantiomers 2) Diastereomers 3) Same molecule 4) Regiomers

51. Which of the following statements is not applicable to enantiomers ?

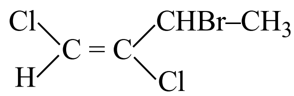
1) They have identical melting and boiling points

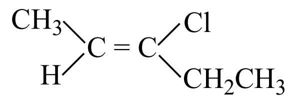
2) They have identical chemical properties except towards optically active reagents

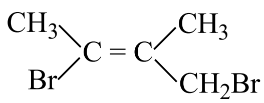
3) They can be separted by fractional crystallization

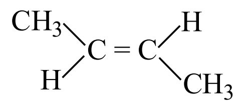
4) They rotate the plane polarized light in opposite directions but to the same extent

52. Which of the following will show optical isomerism ?

1) 

2) 

3) 

4) 

53. 2, 3-Pentadiene shows enantiomorphism since it
1) contains one chiral carbon atom
2) contains two chiral atoms but the molecule as a whole is achiral
3) does not contain any chiral carbon atom but the molecule as a whole is chiral
4) none of the above

54. How many chiral carbon atoms are present in 2, 3, 4 - trichoropentane ?
1) 3 2) 2 3) 1 4) 4

55. How many structural and isomers could be obtained by replacing one hydrogen of propene with chlorine ?
1) 2 2) 4 3) 3 4) 5

CONFORMATIONAL ISOMERISM :

56. The dihedral angle between the hydrogen atoms of two methyl groups in staggered conformation of ethane is
1) 120° 2) 180° 3) 45° 4) 60°

57. The dihedral angle between the two methyl groups in gauche conformation of n-butane is
1) 120° 2) 180° 3) 45° 4) 60°

58. The most stable conformation of ethylene glycol is
1) Anti 2) Gauche 3) Partially eclipsed 4) Fully eclipsed

59. Which of the following does not show geometrical isomerism ?
1) 1, 2 - dichloro -1- pentence 2) 1, 3 - dichloro -2- pentence
3) 1, 1 - dichloro -1- pentence 4) 1, 4 - dichloro -2- pentence

WORK SHEET - II

1. The number of isomeric structures possible for a molecule having molecular formula C_5H_{12}
1) 2 2) 3 3) 4 4) 5

2. A pair of functional isomers
1) $CH_3CH_2CH_2OH$, $CH_3CH(OH)CH_3$
2) $CH_3CH_2CH_2CH_2OH$, $(CH_3)_2CHCH_2OH$
3) $CH_3CH_2CH_2OH$, $CH_3CH_2CH_2Cl$
4) $CH_3CH_2CH_2OH$, $CH_3–O–CH_2CH_3$

Organic Chemistry - Nomenclature

WORK SHEET - III

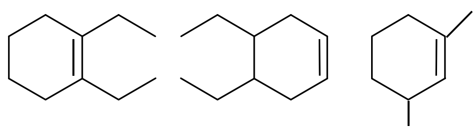
Topic : GEOMETRICAL ISOMERISM

SECTION - A

Single correct answer Type Questions

01. Geometrical isomerism is possible about which of the following multiple bonds ?

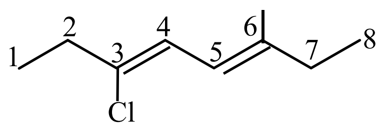
1) C = N 2) N = N
3) both a and b 4) none of these

02. 

I II III

Which of these cycloalkenes will exhibit geometrical isomerism ?

1) I 2) II 3) III 4) all of these

03. 

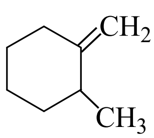
This compound can be named as

1) 3-chloro-6-methyl-(3E,5Z)-octadiene 2) 3-chloro-6-methyl-(3Z,5E)-octadiene
3) 3-chloro-6-methyl-(3Z,5Z)-octadiene 4) 3-chloro-6-methyl-(3E,5E)-octadiene

04. $CH_2 = CH - CH = CH - CH = CH - CH_3$

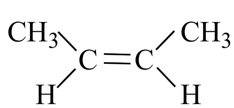
How many geometrical isomers of this compound are possible ?

1) 2 2) 3 3) 4 4) 8

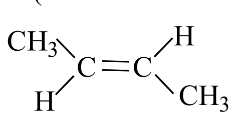
05. 

How many grometrical isomers of this compound are possible ?

1) 0 2) 2 3) 3 4) 4

06. I 

(cis-2-butene

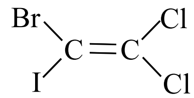
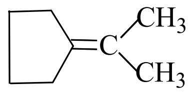
II 

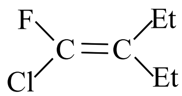
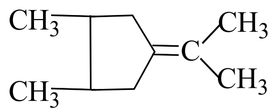
(trans-2-butene

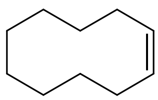
Which of the following orders stability is correct among these two isomers ?

1) I = II 2) I > II 3) II > I 4) not predictable

07. Which of following compound can show geometrical isomerism ?

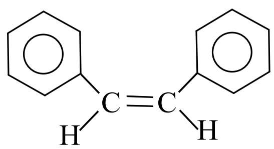
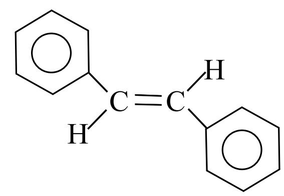
1)  2) 

3)  4) 

08. 

How many geometrical isomers of this cylcodecene are possible ?

1) 0 2) 2 3) 3 4) 4

09. I  II 

Which of the following orders of stability is correct among these two isomers ?

1) I = II 2) I > II 3) II > I 4) not predictable

10. Difference in heat of hydrogenation of cis and trans isomers will be maximum in which of the follwoing cases?

1) CH_3-CH=CH-CH_3 2) CH_3-CH=CH-CMe_3

3) Me_3C-CH=CH-CMe_3 4) Same difference in a, b and c

SECTION - B

More than one correct answer Type Questions

11. Of the following compounds, which will have zero dipole moment?

1) 1,1- dichloroethylene 2) cis-1, 2,- dichloroethylene

3) trans-1,2-dichloroethylene 4) Benzene

12. The molecules that will have dipole moment are

1) 2,2-dimethylpropane 2) cis-3-hexene 3) 2,2,3,3-tetramethylbatane

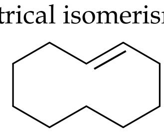
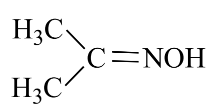
4) trans-2,2-pentene

13. An organic compound with molecular formula C_2H_5NO contains doubly linked atoms. It exhibits.

1) tautomerism 2) optical isomerism

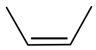
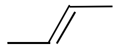
3) functional isomerism 4) geometrical isomerism

14. Which will show geometrical isomerism ?

1) CH_3CH=NOH 2)  3)  4) HO-N=N-OH

15. CHCOOH
||
CHCOOH (maleic aci4) can form :

1) optical isomer 2) grometrical isomer 3) position isomer 4) functional isomer

16.  

P Q

Which is/are correct statements about *P* and *Q*?

1) *P* is *cis*- and *Q* is *trans*- 2) *P* is *Z* and *Q* is *E*

3) *P* is *R* and *Q* is *S* 4) *P* and *Q* are same structure

WORK SHEET - IV

Topic : OPTICAL ISOMERISM

SECTION - A

Single correct answer Type Questions

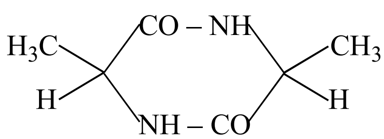
01. A compound contains 2 dissimilar asymmetric carbon atoms. The number of optical isomers is

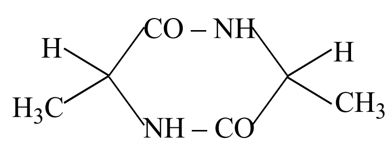
1) 2 2) 3 3) 4 4) 5

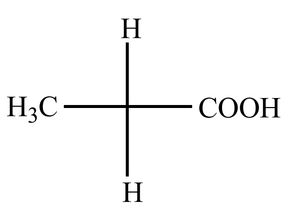
02. How maby total isomers are possible by replacing one hydrogen atom of propane with chlorine

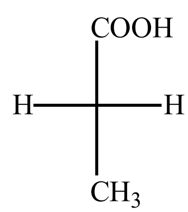
1) 2 2) 3 3) 4 4) 5

03. Which of the following does not show stereoisomerism ?

1) 

2) 

3) 

4) 

04. Cahn-Ingold-Prelog sequence rule states that

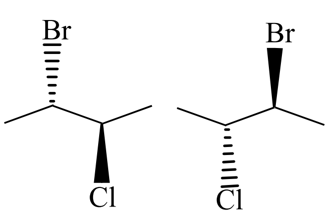
1) that group will be of higher priority in which first atom is of higher atomic number (higher atomic weight in case of isotapes) and if first atom is same then this operation is done on second present.

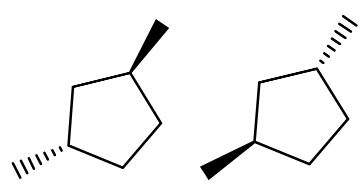
2) that group will be of higher priority in which maximum number of atoms are present.

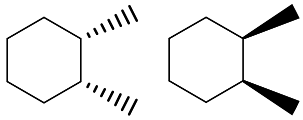
3) that group will be of higher priority in which minimum number of atoms are present.

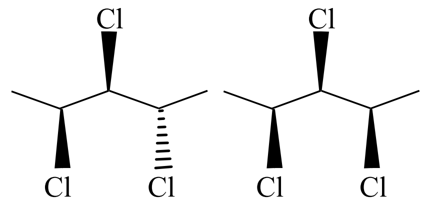
4) both a and b

05. Which of the following pairs of compounds is a pair of enantiomers ?

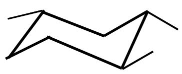
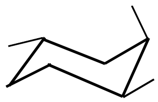
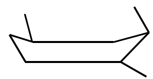
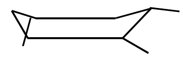
1) 

2) 

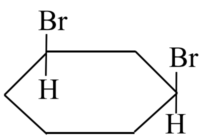
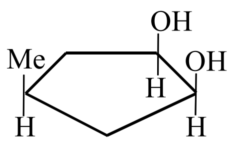
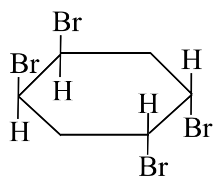
3) 

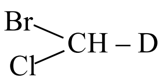
4) 

06. Among the structure shown below, which has lowest potential energy ?

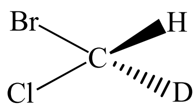
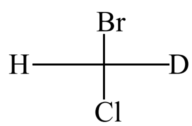
1)  2)  3)  4) 

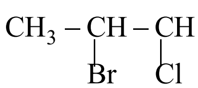
07. Which of the following compound is (meso) compounds ?

1)  2)  3)  4) All

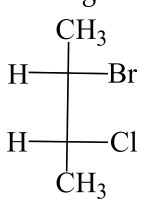
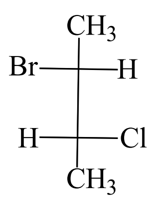
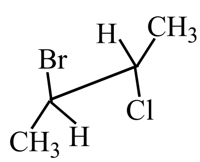
08. 

This molecule has one asymmetric centre. Which of the following presentations of this asymmetric centre is called wedge presentation ?

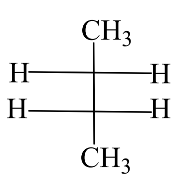
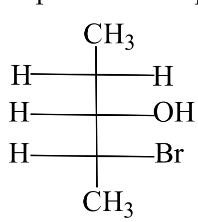
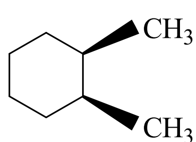
1)  2)  3) both a and b 4) none of these

09. 

Which of the following presentations is a fischer projection formula of this molecule containing two asymmetric centres is correct ?

1)  2)  3)  4) both a and b

10. Which of the following compounds have plane of symmetry ?

1)  2)  3)  4) all of these

EXERCISE - I

WORK SHEET - I

1) 1	2) 2	3) 2	4) 1	5) 4	6) 4	7) 4	8) 1	9) 2	10) 4
11) 2	12) 3	13) 3	14) 3	15) 3	16) 2	17) 4	18) 4	19) 4	20) 4
21) 1	22) 4	23) 4	24) 4	25) 4	26) 3	27) 1	28) 4	29) 2	30) 2
31) 2	32) 3	33) 2	34) 1	35) 3	36) 3	37) 1	38) 1	39) 2	40) 2
41) 1	42) 4	43) 3	44) 3	45) 2	46) 4	47) 1	48) 3	49) 4	50) 3
51) 3	52) 1	53) 3	54) 2	55) 2	56) 2	57) 4	58) 1	59) 3	

WORK SHEET - II

1) 2	2) 4

WORK SHEET - III

1) 3	2) 2	3) 2	4) 3	5) 1	6) 3	7) 4	8) 2	9) 3	10) 3
11) 3	12) 24	13) 34	14) 124	15) 234	16) 12				

WORK SHEET - IV

1) 3	2) 1	3) 3	4) 1	5) 2	6) 1	7) 4	8) 1	9) 4	10) 4

BOND POLARITY EFFECTS&TYPES OF REACTIONS

EXERCISE - I

1. Electrophiles are
   1) Electron loving species 2) Electron hating species
   3) Necleus loving 4) Nucleus hating
2. The species having trigonal planar shape is
   1) CH_3^+ 2) $:CH_3^-$ 3) BF_4^- 4) SiH_4
3. Which of the following is not an electrophile?
   1) BF_3 2) $AlCl_3$ 3) $ZnCl_2$ 4) NH_3
4. Which of the following is not a nucleophile ?
   1) OH^- 2) HSO_3^{-} 3) NH_3 4) BF_3
5. Which of the following free radical is most stable ?
   1) Tertiary 2) secondary 3) Primary 4) Methyl
6. Which of the following is a free radical ?
   1) NO_2^- 2) Cl^- 3) $Cl^\bullet$ 4) Cl^+
7. Heterolysis of a C–C covalent bond gives
   1) Carbanion 2) Carbonium ion 3) Free radical 4) Both 1 and 2
8. In carbonium ion, the carbon bearing the positive charge is
   1) sp^2 hybridised 2) sp^3 hybridised 3) dsp^3 hybridised 4) None
9. Shape of carbanion is
   1) Planar 2) Pyramidal 3) Tetrahedral 4) Linear
10. Shape of carbonium ion is
    1) Planar 2) Linear 3) Octahedral 4) Tetrahedral
11. Which of the following types of reactions majarly occur when a reactant has a double bond ?
    1) Addition 2) Substitution 3) Elimination 4) Photolysis
12. The +I (inductive effect) is shown by
    1) CH_3 – 2) -OH 3) F 4) $-C_6H_5$
13. The -I effect is shown by ?
    1) -COOH 2) $-CH_3$ 3) $-CH_3CH_2$ 4) $-CHR_2$
14. Which of the following groups has highest inductive effect ?
    1) CH_3- 2) CH_3CH_2- 3) $(CH_3)_2CH$– 4) $(CH_3)_3C$-
15. Shifting of electrons of a multiple bond under the influence of a reagent is called
    1) I-effect 2) M-effect 3) E-effect 4) T-effect
16. The cleavage of covalent bond $A - B \rightarrow A^\bullet + B^\bullet$ is known as
    1) Heterolytic fission 2) Homolytic fission
    3) Carbanion formation 4) Carbocation formation
17. The reaction of HBr with ethene is an example of reaction
    1) Polymerisation 2) Substitution 3) Addition 4) Condensation
18. Which of the following substituents has +M (Mesomeric) effect ?
    1) -CN 2) -CHO 3) $-NH_2$ 4) $-NO_2$
19. The C-C bond dissociation energy is

1) 103 K cals $mole^{-1}$ 2) 83 K cals $mole^{-1}$ 3) 8.3 K cals $mole^{-1}$ 4) 83 cals $mole^{-1}$

20. Which of the following show electromeric effect ?
1) Alkanes 2) Alkyl amines 3) Alkyl halides 4) Aldehydes

21. Which of the following ions does not show resonance ?
1) NO_3^{-} 2) CH_3COO^{-} 3) Cl^{-} 4) $CO^{2}{}_3^{-}$

22. The bond length is affected by
1) Hybridisation 2) Delocalisation 3) Electronegativity 4) All of the above

23. Mesomeric effect is a permanent effect in which π electrons are transferred from a
1) Multiple bond to an atom 2) Multiple bond to a single covalent bond
3) Both 1 and 2 4) None

24. Free radical reactions
1) Occur in gas phases 2) Are often autocatalytic
3) Are initiated by light, oxygen or peroxides 4) All are correct

25. Which of the folowing occur as reaction intermediate ?
1) Free radicals 2) Carbocations 3) Carbanions 4) All

26. Which of the following is a more stable carbocation?
1) Sec. pentyl carbocation 2) Isopentyl carbocation
3) Tert. Pentyl carbocation 4) Neopentyl carbocation

27. -CHO group is
1) +ME and +IE group 2) -ME and -IE group 3) +ME and -IE group 4) -ME and +IE group

28. Which one of the following alkyl groups is more powerful electron donation group when they are attached to saturated carbon
1) $-CH(CH_3)_2$ 2) $-CH(CH_3)C_2H_5$ 3) $-CH_3$ 4) $-C(CH_3)_3$

29. An example of electrophile is
1) CN^- 2) OH^- 3) $AlCl_3$ 4) H_2

30. An example of nucleophile is
1) C_2H_6 2) C_2H_2 3) H^+ 4) R^+

31. Which one of the following is not an electrophile?
1) RNH_2 2) ROR 3) R-OH 4) All

32. $C_2H_5Br + NaOH \rightarrow C_2H_5OH + NaBr$, the above reaction is
1) Free radical substitution 2) Nucleophilic substitution
3) Electrophilic substitution 4) Condensation

33. The hybridization of central carbon atom in trimethyl free radical is
1) sp 2) sp^2 3) sp^3 4) may be sp^2 or sp

34. A carbocation in which no dispersal of charge is
1) $R_3C^{\oplus}$ 2) $R_2CH^{\oplus}$ 3) $RCH_2^{\oplus}$ 4) $^{\oplus}CH_3$

35. The most stable electrophile is
1) $R_3\overset{\oplus}{C}$ 2) $C_6H_5\overset{\oplus}{C}H_2$ 3) $(C_6H_5)_3\overset{\oplus}{C}$ 4) $(CH_3)_2\overset{\oplus}{C}H$

36. Which of the following effects can explain the stability of tertiary butyl carbonium ion?
1) Electrometic 2) Inductive 3) Hyper Conjugation 4) Both 2 and 3

37. The most stable methylated alkene is

1) $\begin{array}{c} H_3C \quad CH_3 \\ | \quad\; | \\ C = C \\ | \quad\; | \\ H_3C \quad CH_3 \end{array}$ 2) $\begin{array}{c} H_3C \quad CH_3 \\ | \quad\; | \\ C = C \\ | \quad\; | \\ H_3C \quad H \end{array}$ 3) $\begin{array}{c} H_3C \quad H \\ | \quad\; | \\ C = C \\ | \quad\; | \\ H_3C \quad H \end{array}$ 4) $\begin{array}{c} H_3C \quad H \\ | \quad\; | \\ C = C \\ | \quad\; | \\ H \quad H \end{array}$

38. Which is least stable ?

1) $\bullet CH_3$ 2) $\bullet CH_2 - CH_3$ 3) $CH_3 - \dot{C}H - CH_3$ 4) $\begin{array}{c} CH_3 - \dot{C}H - CH_3 \\ | \\ CH_3 \end{array}$

39. Which of the following statements about resonance is not correct ?

1) The different resonance structures of a molecule have fixed arrangement of atomic nuclei.

2) The different resonance structures of a molecule should have same number of unpaired electrons

3) The hybrid structure has equal contribution from all the resonating strctures

4) None of the individual resonating structures explains the various characteristics of the molecule

40. Homolytic fission of C-C bond in ethane gives an intermediate in which carbon is

1) sp^3 – hybridized 2) sp^2 – hybridized 3) sp – hybridized 4) sp^3d hybridized

41. The order of decreasing stability of the carbanions

$(CH_3)_3C^-(I);(CH_3)_2CH^-(II);\ CH_3CH_2^-(III);\ C_6H_5CH_2^-(IV)$

1) I>II>III>IV 2) IV>III>II>I 3) IV>I>II>III 4) I>II>IV>III

WORK SHEET - II

1. Which of the following has highest bond disociation energy

1) CH_3-F 2) CH_3-Cl 3) CH_3-Br 4) CH_3-I

2. The group which exhibits -M effect is

1) >C=O 2) -C$\equiv$N 3) -NO_2 4) All

3. Which of the following statement about inductive effect is correct ?

1) It operate in saturated compounds

2) It involves electrons in σ bond

3) The electron pairs is only slightly displaced during the I-effect

4) All are correct

4. Mark the true statement concerning mesomeric effect ?

1) It occurs in conjugaged compounds 2) It involves electrons in π bonds

3) Here electron pair is transferred completely 4) All are true

5. A series of alkyl groups CH_3, -CH_3CH_2-, $(CH_3)_2CH$-, $(CH_3)_3C$- represents

1) Increasing hyperconjugation from left to right

2) Decreasing hyperconjugation from left to right

3) Decreasing inductive effect from L to R

4) None

6. Pick up the incorrect statement

1) Mesomeric effect occurs in conjugated compounds

2) Inductive effect transmitted over only quite a short length

3) Due to mesomeric effect, electron pairs is transferred completely

4) Inductive effect is a polarisability effect

7. In benzylamine amino group is a

1) -IE group　2) +ME group　3) both　4) +IE group

8. Which one of the following does not exhibit hyperconjugation?

1) Ethanal　2) Allylene

3) Isobutylene　4) Trifluro acetaldehyde

9. Benzyl cation is stabilized by

1) Resonance　2) Hyperconjugation　3) Both　4) Inductive

10. Which one of the following is most stable ?

1) Isobutylene　2) 2-Methyl-2-butene　3) 2,3-Dimethyl-2-butene　4) Ethylene

11. Match List-1 (ion/radical) with List-II (stabilisation) and select the correct answer using the codes given below the lists

List-1	**List-2**
A) $^{0}C(CH_3)_3$(Free radical)	1) Inductive effect
B) PhO^-	2) Hyperconjucation
C) $^{+}CH_2C(CH_3)_3$	3) Resonance

1) A-1, B-2, C-3　2) A-2, B-1, C-3　3) A-3, B-1, C-2　4) A-2, B-3, C-1

12. Which of the following is the least stable carbonium ion ?

1) $\overset{\oplus}{C}F_3$　2) $\overset{\oplus}{C}Cl_3$　3) $\overset{+}{C}(NO_2)_3$　4) $\overset{\oplus}{C}H_3$

13. Which of the following Carbonium ion is stabilised by HyperConjugation ?

1) $CH_2 = CH - \overset{\oplus}{C}H_2$　2) $CH_3 - CCl_2 - \overset{\oplus}{C}H_2$　3) $CH_2 = CH^{\oplus}$　4) $CH_3 - \overset{\oplus}{C}H - CH_3$

14. Which of the following is stabilised by mesomesic effect ?

1) $CH_3 - \overset{\oplus}{C}H_2$　2) $CH_2 = \overset{\oplus}{C}H$　3) $CH_2 = CH - \overset{\oplus}{C}H_z$　4) $\underset{\displaystyle NO_2}{\underset{|}{CH_2}} - \overset{\oplus}{C}H_2$

15. Which of the following has maximum number of Hyper Conjugation structures ?

1) isopropyl carbonium ion　2) tertinary butyl carbonium ion

3) n-propyl carbonium ion　4) Benzyl carbonium ion

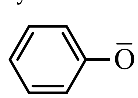
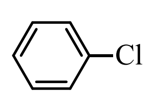
16. Which of the following shows maximum-I effect ?

1) $-CH_3$　2) $-OCH_3$　3) $-NO_2$　4) -Cl

17. β - elimination reaction leads to formation of

1) carbene　2) π -bond　3) Sigmabond　4) Cyclic compound

18. The substance stabilized by resonance

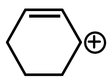
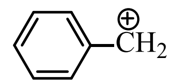
1) $CH_2 = CH - Cl$　2) 　3) 　4) All

19. Which of the following compounds will produce the most stable carbonium ion?

1) $CH_3\underset{\underset{CH_3}{|}}{CH}-CH_2-OH$ 2) $CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-OH$

3) $CH_3-\underset{\underset{OH}{|}}{CH}-CH_2-CH_3$ 4) $CH_3-CH_2-CH_2-CH_2-OH$

20. Which carbonium ion is most stable

1)  2) $CH_2=\overset{\oplus}{C}H$ 3) $(CH_3)_3C^{\oplus}$ 4) 

EXERCISE - I / ANSWERS

WORK SHEET - I

1) 1	**2) 1**	**3) 4**	**4) 4**	**5) 1**	**6) 3**
7) 4	**8) 1**	**9) 2**	**10) 1**		
11) 1	**12) 1**	**13) 1**	**14) 4**	**15) 3**	**16) 2**
17) 3	**18) 3**	**19) 2**	**20) 4**		
21) 3	**22) 4**	**23) 3**	**24) 4**	**25) 4**	**26) 3**
27) 2	**28) 4**	**29) 3**	**30) 2**		
31) 4	**32) 2**	**33) 2**	**34) 4**	**35) 1**	**36) 4**
37) 1	**38) 1**	**39) 3**	**40) 2**		
41) 2					

WORK SHEET - II

1) 1	**2) 4**	**3) 4**	**4) 4**	**5) 2**	**6) 4**
7) 2	**8) 4**	**9) 1**	**10) 3**		
11) 4	**12) 3**	**13) 4**	**14) 3**	**15) 2**	**16) 3**
17) 2	**18) 4**	**19) 2**	**20) 2**		

QUALITATIVE & QUANTITATIVE ANALYSIS

EXERCISE - I

PURIFICATION

1. The best method to separate the mixture of ortho & Para nitrophenol (1 : 1) is
   1) Steam distillation 2) crystallisation 3) Vapourisation 4) Colour spectrum

2. Benzoic acid mixed with napthalene can be purified by
   1) Treating the mixture with hot water 2) Sublimation
   3) Treating the mixture with cold water 4) Dissolving the mixture in benzene

3. Turpentine oil can be purified by this process
   1) Steam distillation 2) Vacuum distillation 3) Simple distilaltion 4) Fractional distillation

4. There are several criteria of purity of organic compounds. Out of the following, which is considered to be the best?
   1) Melting point 2) Mixed melting point
   3) Microscope examination 4) Colour

5. Fractional crystallization is carried out to separate
   1) Organic solids mixed with inorganic solids
   2) Organic solids highly soluble in water
   3) Organic solids having small difference in their solubilities in a suitable solvent
   4) Organic solids having great difference in their solubilities in a suitable solvent

6. Lassaigne's solution is boiled with dilute HNO_3 before testing for halogens because
   1) Silver halides are insoluble in HNO_3 2) Na_2S and NaCN are decomposed by HNO_3
   3) Ag_2S is soluble in HNO_3 4) AgCN is soluble in HNO_3

7. For which of the following compounds the Lassaigne's test of nitrogen will fail?
   1) H_2NCONH_2 2) H_2NNH_2. 2HCl 3) $C_6H_5NH_2$ 4) CH_3CONH_2

8. If 0.02 g of a volatile compound on heating displaces 11.2 ml of dry air at STP, the molecular weight of the compound is
   1) 20 2) 30 3) 40 4) 50

9. Kjeldahl's method cannot be used for the estimation of nitrogen in
   1) Pyridine 2) Nitro compounds 3) Azo compounds 4) All the three above

10. Sugar containing an impurity of common salt can be purified by crystallisation from
    1) Benzene 2) Ether 3) Alcohol 4) Water

11. Mixture of glucose and water can be separated by :
    1) Distillation 2) Crystallation 3) Steam distillation 4) All of these

12. Water from the mixture of alcohol and water can be separated by :
    1) Simole distillation 2) Fractional distillation
    3) Azeotropic distillation 4) Steam distillation

13. Presence of nitrogen in organic compound is tested as :
    1) Nitrogen gas 2) NH_3 3) NO 4) $\overset{\ominus}{CN}$

14. When $FeSO_4$ is added in the sodium extract the compound formed as
1) Only $Na_4[Fe(CN)_6]$ 2) Only $Fe(OH)_2$
3) Only Na_2SO_4 4) Mixture of these three

15. Sodium extract gives blood red colour when treated with $FeCl_3$. Formation of blood red colour confirms the presence of
1) Only nitrogen 2) Only sulphur
3) Only halogens 4) Nitrogen and Sulphur both

16. Beilstein's test is used for the detection of
1) Nitrogen 2) Sulphur 3) Halogens 4) Phosphorus

17. In quantitative determination of carbon the CO_2 produced is absorbed in the solution of
1) Pyrogallol 2) KOH 3) $Ca(OH)_2$ 4) Any one of these

18. In Duma's method percentage of nitrogen in organic compound is estimated in the form of
1) N_2 gas 2) NO 3) NH_3 4) B_2O_5

19. In which of the following compounds percentage of nitrogen cannot be estimated accurately by Kjeldathl's method?
1) Urea 2) Phenyl hydrazine 3) Nitrobenzene 4) Gaunidine

20. In Carius method halogens are estimated as
1) X_2 2) BaX_2 3) PbX_2 4) AgX

21. 0.73 g of organic compound on oxidation gave 1.32 g of carbon dioxide. The percentage of carbon in the given compound will be
1) 49.32 2) 59.32 3) 29.32 4) 98.64

22. 0.365 g of an organic compound containing nitrogen gave 56 ml of nitrogen at S.T.P. The percentage nitrogen in the given compound is
1) 19.18 2) 38.36 3) 9.18 4) 29.18

23. 0.303 g of sample was analysed for nitrogen by Kjeldahl's method. The ammonia gas evolved was absorbed in 50 ml of 0.05 M H_2SO_4. The excess acid required 25 ml of 0.1 M NaOH for neutralisation. The percentage of nitrogen in the given compound is
1) 11.5 2) 23 3) 12.5 4) 14.5

24. Four binary mixtures are given below with their bp's. Which of them can be separated by simple distillation
1) $A(b.p.80^0 C) + B(b.p.90^0 C)$ 2) $A(b.p.80^0 C) + C(b.p.20^0 C)$
3) $B(b.p.90^0 C) + D(b.p.70^0 C)$ 4) $D(b.p.70^0 C) + E(b.p.75^0 C)$

25. fractional distillation is used to separate liquids which differ in their b.p. by
1) 5^0C 2) 10^0C to 20^0C 3) 30 – 80^0C 4) 3^0C

26. Two substances when separated on the basis of partition coefficient between two liquid phases, the technique is known as
1) Column chromatography 2) Paper chromatography
3) GLC 4) TLC

27. Absolute alcohol is prepared from rectified spirit by
1) Fractional distillation 2) Steam distillation
3) Azeotropic distillation 4) Vacuum distillation

28. An organic compound containing carbon, hydrogen and nitrogen have the percentage, 40, 13.33 and 46.67 respectively. Its empirical formula will be

1) C_2H_7N 2) $C_2H_7N_2$ 3) CH_4N 4) CH_5N

29. The least technique used for the purification of organic compounds containing minute amount is

1) Chromatography 2) Sublimation 3) Crystallisation 4) Distillation

30. Compound (X) of molecular formula C_4H_8 takes up one equivalent of hydrogen in presence of Pt to form another compound (Y). [X] on ozonolysis gives acetaldehyde as the only product. Compound [X] is

1) $CH_3-CH_2-CH=CH_2$ 2) $CH_3-CH=CH-CH_3$

3) Cyclobutane 4) Cyclobutene

31. An unknown organic compound is soluble in water. It gives negative test with 2, 4-DNP but positive test with Lucas reagent. Compound should have

1) –COOH group 2) –OH group 3) Keto group 4) Amide group

32. Lassaigne's extract of m-nitrochlorobenzene is acidified with dil. HNO_3 and then treated with $AgNO_3$ solution, the white precipitate formed is due to

1) $AgCl$ 2) AgCN 3) both a and b 4) Ag_2O

33. An organic compound [X] of the formula C_7H_8O is soluble in NaOH but not in $NaHCO_3$. It gives colour with alcoholic $FeCl_3$. On treatment with bromine water it gives a tribromo product. The compound (1) is

1) o-cresol 2) m-cresol 3) p-cresol 4) either of the three

WORK SHEET - II

Topic : PURIFICATION AND DETECTION OF ELEMENTS

SECTION - A

Single correct answer Type Questions

1. A mixture of acetone and methanol can be separated by :

1) vacuum distillation 2) steam distillation 3) fractional distillation 4) none of these

2. Aniline is purified by :

1) steam distillation 2) simple distillation 3) vacuum distillation 4) extraction with a solvent

3. Absolute alcohol is prepared from rectified spirit by :

1) fractional distillation 2) steam distillation

3) azeotropic distillation 4) vacuum distillation

4. In paper chromatography:

1) mobile phase is liquid and stationary phase is solid

2) mobile phase is solid and stationary phase is liquid

3) both phases are solids 4) both phases are liquids

5. The most satisfactory method of separating sugars from each other is :

1) fractional crystallization 2) sublimation

3) chromatography 4) benedict solution

6. Anthracene is purified by :

1) filtration 2) crystallization 3) distillation 4) sublimation

7. An organic substance from its aqueous solution can be separated by

1) solvent extraction 2) steam distillation 3) distillation 4) fractional distillation

8. Distillation involves all the following processes except:

1) change of state 2) boiling 3) condensation 4) evaporation

9. Simple distillation can be used to separate

1) a mixture of benzene (b.p. $80^0$3) and toluene (b.p.110^0C)

2) a mixture of ether (b.p. $35^0$3) and toluene (b.p.110^0C)

3) a mixture of ethanol (b.p. $78^0$3) and water (b.p.$100^0$3)

4) none of the above

10. Impure glycerine can be purified by:

1) steam distillation 2) vacuum distillation 3) simple distillation 4) extraction with a solvent

EXERCISE - I / ANSWERS

WORK SHEET - I

1) 1 2) 1 3) 1 4) 2 5) 3 6) 2 7) 2 8) 3 9) 4 10) 1

11) 3 12) 4 13) A 14) 3 15) 4 16) 4 17) 4 18) 3 19) 2 20) 1

21) 3 22) 1 23) 1 24) 2 25) 2 26) 2 27) 3 28) 3 29) 1 30) 2

31) 2 32) 3 33) 2

WORK SHEET - II

1) 3 2) 1 3) 3 4) 1 5) 3 6) 4 7) 1 8)4 9) 2 10) 2

ALKANES

EXERCISE - I

1. Along with methane, natural gas contains ---% ethane
1) 90-95 2) 70-80 3) 50-60 4) 10-20

2. When ethyl bromide is heated with sodium in dry ether solvent, the alkane obtained is
1) Butane 2) Propane 3) Ethane 4) A mixture of the above three

3. When a mixture of methy iodide and ethyl iodide are heated with sodium in dry ether solvent, the alkane(s) obtained
1) Ethane 2) Propane 3) Butane 4) A mixture of the above three

4. The nature of the aqueous solution after kolbe's electrolysis is
1) Acidic 2) Alkaline 3) Neutral 4) May be acidic, alkaline or neutral

5. What is X in the following sequence of reactions? $X \xrightarrow[-\frac{1}{2}H_2]{Na} Y \xrightarrow[CaO]{NaOH} CH_4$
1) Methanoic acid 2) Ethanoic acid 3) Propane 4) Methane

6. Pyrolysis of Methane and Ethane respectively are
1) Exothermic & Endothermic 2) Endothermic & Exothermic
3) Both are endothermic 4) Both are exothermic

7 Alkanes with howmany carbons are solids at room temperature
1) above C_{17} 2) above C_{10} 3) above C_8 4) above C_4

8. Among the following boiling point is maximum for
1) iso butane 2) n-butane 3) propane 4) ethane

9. (A) : For a given alkane, with increasing the branching boiling point decreases.
(R) : For a given alkane, with increasing the branching molecule gets spherical shape which is having minimum surface area

10. The correct order of melting points is
1) ethane < propane < butane 2) butane , propane < ethane
3) propane < ethane < butane 4) ethane < butane < propane

11. Arrange the following compounds in the descending order of their boiling points
a) n-pentane b) iso pentane c) neopentane
1) e>b>a 2) a>b>c 3) b>c>a 4) c>a>b

12. Petroleum refining involves
a) distillation b) cracking c) reforming
1) only a 2) only b and c 3) only a and c 4) a , b and c

13. Halogenation of alkanes in the presence of sunlight is
1) Free radical addition 2) Electrophillic substitution
3) Nucleophillic substitution 4) Free radical substitution

14. $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2-CH_3+Br_2\xrightarrow{h\upsilon}\underset{(major)}{X}$; here 'X' is

1) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2-CH_2-Br$ 2) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CHBr-CH_3$

3) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CBr}}-CH_2-CH_3$ 4) $CH_2Br-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2-CH_3$

15. In the chlorination of ethane in the presence of sunlight which one of the following is also formed in minute quantity

1) CH_4 2) C_4H_{10} 3) C_2H_6 4) C_8H_{18}

16. $C_2H_6\xrightarrow{X,\Delta}$ Ethanoicacid, here 'X' is

1) $(CH_3COO)_2Mg$ 2) acedified $KMnO_4$ 3) $(CH_3COO)_2Mn$ 4) CH_3COONa

17. Polythene is

1) $-(H_2C=CH_2)-_n$ 2) $-(HC-CH)-_n$ 3) $-(H_3C-CH_3)-_n$ 4) $-(H_2C-CH_2)-_n$

18. An example of Antifreeze is

1) Polyvinyl chloride 2) Ethylene glycol 3) Ethylene chlorohydrin 4) Mustard gas

19. $CH_3-CH_2-CH=CH-CH_3+O_3\xrightarrow[Zn]{H_2O}$

1) CH_3CH_2CHO & CH_3CHO; each one mole 2) Two moles of CH_3CH_2CHO

3) Two moles of CH_3CHO 4) $CH_3-CH_2-CH-CH-CH_3$

20. Which of the following hydrocarbons is not formed when Wurtz reaction takes place between ethyl iodide and propyl iodide

1) Butane 2) Propane 3) Pentane 4) Hexane

21. Methyl magnesium iodide on treatment with D_2O furnished a hydrocarbon of structure ---- along with Mg(OD)I

1) CHD_3 2) CH_2D_2 3) CH_3D 4) CD_4

22. Which of the following is not obtained when propyl chloride and methyl chloride react with sodium in dry ether

1) C_2H_6 2) C_4H_{10} 3) C_3H_8 4) C_6H_{14}

23. Hydrolysis of ---- carbide, we get methane

1) Calcium 2) Beryllium 3) Aluminium 4) Both Be and A*l*

24. Which of the following reactions can be used to prepare Methane?

1) Decarboxylation of sodium acetate 2) Kolbe's electrolysis

3) Wurtz reaction 4) Hydrogenation of alkenes

25. Methyl magnesium iodide reacts with ethyl alcohol to produce

1) Ethane 2) Methane 3) Propane 4) Ether

26. Methyl alcohol is treated with conc. HI and red P. The main product obtained is

1) CH_3OH 2) CH_4 3) CH_2I_2 4) PH_3

27. The volume of Methane (N.T.P.) formed from 8.2 g. of sodium acetate by fusion with soda lime is

1) 10 lit 2) 11. 2 lit 3) 5.6 lit 4) 2.24 lit

28. **(A) :** Methane is called Marsh gas

(R) : Methane is bubbled from marshy places

The correct answer is

1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false
4) (A) is false but (R) is true

29. The final product in the chlorination of Methane is
1) CCl_4 2) $CHCl_3$ 3) CH_2Cl_2 4) CH_3Cl

30. Gasoline has alkanes having
1) C_{12} - C_{15} 2) C_7 - C_{12} 3) C_1 - C_5 4) C_5 - C_7

31. When petroleum is heated gradually the first batch of vapours evolved will be rich in
1) Kerosene 2) Petroleum ether 3) Diesel oil 4) Lubricating oil

32. Which of the following has highest knocking
1) Aromatic hydrocarbons 2) Olefins
3) Branched chain paraffins 4) Straight chain paraffins

33. Kerosine oil is a mixture of
1) Alkanes 2) Aromatic compounds
3) Alcohols 4) Aliphatic acids

34. Reforming on n-heptane gives
1) Benzene 2) Toluene 3) Ethyl benzene 4) Benzoic acid

35. Reforming improves the quality of
1) Gasoline 2) Coal tar 3) Paraffin wax 4) Petroleum

36. Petroleum is refined by
1) Steam distillation 2) Vacuum distillation
3) Fractional distillation 4) Passing over activated charcoal

37. Aromatisation of n-hexane gives
1) Benzene 2) Toluene 3) Methane 4) A mixture of octanes

38. Natural gas is primarily composed of
1) n-Butane 2) n - Octane 3) Methane 4) A mixture of octanes

39. The order of appearance of the following with rising temperature during the refining of crude petroleum is
1) Kerosene oil, gasoline, diesel 2) Diesel, gasoline, kerosine oil
3) Gasoline, diesel, kerosene 4) Gasoline, Kerosene oil, diesel

40. The reaction $C_8H_{18} \rightarrow C_4H_{10} + C_2H_4 + CH_4 + C$ represents
1) Synthesis 2) Isomerisation 3) Cracking 4) Cratalytic oxidation

41. Which fraction of petroleum refining is used as motor fuel ?
1) Gasoline 2) Lubricating oil 3) Petroleum coke 4) Petroleum ether

42. A knocking sound is produced more in the engine when the fuel contains mainly
1) n - alkanes 2) CO_2 3) CO 4) Lubricating oil

43. Reaction of alkanes with halogen is explosive in case of
1) F_2 2) Cl_2 3) Br_2 4) I_2

44. A knocking sound is produced in the internal combustion engine when the fuel
1) Burns slowly 2) Burns fast
3) Contains some water 4) Is contaminated with lubricating oil

45. Which of the following hydrocarbon is a liquid at room temperature ?
1) Ethene 2) Ethane 3) Hexane 4) Butane

46. Cracking is a process in which
1) Petrol is produced by cracks on the surface of wax
2) Combustion of petrol is carried out
3) Compounds of high molecular mass are converted into compounds of lower molecular mass
4) None of the statements is correct.

47. Which of the following reagent can be empolyed for isomerisation of n-butane
1) HI/P 2) $Al_2Cl_6/HCl_{(g)}$ 3) $LiAlH_4$ 4) None

48. The reaction ; $CH_3-CH_2-CH_2-CH_3 \xrightarrow[AlCl_3]{HCl\ Gas} CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_3$ is an example of
1) Isomerisation 2) Polymerisation 3) Cracking 4) Dehydrogenation

49. Iodination of alkane is carried out in the presence of
1) Alcohol 2) HNO_3 or HIO_3 3) Any reducing agent 4) Benzene

CYCLO ALKANES :

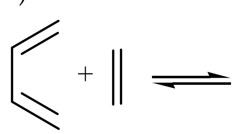
50. Cyclo alkanes are
1) carbocyclic 2) homocyclic 3) hetero cyclic 4) both 1 and 2

51. Cycloalkanes mainly resemble with
1) alkanes 2) alkenes 3) alkynes 4) all the above

52. The Greek letter Omega (ω) is generally used to designate a substituent at the ____ of a chain.
1) begining 2) middle 3) end 4) any length

53. Which method is regarded as internal wurtz reaction
1) Freunds method 2) Wislicenus method 3) Dieckmann method 4) Ziegler method

54. Which method is regarded as intra molecular condensation :
1) Freunds method 2) Wislicenus method 3) Dieckmann method 4) Ziegler method

55.  X $\xrightarrow{Ni/H_2}$ Y ; Here 'X' and 'Y' are :
1) cyclohexene and cyclohexane 2) cyclohexane and cyclohexene
3) cyclohexane and cyclohexane 4) cyclohexene and cyclohexene

56. Ring strain or Angle strain is maximum in
1) C_3H_6 2) C_4H_8 3) C_5H_{10} 4) C_6H_{12}

57. The stability of various cycloparaffins
1) $C_3H_6 > C_4H_8 > C_5H_{10} > C_6H_{12}$ 2) $C_6H_{12} > C_5H_{10} > C_4H_8 > C_3H_6$
3) $C_6H_{12} > C_4H_8 > C_5H_{10} > C_3H_6$ 4) $C_6H_{12} = C_5H_{10} = C_4H_8 = C_3H_6$

58. Which one is not effected by H_2 in presence of nickel ?
1) Cyclobutane 2) Cyclopentane 3) Cyclohexene 4) both 2 and 3

59. Cyclohexane on chlorination gives
1) chloro cyclohexane 2) orthodichloro cyclohexane
3) paradichloro cyclohexane 4) a mixture of all the above.

60. Cyclohexanone $\leftrightarrow$ cyclohexane. This conversion can be done with which of the following

reagents ?

a) Na/EtOH b) Conc.H_2SO_4 c) H_2/Ni d) HI

1) a, b, c 2) b, c, d 3) a, b, d 4) c, d

61. Cyclohexene + $O_3 \xrightarrow{Zn/H_2O}$ A, 'A' is

1) Ketone 2) Dialdehyde 3) Diketone 4) Diacid

62. Diel's Alder reaction is an .... reaction

1) Addition 2) Cyclic addition 3) Substitution 4) None

63 $X \xrightarrow{Na}$ Cyclopentane ; X is

1) 1,6 – dibromohexane 2) 1,5 – dibromohexane

3) 1,5 – dibromopentane 4) 1,5 – dibromooctane

64. In Dieckmann condensation reaction ethyl heptanedioate gives

1) Cycloheptane 2) cyclohexane 3) cyclopentane 4) cyclobutane

65 Cyclobutane $\xrightarrow[200^0 C]{+H_2/Ni}$ product in the reaction is

1) n– butane 2) iso - butane 3) Butene 4) reaction not possible

66. **(A)** : Cyclopropane is more reactive is cyclohexane

(R) : Cycloalkanes with odd number of carbons are more reactive than even number of carbons

67. In which one of the following $\angle CCC$ bond angle is 60^0

1) Cyclopropane 2) Cyclobutane 3) Cyclopentane 4) Cyclohexane

ALKENES

68. In dehydrohalogenation, hydrogen and halogen are removed from

1) the same carbon atom 2) from adjacent carbon atoms

3) from isolate carbon atoms 4) from any two carbon atoms

69. Dehydration means

1) Removal of Hydrogen molecule from adjacent carbons

2) Removal of Hydrogen molecule from the same carbon

3) Removal of water molecule from the same carbon as H and OH

4) Removal of water molecule from the adjacent carbons as H and OH

70. The IUPAC name of the product formed when Ethylene reacts with hypochlorous acid is

1) Ethylene chlorohydrin 2) 2–chloroethanol

3) 1–chloroethanol 4) Hydroxyethyl chloride

71. The oxidation product of ethylene by air at 200–400°C in presence of silver catalyst is

1) Ethylene glycol 2) Ethylene oxide 3) 1, 2–Ethanediol 4) Ethylene chlorohydrin

72. $C_2H_5Cl \xrightarrow{alc.KOH} A \xrightarrow{dil.H_2SO_4} B$. Here A and B are

1) C_2H_4, C_2H_5OH 2) C_2H_6, C_2H_5OH 3) C_3H_8, C_2H_5OH 4) C_2H_2, C_2H_5OH

73. $B \xleftarrow{alc.KOH} C_2H_5Cl \xrightarrow[C_2H_5OH]{Zn-Cu} A$ Here A and B are

1) CH_4, C_2H_4 2) C_2H_4, C_2H_6 3) C_2H_6, C_2H_4 4) C_2H_6, CH_4

74. $C_2H_6 \xrightarrow[1000^o C]{\Delta} A \xrightarrow{S_2Cl_2} B$. Here 'B' is

1) $(C_2H_5)_2S$ 2) $(C_2H_4Cl)_2 S$ 3) $(CH_3Cl)_2 S$ 4) $(CH_3)_3S$

75. $HC\equiv CH \xrightarrow[\text{Quinoline}]{\text{Pd–BaSO}_4} A \xrightarrow[\text{AlCl}_3]{\text{HCl}} B \xrightarrow[\text{Dry ether}]{\text{Na}} C$. Here 'C' is

1) C_2H_6 2) C_4H_{10} 3) C_2H_5Cl 4) C_3H_7Cl

76. Ozonolysis of products of 2–methyl–2–butene are

1) 2 moles are HCHO 2) $CH_3CHO + HCHO$
3) $CH_3CHO + CH_3COCH_3$ 4) $HCHO + CH_3COCH_3$

77. $CH_3 - CH_2Cl \xrightarrow{\text{alcoholic KOH}} A \xrightarrow{Br_2} B$ $B \xrightarrow[\Delta]{Zn} C$. C is

1) Acetylene 2) Ethylene 3) Ethene 4) Methane

78. $\beta - \beta^1$ - dichloro - diethyl sulphide is known as

1) Lewisite 2) Mustard gas 3) Phosgene 4) Clatharate

79. Which is a planar molecule?

1) $CH_2 = CH_2$ 2) $CH_3 - CH_3$ 3) $CH \equiv C–CH_3$ 4) Cyclohexane

80. $C_2H_5Cl \xrightarrow{\text{Alc KOH}} X \xrightarrow{\text{HBr}} Y$. reaction is

1) hydrohalogenation 2) dehydrohalogenation
3) halogenation 4) dehalogenation

81. **LIST - 1**
LIST - 2

A) Baeyer's reagent 1) Pd/$BaSO_4$–Quinoline
B) Lindlar's catalyst 2) Ammonical Silver nitrate
C) Tollen's reagent 3) Alkaline Potassium Permanganate
D) Wurtz reaction 4) Na,dry ether
5) Br_2 in CCl_4

The correct match is

1) A - 3 ; B - 1 ; C - 5 ; D - 2 2) A - 2 ; B - 1 ; C - 5 ; D - 4
2) A - 5 ; B - 2 ; C - 1 ; D - 3 4) A - 3 ; B - 1 ; C - 2 ; D - 4

82.

List - 1	**LIST - 2**	**LIST - 3**
Reactant	Reagent	Product
A) CH_3COONa	1)Alc. KOH	a) Ethylene
B) $CHCl_2$–$CHCl_2$	2)H_2O	b) Acetylene
C) C_2H_5 MgI	3)NaOH + CaO	c) Methane
D) CH_3–CH_2Cl	4)Zn dust	d) Ethane

The correct match is

1) A – 3 – c; B - 4 - b; C - 2 - d; D - 1 - a 2) A – 1 – a; B - 1 - b; C - 2 - a; D - 1 - d
3) A – 2 – b; B - 3 - c; C - 1 - b; D - 4 - d 4)A– 1 – d; B - 2 - d; C - 1 - b; D - 4 - c

83. IUPAC name of allyl chloride is

1) 1 – chloro propene 2) 2 – chloro propene
3) 3 – chloro propene 4) 3 – chloropropane

84. Characteristic reactions of alkenes is

1) Electrophilic addition 2) Nucleophiclic addition

3) Electrophilic substitution 4) Nucleophilic substitution

85. Correct statement about ethene is

1) $\angle HCC$ is greater than $\angle HCH$ 2) $\angle HCC$ is less than $\angle HCH$

3) Carbon , carbon bond length is less than C– H bond length

4) Carbon undergo sp^3 hybridisation

86. $CH_2{=}CH_2+H_2 \xrightarrow{Pt, T_1K} C_2H_6$

$CH_2 = CH_2+H_2 \xrightarrow{Ni, T_2K} C_2H_6$. The carrect relation among the following is

1) $T_1 > T_2$ 2) $T_2 > T_1$ 3) $T = T_2$ 4) $T_1 > 2T_2$

87. Incorrect statement about addition of halogen to alkenes

1) It is electrophilic addition

2) Syn addition of halogen to C = C takes place

3) Three membered cyclic halonium ion is intermediate

4) Vicinal dehalides are formed.

88. $CH_2 = CH_2 \begin{cases} \xrightarrow{Cl_2/CCl_4} X \\ \xrightarrow{Cl_2/H_2O} y \end{cases}$ Here X and Y are

1) $ClCH_2 - CH_2Cl$, $ClCH_2 - CH_2Cl$ 2) $ClCH_2 - CH_2Cl$, $ClCH_2 - CH_2OH$

3) $Cl_2C{=}CCl_2$, $ClCH{=}CHCl$ 4) $Cl_2C{=}CCl_2$, $ClCH_2{-}CH_2OH$

89. $CH_3{-}CH{=}CH_2 \begin{cases} \xrightarrow{+HBr} X\ \textbf{(major)} \\ \xrightarrow{+HBr/(C_6H_5CO)_2O_2} y\ \textbf{(major)} \end{cases}$

Incorrect statement among the following is

1) X is isopropyl bromide, Y is n-propyl bromide 2) X and Y are position isomers

3) Formation of X is electrophilic addition 4) Formation of Y is electrophilic addition

90. $CH_3 - CH_2 - \underset{\substack{|\\ CH_3}}{C} = CH{-}CH_2{-}CH_3 + HBr \rightarrow$ product formed in this reaction is

1) dextro rolatary 2) laevo rotatory 3) meso compound 4) racemic mixture

91. $CH_3 - \underset{\substack{|\\ CH_3}}{C} = CH_2+HCl \xrightarrow{(C_6H_5CO)_2O_2} X$ (major) Here 'X' is

1) $(CH_3)_2CHCl$ 2) $(CH_3)_2CH\,CH_2Cl$ 3) $ClCH_2 - \underset{\substack{|\\ CH_3}}{CH} - CH_3$ 4) $CH_3 - \underset{\substack{|\\ CH_3}}{CCl} = CH_2$

92. **(A) :** HCl do not add to unsymmetrical alkene by free radical mechanism

(R) : Benzoyl free radical unable to break stronger H – Cl bond

93. **(A) :** Peroxide effect is not observed in the addition of HI to unsymmetrical alkene.

(R) : Free radical unable to break stronger H–I bond

94. **(A) :** In the addition of HBr to propene, isopropyl bromide is major product but n-propyl bromide is minor product.

(R) : Isopropyl carbonium ion is more stable than n - propyl carbonium ion.

95. $CH_3{-}CH = CH - CH_3 \xrightarrow{KMnO_4/H^+}$ product in this reaction. is

1) $CH_3-\underset{\displaystyle OH}{\underset{|}{CH}}-\underset{\displaystyle OH}{\underset{|}{CH}}-CH_3$ 2) $2CH_3CHO$

3) $2CH_3COOH$ 4) $CH_3CHO + CH_3COOH$

96. $CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}}=CH-CH_3 \xrightarrow{KMnO_4/H^+}$ products in this reaction

1) $CH_3-\overset{\displaystyle OH}{\overset{|}{\underset{\displaystyle CH_3}{\underset{|}{C}}}}-\overset{\displaystyle OH}{\overset{|}{CH}}-CH_3$ 2) $CH_3CHO+CH_3CHO$

3) $CH_3COCH_3 + CH_3COOH$ 4) $2CH_3COOH$

97. Arrange the following alkenes in the descending order of their reactivity with HBr.

a) ethene b) Propene c) 2 - Butene d) 2- methyl-2-Butene

1) a > b > c > d 2) d > c > b > a 3) d > c > a > b 4) a > b > d > c

98. In which of the following reactions anti Markownikoff's rule is observed

1) $CH_3-CH=CH_2 + HC\ell \xrightarrow{Peroxide}$ 2) $CH_3-CH=CH_2 + HBr \xrightarrow{Peroxide}$

3) $CH_3-CH=CH_2 + HI \xrightarrow{Peroxide}$ 4) $CH_3-C=CH_2 + H_2SO_4 \rightarrow$

99. The Kolbe's electrolysis proceeds via

1) Nucleophilic substitution mechanism 2) Electrophilic addition mechanism

3) Free radical mechanism 4) Electrophilic sustitution mechanism

100. Which of the following statements is correct?

1) C - D bond is slightly weaker than C-H bond

2) C - D bond is slightly stronger than C-H bond

3) Both C-H & C-D bonds are equally strong

4) Replacement of D in C-D by C*l* is faster than the replacement of H in C-H

101. Propene + HCl $\xrightarrow{C_6H_5COO_2CO-C_6H_5}$ A. A is

1) n - propyl chloride 2) Isopropyl chloride 3) Allyl chloride 4) None

102. Addition of Br_2 takes place readily with

1) $CH_2=CH_2$ 2) $CH_3-CH=CH_2$

3) $CH_3-CH=CH-CH_3$ 4) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}}=CH-CH_3$

103. Which of the following is used as gasoline additive ?

1) n - Heptane 2) Isoctane 3) TEL 4) Diethyl lead

104. $X \xrightarrow{Sodalime} Y \xrightarrow{Cl_2/uv-light} Z \xrightarrow[\text{dry either}]{2Na} CH_3-CH_2-CH_2-CH_3+2NaCl.$

Then X, Y and Z includes

1) Sodium ethanoate, ethane and ehtyl chloride

2) Sodium propnoate, ethane and methyl chloride

3) Sodium butanoate, ethane and ehtyl chloride

4) Sodium propanoate, ethane and ethyl chloride

105. n - propyl chloride and isopropyl chloride mixture is subjected to the Wurtz reaction, which one of the following compound is not formed

1) hexane 2) 2, 5 dimethyl hexane
3) 2, 3 dimethyl butane 4) 2 - methyl pentane

106. Addition of HBr to propene gives 2 - bromo propane, this reaction is intiated by

1) $H^{\oplus}$ 2) Br^{-} 3) Br 4) $Br^{\oplus}$

107. Orlon is the polymerised product of-------

1) CH_2=CHCl 2) CH_2=CH-O-CO-CH_3
3) CH_2=CH-CN 4) CH_2 =CH-CH=CH_2

108. Anti Markownikoff's addition of HBr is not observed in

1) 1 - butene 2) 1 - pentene 3) Propene 4) 2 - butene

WORK SHEET - II

1. By treating ethylmagnesium bromide with water or alcohol, we get

1) Methane 2) Ethane 3) Propane 4) Butane

2. Which of the following reacts with water to give ethane ?

1) CH_4 2) C_2H_5MgBr 3) C_2H_5OH 4) C_2H_5–O–C_2H_5

3. What is the minimum quantity (in grams) of methyl iodide required for preparing one mole of ethane by Wurtz reaction ? (Atomic weight of iodine = 127)

1) 142 2) 568 3) 326 4) 284

4. Which of the following compounds does not form an ozonide ?

1) Ethane 2) Propyne 3) Propene 4) Ethene

5. The number of σ and π bonds present in ethene is

1) 6 σ 2) 3 σ 3) 4 σ , 2 π 4) 5 σ ,1 π

6. When propyl iodide is heated with alcoholic KOH, the product is

1) Propene 2) Cyclopropane 3) Propyne 4) Propane

7. On mixing a certain alkane with chlorine and irradiating it with ultraviolet light, it forms only one monochloroalkane. This alkane should be

1) Neopentane 2) Propane 3) Pentane 4) Isopentane

WORK SHEET - III

Topic : AlKANES AND CYCLOALKANES

SECTION - A

Single correct answer Type Questions

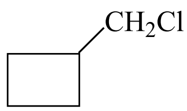
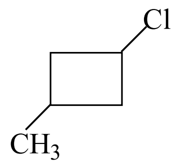
1. A hydrocarbon,C_4H_8,neither decolourised bromine in CCl_4solution nor reacted with HBr.When heated to 200^0C with hydrogen in the presence of Ni catalyst a new hydrocarbon C_4H_{10} was formed. The hydrocarbon is

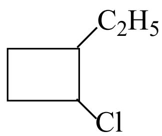
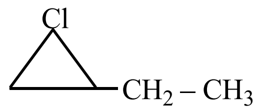
1) n-butane 2) Cis-2-butene 3) Iso-butylene 4) Cyclo butane

2. Free radical monochlorination of ter.butyl bromide gives

1) 1- bromo-1-chloro-2-methyl propane 2) 2- bromo-1-chloro-2-methyl propane
3) 1- bromo-2-chloro-2-methyl propane 4) Ter.butyl Chloride

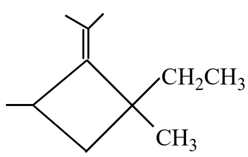
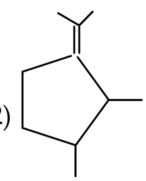
3. A compound "x" has molecular formula C_5H_9Cl .It does not react with Bromine in CCl_4 .On treatment with strong base it produces single compound "y" (C_5H_8) and reacts with $Br_2\,(aq)$ .Ozonolysis of "y" produces a compound $C_5H_8O_2$ .The structure of x is

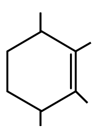
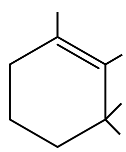
1)  2) 

3)  4) 

4. Propene, $CH_3 - CH = CH_2$ can be converted into 1-propanol by oxidation. Which set of reagents among the following is ideal to effect the conversion ?
1) Alkaline $KMnO_4$ 2) B_2H_6 and alk. H_2O_2 3) O_3/zinc dust 4) $OsO_4/CHCl_3$

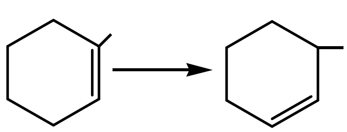
5. $Me_2C = CHCH_2 - CH_2 - \underset{\underset{Me}{|}}{C} = CH - CH_3 \xrightarrow{H^+}$ Product. The main product is

1)  2) 

3)  4) 

6. Which of the following will explain the chemical reactivity of ethylene ?
1) short carbon to carbon bond distance 2) high double bond energy
3) trigonal planar structure 4) presence of π -electrons

7. For which of the following addition reaction Markownikoff's rule is applicable?
1) $CH_3CH = CH_2 + Br_2 \rightarrow$ 2) $CH_3CH = CH_2 + HBr \rightarrow$
3) $CH_2 = CH_2 + HBr \rightarrow$ 4) $CH_3CH = CHCH_3 + Br_2 \rightarrow$

8. 

The most suitable set of reagents to perform this conversion is
1) $HBr; (CH_3)_3COK / (CH_3)_3C - OH$ 2) NBS; Alcoholic KOH

3) HBr-peroxide; CH_3CH_2OK / CH_3CH_2OH

4) HBr- peroxide; $(CH_3)_3\,COK / (CH_3)_3\,COH$

9. An isolated alkadiene is :

1) penta-1,4-diene 2) penta-1,3-diene 3) penta-1,2-diene 4) Hexa-2,4-diene

10. Sample of 2,3-dibromo-3-methyl pentane is heated with zinc dust. The resulting product is isolated and heated with HI in the presence of phosphorus. Indicate which structure does represent the final organic product in the reaction ?

1) $CH_2 = CH - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_2 - CH_3$ 2) $CH_3 - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_2 - CH_3$

3) $CH_3 - \underset{\displaystyle I}{\underset{|}{CH}} - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_2 - CH_3$ 4) $CH_2 = CH - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_2 - CH_3$

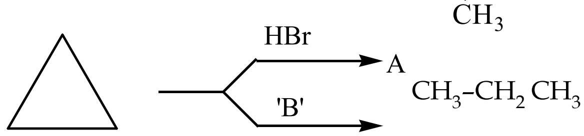
SECTION - B

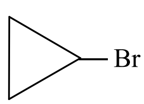
More than one correct answer Type Questions

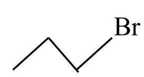
11. Which of the following can be prepared by wurtz reaction?

1) CH_3CH_3 2) $CH_3CH_2CH_2\text{–}CH_3$

3) $CH_3 - \overset{\displaystyle CH_3}{\overset{|}{CH}} - CH_3$ 4) $CH_3 - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_3$

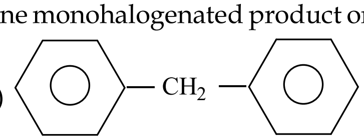
12. 

1) compound 'A' is 

2) compound 'A' is 

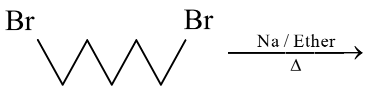
3) Reagent 'B' is H_2/Ni at 80^0C 4) Reagent 'B' is Li AlH_4

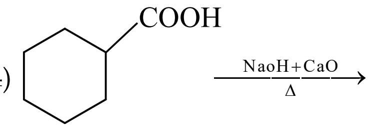
13. Which of the following molecules of alkane will give only one monohalogenated product on reaction with halogen in presence of sunlight ?

1) CH_3CH_3 2) $CH_3CH_2CH_3$ 3) $(CH_3)_4C$ 4) 

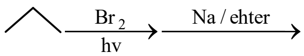
14. Which of the following methods yield saturated hydrocarbon ?

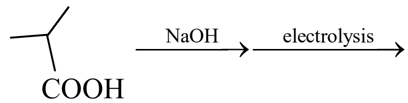
1) $R - CH = CH_2 \xrightarrow[CH_3COOH]{BH_3}$ 2) $R - CH = CH_2 \xrightarrow[\Delta]{CH_2N_2}$

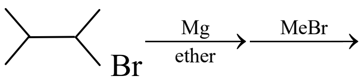
3) 

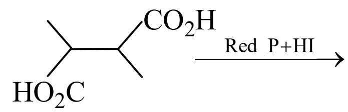
4) 

15. Which of the following reactions produce the same product ?

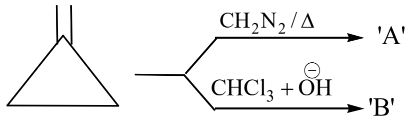
1) 

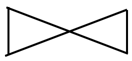
2) 

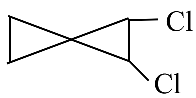
3) 

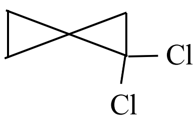
4) 

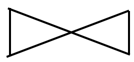
16. Write theproducts of the following reaction,



1) A is 

2) 'A' is 

3) 'B' is 

4) 'B' is 

WORK SHEET - IV

Topic : AKANES AND CYCLOALKANES

SECTION - A

Single correct answer Type Questions

1. Select the response that correctly identifies the number of carbon atoms of each type of hybridization in the compound given below $H_2C = C = CH - CH = O$

	sp^3	sp^2	sp		sp^3	sp^2	sp
1)	2	2	0	2)	1	3	0
3)	0	3	1	d)	1	2	1

2. On halogenation, an alkane gives only one monohalogenated product. The alkane may be
1) 2-methyl butane
2) 2, 2-dimethyl propane
3) cyclopentane
4) both (2) and (c)

3. Which of the following compounds can be best prepared by Wurtz-reaction ?
1) iso-butane 2) n-butane 3) n-pentane 4) iso-pentane

4. A hydrocarbon A(V.D = 36) forms only one monochloro susbtitution product. A will be :
1) iso-pentane 2) neo-pentane 3) cyclohexane 4) methyl-cyclohexane

5. Ethyl iodide and n-propyl iodide are allowed to under go Wurtz reaction. The alkane which will not be obtained in this reaction is
1) butane 2) propane 3) pentane 4) hexane

6. $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2-CH_3 \xrightarrow[hv]{Cl_2}$ .Number of chiral centers generated during monochlorination in the above reaction :

1) 1 2) 2 3) 3 4) 4

7. $CH_3Cl \rightarrow CH_4$. Above conversion can be achieved by

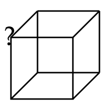
1) Zn/H^+ 2) $LiAlH_4$ 3) Mg/H_2O (ether) then H_2O 4) all of these

8. n - Butane $\xrightarrow{Cl_2/hv}$. Give the total number of monochloro products (including stereoisomers), which are possible in the above reaction.

1) 2 2) 3 3) 4 4) 5

9. $CH_4 + Cl_2 \xrightarrow{hv} CH_3Cl + HCl$. To obtain high yields of CH_3Cl, the ratio of CH_4 to Cl_2 must be

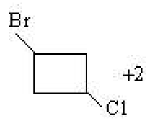
1) high 2) low 3) equal 4) can't be predicted

10. Double bond equivalent of cubane is ? 

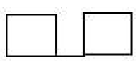
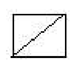
1) 4 2) 5 3) 6 4) 7

SECTION - B

More than one correct answer Type Questions

11.  $+2Na \xrightarrow{\text{dry ether}} X+Y+Z$

When Y and Z are salts then

1) X is 
2) Molecular formula of X is C_4H_8
3) Molecular weight of X is 54
4) X is 

12. When $CH_2=CH-Br$ is reacted with HBr then the product formed is A and when $CH_2=CH-COOH$ is treated with HBr then the product formed is C

1) A is $\underset{\displaystyle Br}{\underset{|}{CH_2}}-\underset{\displaystyle Br}{\underset{|}{CH_2}}$
2) A is $CH_3-CH\begin{smallmatrix}Br\\Br\end{smallmatrix}$
3) C is $CH_3-\underset{\displaystyle Br}{\underset{|}{CH}}-COOH$
4) C is $\underset{\displaystyle Br}{\underset{|}{CH_2}}-CH_2-COOH$

13. Which of the following alkanes cannot be synthesised by the Wurtz reaction in a good yield ?

1) $(CH_3)_2CH-CH_2-CH(CH_3)_2$ 2)

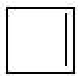
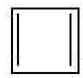
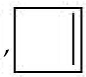
$(CH_3)_2CH-CH_2-CH_2-CH(CH_3)_2$

3) $CH_3-CH_2C(CH_3)_2CH_2CH_3$ 4) $(CH_3)_3C-CH_2-CH_2-CH_3$

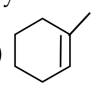
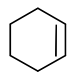
14. $\underset{(A)}{C_4H_6} \xrightarrow{H_2/pt} \underset{(B)}{C_4H_8} \xrightarrow{O_3/H_2O} CH_3COOH$. A and B in the above sequence are

1) $CH_3C \equiv CCH_3$ and $CH_3CH = CHCH_3$

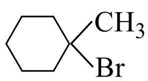
2) $CH_2 = CHCH = CH_2$ and $CH_3CH = CHCH_3$

3) , $CH_3CH = CHCH_3$ 4) , 

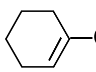
15. Hydroboration oxidation and acid hydration will yield the same product in case of

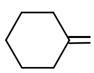
1)  2) 

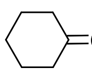
3) $CH_2 = CH_2$ 4) $CH_3CH = CHCH_3$

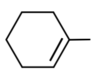
16. 

$\xrightarrow{t-Buok}$ Product . which is/are correct statements about the product?

1)  $-CH_3$ is an endocyclic saytzeff product

2)  $=CH_2$ is an exocyclic saytzeff product

3)  $=CH_2$ is an exocyclic Hofmann product

 $-CH_3$ 4) is an endocyclic Hofmann product.

WORK SHEET - V

SECTION - A

Topic :CYCLOALKANES PROPERTIES ALKANES

Single correct answer Type Questions

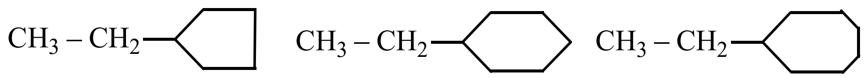
1. Which of the following has highest chlorine content ?
1) Pyrene 2) DDT 3) Chloral 4) Gammaxene

2. Pure methane can be prepared by
1) Wurtz reaction 2) Kolbe electrolysis method
3) Soda-lime de-carboxylation 4) reduction with H_2

3. Berylium carbide + heavy water $\longrightarrow$?
The product of the above reaction is
1) C_2H_2 2) BeD_2 3) CD_4 4) CH_4

4.
$$\begin{array}{l} CH_2-OH \\ | \\ CH-OH + \underset{(excess)}{CH_3MgBr} \rightarrow xCH_4 \\ | \\ CH_2-SH \end{array}$$
What is the value of x in the above reaction ?

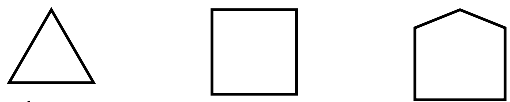
1) 1 2) 2 3) 3 4) 4

5. 

Ethyl cyclopentane (I) Ethyl cyclohexane (II) Ethyl cycloheptane (III)

Arrange the compounds I, II and III in decreasing order of their heats of combustion :

1) II > I > III 2) I > II > III 3) III > II > I 4) III > I > II

6. 

Cyclopropane (I) Cyclobu tan e (II) Cyclopen tan e (III)

The correct order of heats of combustion of above compounds is :

1) I > II > III 2) II > I > III 3) III > II > I 4) III > I > II

7. An alkane (mol wt = 86) on bromination gives only two monobromo derivatives (excluding stereoisomers). The alkane is :

1) $CH_2-\underset{CH_3}{\underset{|}{CH}}-CH_2-CH_2-CH_3$

2) $CH_2-\overset{CH_3}{\overset{|}{\underset{CH_3}{\underset{|}{C}}}}-CH_2-CH_3$

3) $CH_2-\underset{CH_3}{\underset{|}{CH}}-\underset{CH_3}{\underset{|}{CH}}-CH_3$

4) $CH_2-\overset{CH_3}{\overset{|}{\underset{CH_3}{\underset{|}{C}}}}-CH_3$

8. $CH_3-CH_2-CH_3 \xrightarrow[\Delta]{CH_2N_2} \underset{(major)}{(A)}$: Product (1) is

1) $CH_3-\underset{CH_3}{\underset{|}{CH}}-CH_3$ 2) $CH_3-CH_2-CH_2-CH_3$

3) equimolar mixture of (1) & (b) 4) n-pentane

9. Which of the following alkanes will give single product on methylene insertion ?

1) CH_3 - CH_3 2) CH_3 - CH_2 - CH_3 3) $(CH_3)_4C$

4) $CH_3CH_2C(CH_3)_2CH_2CH_3$ E) $(CH_3)_2CHCH(CH_3)_2$.

1) A, B, D 2) A, C, D 3) A, C 4) B, D, E

10. Order of the bond strength of C-H bonds involving sp, sp^2 and sp^3 hybridized carbon atoms is :

1) sp > sp^2 > sp^3 2) sp^3 > sp^2 > sp 3) sp^2 > sp^3 > sp 4) sp^2 > sp > sp^3.

SECTION - B

More than one correct answer Type Questions

11. When an aqueous solution of sodium formate is electrolysed

1) H_2 gas is liberated at cathode 2) No alkane is formed

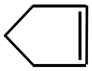
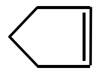
3) H_2 and CO_2 gases are liberated at anode 4) NaOH is formed at anode

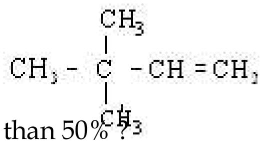
12. The product obtained in the reaction $C_6H_5CH_2CH_3 \xrightarrow[273K]{Cl_2/hv}$ is

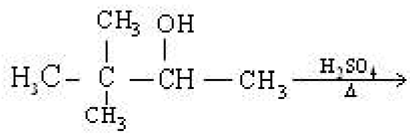
1) $C_6H_5CHCl-CH_3$ 2) $C_6H_5CH_2-CH_2Cl$ 3) $C_6H_5CCl_2-CH_3$ 4) $C_6H_5CHCl-CH_2Cl$

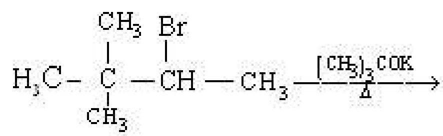
13. Which of the following will give Cis-diols ?

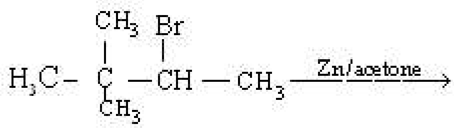
1) $>C=C< \xrightarrow[2)H_2O]{1)KMnO}$ 2) $>C=C< \xrightarrow[2)Na_2SO_3]{1)OsO_4}$

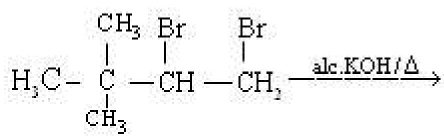
3)  $\xrightarrow[2)Na_2SO_3]{1)OsO_4\ 25^0C}$ 4)  $\xrightarrow[2)HCO_2H,25^0C]{1)\ 35\%H_2O_2}$

14.  which of the following reactant will yield the above compound more than 50% ?

1) 

2) 

3) 

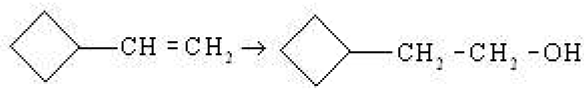
4) 

15. i) Cis-2-butene $\xrightarrow{HCO_3H}$ I.

ii) trans-2-butene $\xrightarrow{HCO_3H}$ II. Correct statements are

1) I is racemic mixture by anti addition 2) II is meso compound by anti addition

3) I is meso compound by anti addition 4) II is racemic mixture by anti addition

16. 

The conversion can be performed suitably by

1) I. Cl_2, H_2O II. $LiAlH_4$ 2) I.HBr II. OH^-

3) I. BH_3-THF II. H_2O_2, OH^- 4) I. HBr-peroxide II. OH^-

EXERCISE - I /ANSWERS

WORK SHEET - I

01) 4	02) 1	03) 4	04) 2	05) 2	06) 3	07) 1	08) 2	09) 1	10) 3
11) 2	12) 4	13) 4	14) 3	15) 2	16) 3	17) 4	18) 2	19) 1	20) 2
21) 3	22) 3	23) 4	24) 1	25) 2	26) 2	27) 4	28) 1	29) 1	30) 2
31) 2	32) 4	33) 1	34) 2	35) 1	36) 3	37) 1	38) 3	39) 4	40) 3
41) 1	42) 1	43) 1	44) 2	45) 3	46) 3	47) 2	48) 1	49) 2	50) 4
51) 4	52) 3	53) 1	54) 3	55) 1	56) 1	57) 2	58) 4	59) 4	60) 1
61) 2	62) 2	63) 3	64) 2	65) 1	66) 3	67) 1	68) 2	69) 4	70) 2
71) 2	72) 1	73) 3	74) 2	75) 2	76) 3	77) 3	78) 2	79) 1	80) 2
81) 4	82) 1	83) 3	84) 1	85) 1	86) 2	87) 2	88) 2	89) 4	90) 4
91) 2	92) 1	93) 3	94) 1	95) 3	96) 3	97) 1	98) 2	99) 3	100) 2
101) 1	102) 4	103) 3	104) 4	105) 2	106) 1	107) 3	108) 4		

WORK SHEET - II

01) 2	02) 2	03) 4	04) 1	05) 4	06) 1	07) 1

WORK SHEET - III

1) 4	2) 2	3) 2	4) 2	5) 4	6) 4	7) 2	8) 4	9) 1	10) 2
11) 12	12) 23	13) 134	14) 1234	15) 1234	16) 13				

WORK SHEET - IV

1) 3	2) 2	3) 2	4) 2	5) 2	6) 2	7) 4	8) 2	9) 1	10) 2
11) 3,4	12) 2,4	13) 1,3,4	14) 1,2	15) 2,3,4	16) 1,3				

WORK SHEET - V

1) 1	2) 3	3) 3	4) 3	5) 3	6) 3	7) 3	8) 2	9) 3	10) 1
11) 123	12) 13	13) 123	14) 23	15) 12	16) 34				

ALKYNES, ARENES

EXERCISE - I

ALKYNES

1. When alkyl substituted acetylene undergoes addition with hydrogen in presence of Lindlar's catalyst, the alkene formed is
   1) A mixture of cis and trans 2) Trans 3) Cis
   4) In presence of Lindlar's catalyst, addition does not take place
2. The reagent used for getting trans alkene from alkyl substituted acetylene with hydrogen is
   1) Na in liq. NH_3 2) Li in liq. NH_3
   3) Both (1) or (2) 4) H_2 in presence of Ni (or) Pt (or) Pd
3. The compounds used in plastic industry and polymer industry respectively are
   1) Vinyl acetate & Vinylcyanide 2) Vinyl cyanide & Vinyl acetate
   3) Acrylonitrile & Ethylidene diacetate 4) Ethylidene dicyanide & Vinyl cyanide
4. Oxidation product of acetylene with alkaline potassium permanganate is
   1) Acetic acid 2) Oxalic acid
   3) Acetone 4) Acetylene dicarboxylic acid
5. Oxidation product of acetylene with chromic acid is
   1) Acetic acid 2) Oxalic acid
   3) Acetone 4) Acetylene dicarboxylic acid
6. The acidic nature of hydrogens in acetylene can be explained by the reaction with
   1) Sodium metal 2) Ammonical cuprous chloride solution
   3) Ammonical silver nitrate solution 4) All the above
7. The colour of the precipitate formed when acetylene is passed through ammonical cuprous chloride solution is
   1) White 2) Red 3) Blue 4) Green
8. Order of reactivity is
   1) Alkynes > Alkenes > Alkanes 2) Alkanes > Alkenes > Alkynes
   3) Alkenes > Alkynes > Alkanes 4) Alkenes = Alkynes > Alkanes
9. What are X and Y respectively in the following reaction ?
   $$\text{Z – product} \xleftarrow{Y} \text{2 – Butyne} \xrightarrow{X} \text{E – product}$$
   1) $Na/NH_{3(liq)}$ and $Pd/BaSO_4 + H_2$ 2) $Ni/140^0$ C and $Pd/BaSO_4 + H_2$
   3) $Ni/140^0$ C and $Na/NH_{3(liq)}$ 4) $Pd/BaSO_4 + H_2$ and $Na/NH_{3(aq)}$
10. The compound which decolourises bromine water but does not give white precipitate with Tollen's reagent.
    1) C_2H_2 2) C_2H_4 3) C_6H_6 4) CH_4
11. $$CH_3-CH_2-CH_2Cl \xrightarrow{alc.KOH} X$$
    $$CH \equiv CH + H_2 \xrightarrow{Pd+BaSO_4} Y$$
    Here, in the above sequences, the final products `X' and `Y'
    1) are a pair of homologues 2) have the percentase composition
    3) have the same empirical formula 4) All the above
12. **(1) :** Disubstituted acetylene on partial hydrogenation may give trans isomer
    (R) : Lindlar's catalyst is used for Partial hydrogenation
    The correct answer is

1) Both (1) and (R) are true and (R) is the correct explanation of (A)
2) Both (1) and (R) are true and (R) is not the correct explanation of (A)
3) (1) is true but (R) is false
4) (1) is false but (R) is true

13. When $R - C \equiv CH$ is treated with cuprous ion in ammonical medium, one of the product is
1) $R - C \equiv C - Cu$ 2) $Cu - C \equiv CH$ 3) $CuC \equiv CCu$ 4) $R - C \equiv C - R$

BENZENE

14. When coal is subjected to destructive distillation, the important products obtained are
1) Light; Middle; Heavy and Anthracene oils
2) Coal gas; Coal tar; Ammonical liquor and Solid residue
3) Benzene; Toluene; Xylene; Naphthalene and Anthracene
4) Carbocyclic aromatic and heterocyclic aromatic compounds

15. Coal tar is
1) Yellow, light liquid with pleasant odour
2) Yellow, light liquid with unpleasant odour
3) Black viscous oily liquid with unpleasant odour
4) Black viscous oily liquid with very pleasant odour

16. To get benzene, coal tar is subjected to
1) Fractional distillation 2) Destructive distillation
3) Vacuum distillation 4) Steam distillation

17. The two structures of benzene proposed by Kekule differ in
1) The position of carbon nuclei 2) The position of hydrogen nuclei
3) The position of the single bonds 4) The position of the double bonds

18. Resonance energy of benzene is
1) 150 Kcals Mol^{-1} 2) 36 Kcals Mol^{-1} 3) 36 KJ Mol^{-1} 4) 200 Kcals Mol^{-1}

19. In Benzene there is
1) Delocalization of p electrons 2) Delocalization of s electrons
3) Delocalization of both s and p electrons 4) No delocalization of electrons

20. The C – C bond lengths in benzene are
1) 1.54A° & 1.34A° 2) 1.34A° & 1.20A° 3) 1.39A° only 4) 1.20A° only

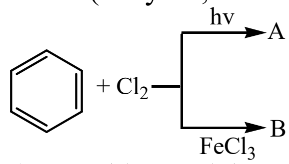
21. Due to delocalization, the energy
1) Increases 2) Decreases
3) May increase or decrease 4) There is neither increase nor decrease

22. The increase in stability and decrease in energy of aromatic compounds is due to
1) Localization of p electrons 2) Delocalization of s electrons
3) Localization of s electrons 4) Delocalization of p electrons

23. The number of p electrons in benzene is
1) 3 2) 6 3) 9 4) 12

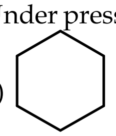
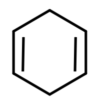
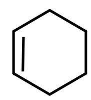
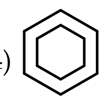
24. The C – C bond length in benzene is
1) < C - C in ethane 2) > C = C in ethene 3) > $C \equiv C$ in ethyne 4) All the above

25. Due to delocalization
1) Reactivity increases 2) Stability increases 3) Stability decreases 4) Solubility in water increases

26.  respectively are

1) Hexachlorocyclohexane & C_6H_5Cl 2) Chlorobenzene & Hexachlorocyclohexane
3) o-and p-Dichlorobenzene & chlorobenzene
4) Chlorobenzene & $C_6H_6Cl_6$

27. During ozonolysis of 1mole of benzene, number of molecules of ozone consumed is
1) 1 2) 2 3) 3 4) 4

28. Under pressure, (with hydrogen) in presence of nickel catalyst, benzene forms
1)  2)  3)  4) 

29. Which of the following statements is False
1) Benzene contains three pi bonds 2) Ethylene is more reactive than ethyne
3) Kolbe's method is useful for preparation of methane
4) Aldehydes & Ketones are a pair of functional isomers

30. $C_2H_4Br_2 \xrightarrow{\text{alc KOH}} A \xrightarrow[Cu^+]{HCN} B$. The type of reaction invoIed in the conversion $A \rightarrow B$
1) Nucleophilic addition 2) Electrophillic addition
3) Radical addition 4) Electrophillic substitution

31. The function of anhydrous $AlCl_3$ in the Friedel-crafts reaction is
1) absorb water 2) absorb HCl
3) Produce electrophile 4) Produce nucleophile

32. Which of the following is not aromatic
1) Cyclotetraene 2) Benzene 3) Naphthalene 4) Anthracene

33. Nitrobenzene can be prepared from Benzene by using a mixture of conc. HNO_3 and conc. H_2SO_4. In this, active species is
1) NO_3^- 2) NO^+ 3) NO_2^+ 4) NO_2^-

34. According to the molecular formula Benzene appears to be highly unsaturated. But Benzene mainly participates in substitution reactions. It is because Benzene is
1) unsaturated 2) Saturated 3) aromatic 4) cyclic compound

35. In Huckel's (4n+2) rule for aromaticity, 'n' represents
1) Number of carbon atoms 2) Number of rings
3) Whole number 4) Fractional number (or) integer (or) zero

PROPERTIES :

36.

LIST - 1	**LIST - 2**
1) Methane	1) Hawker's lamp
2) Ethylene	2) Paraldehyde
3) Acetylene	3) Printer's ink
4) Benzene	4) Mustard gas
	5) Motor fuel

The correct match is
1) A - 1 ; B - 2 ; C - 3 ; D - 4 2) A - 3 ; B - 5 ; C - 1 ; D - 4
3) A - 3 ; B - 4 ; C - 1 ; D - 5 4) A - 4 ; B - 2 ; C - 3 ; D - 1

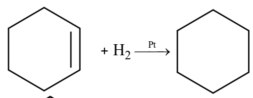
37. **LIST - 1**

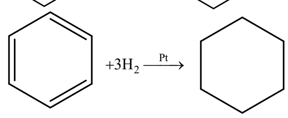
1) $C_6H_6Cl_6$
2) RMg X
3) OH C – CHO
4) $C_6H_5COCH_3$

LIST - 2

1) Glyoxal
2) Grignard reagent
3) Acetophenone
4) Hexachlorocy clohexane
5) Hexachlorobenzene

1) A - 5 ; B - 2 ; C - 3 ; D - 1 2) A - 4 ; B - 2 ; C - 1 ; D - 3
3) A - 5 ; B - 2 ; C - 1 ; D - 3 4) A -3 ; B - 1 ; C - 4 ; D - 2

38.  ; Δ H= -x k.cal/mole

 ; Δ H= -y k.cal/mole

The carrect relation among the following is
1) x = y 2) y = 3x 3) 3x -y=36k.cal 4) x-3y = 36k.cal

39. Match the following

List - I

1) O-,P - directing and ring activating
2) O-,P-directing and ring deactivating
3) m - directing and ring deactivating

List - II

1) - NO_2
2) -Cl
3) - OH

The carrect match among the following is
1) 1 - a ; 2 - b ; 3 - c 2) 1 - c ; 2 - b ; 3 - a 3) 1 - b ; 2 - c ; 3 - a 4) 1 - a ; 2 - c ; 3 - b

40. Arrang the following compounds in the descending order of their reactivity towards electrophilic substitution.
1) Chlorobenzene 2) Nitrobenzene
3) Benzene 4) Phenol e) Toluene
1) d > e> c > a > b 2) b > a > c > e > d 3) d > e > c > b > a 4) e > d > c > a > b

41. Which one of the following is benzene ring activating group towards electrophilic substitution
1) -CN 2) -CHO 3) -SO_3H 4) -OCH_3

42. Which one of the following is benzene ring deactivating group towards electrophilic substitution.
1) -$NHCOOH_3$ 2) -$N(NH_3)_2$ 3) -OH 4) - Br

43. The correct order of activating abiltity of fthe groups at benzene ring, towards electrophilic substitution.
1) -NH_2> -NHR > - NR_2 > -OH> -OR 2) -OH > -OR > -NH_2> -NHR > -NR_2
3) -OR > -OH > -NR_2> -NHR > -NH_2 4) -NR_2> -NHR > -NH_2> -OR> - OH

44. **(1) :** $NO_2$is benzene ring deactivating group and m - directing group.
(R) : NO_2 withdraw electron density from benzine ring and make ortho and para positions more electrons deficent than mata position.

45. **(1) :** NH_2 is benzene ring activating group and O-, P- directing group
(R) : NH_2 increases the electron density in benzene ring through resonance and make

O - , P - positions more electron efficient than m- position

46. Deactivating nature and O - , P- directing nature of halogens can be explained by the effects respectively

1) - I, - M 2) - I, +M 3) +I, +M 4) +I, - M

WORK SHEET - II

ALKYNES

1. A gaseous mixture containing two hydro carbons X & Y of volume 44.8 lit (STP) when passed through ammonical Cu_2Cl_2 has suffered reduction in volume of about 11.2 lit. If remaining volume is due to Y, X is

1) Butyne -2 2) Ethene 3) Ethane 4) Propyne

2. A hydrocarbon of molecular formula C_5H_{12} has three chain isomers. If one of those isomers (X) gives only one mono chloro derivative, IUPAC name of X is

1) 2,2 - diethyl pentane 2) 2 - methyl pentane 3) 2,2 - diethyl propane
4) 2,2 - dimethyl propane

3. $X \xrightarrow[H_2]{Pd+BaSO_4} Y,$

$Q \xrightarrow{450^0 C} Y$ where X,Y & Q are gaseous hydro carbons, then X, Y & Q respectively are

	X	Y	Q
1)	C_2H_4	C_2H_6	C_2H_4
2)	C_2H_2	C_2H_6	C_2H_4
3)	C_2H_2	C_2H_4	C_2H_6
4)	C_2H_6	C_2H_4	C_2H_2

4. $\text{Pr opyne} \xrightarrow[\Delta]{Na(l)} X + 1/2H_2$

$X \xrightarrow[\Delta]{CH_3I} Y$ Now , which of the following reagents can be used to distinguish Y from propyne?

1) $NH_4OH + AgNO_3$ (or) cold alk $KMnO_4$ 2) $NH_4OH + Cu_2Cl$ (or) Br_2/ CCL_4
3) Cold alk. $KMnO_4$ (or) Br_2 / CCl_4 4) $NH_4OH + AgNO_3$ (or) $NH_4OH + Cu_2Cl_2$

5. The common method used to prepare ethane & ethyne is X while ethene & ethyne is Y. Now, X & Y respectively are

1) decarboxylation ; wurtz reaction 2) Kolbe's electrolysis ; Sabatier reaction
3) Kolbe's electrolysis ; dehydrohalogenation 4) Kolbe's electrolysis ; decarboxylation

6. Ethene on ozonolysis yields X. To prepare successive homologue of X, which of the following should be subjected to ozonolysis ?

1) Butene - 1 2) Hexene - 3 3) Butyne - 2 4) Butene - 2

7. $X \xrightarrow{Ag/\Delta} Y$ (g) where if Y is ethyne, X is prepared from CH_4 by

1) Chlorination 2) Combustion 3) Pyrolysis 4) Nitration

8. Lindlar's catalyst cannot be used to carryout the following process

1) $CH_3\text{-}C \equiv C\text{-}CH_3 \xrightarrow{H_2}$ trans Butene -2 2) $CH_3 - C \equiv C - CH_3 \xrightarrow{H_2} \text{Butane}$

3) $C_2H_2 \xrightarrow{H_2} C_2H_6$ 4) $CH_3\text{-}C \equiv C\text{-}CH_3 \xrightarrow{H_2}$ cis Butene -2

1) A only 2) A, B & D only 3) A, B & C only 4) A, C & D only

9. $X \xrightarrow{\text{Electrolysis}} Y$ (g) [anode]

$Q \xrightarrow{\text{Electrolysis}} R$ (g) [anode] where Y and R are gaseous hydrocarbons. If Y on hydrogenation yields R, X and Q are the potassium salts of

1) Fumaric acid ; Oxalic acid
2) Succinic acid ; Oxalic acid
3) Fumaric acid ; Acetic acid
4) Acetic acid ; Propionic acid

10. $X \xrightarrow[170^0 C]{ConH_2SO_4} Y \xrightarrow[CCl_4]{Br_2} Q \xrightarrow[\Delta]{alc\,KOH} R$ If X is ethyl alcohol correct statement (s) about R is/ are

I. It decolourizes Bayer's reagent

II. It gives benzene when subjected to polymerization

III. It gives red precipitate with ammonical Cu_2Cl_2

IV. It gives ethylene on hydrogenation in the presence of Lindlar's catalyst.

1) A, B & C
2) B, C & D
3) A, B, C & D
4) A, B & D

BENZENE

11. $X \xrightarrow[boil]{dil.H_2SO_4} Y \xleftarrow[\Delta]{Zn\,dust} Q$ where if 1 mole Y on ozonolysis gields there moles of ethane - 1, 2- dial, X and Q respectively are

1) Napthalene ; Phenol
2) Benzone sulphonic acid, Nitrobenzene
3) Benzene sulphonic acid ; Phenol
4) Phenol ; Toluene

12. Active species involved in the process $C_6H_6 \longrightarrow C_6H_5SO_3H$ is

1) SO_3
2) HSO_4^-
3) SO_3^+
4) SO_2

13. In which of the following reactions, aromatic character is retained ?

1) $C_6H_6 \xrightarrow{H_2/Ni} X$
2) $C_6H_6 \xrightarrow[Zn/H_2O]{O_3} Y$
3) $C_6H_6 \xrightarrow[AlCl_3]{CH_3COCl} Q$
4) $C_6H_6 \xrightarrow[light]{Cl_2} R$

14. Number of $\sigma sp^2 - sp^2$ bonds present in a molecular of X in the process $C_6H_6 \xrightarrow{H_2/Ni} X$ is

1) 6
2) 3
3) 12
4) Zero

1) Both A & R are true & R explains A
2) Both A & R are true but R does not explain A
3) A is true but R is false
4) R is true but A is false

15. (1) : Ethyne gives white precipitate with Tollen's reagent

(R) : Ethyne is the first member of alkynes

16. (1) : Benzene does not decolourize Bayer's reagent

(R) : Benzene molecule obeys Huckel's rule.

17. (1) : Both Benzene & Ethyne give same product on ozonolysis.

(R) : Ethyne & Benzene possess same empirical formula.

WORK SHEET - III

1. Which of the following reacts with ammonical cuprous chloride ?

Hydrocarbons (Alkynes, Arenes)

1) CH_4 2) C_2H_2 3) C_2H_6 4) C_6H_6

2. In the following reaction, what is X $C_2H_2 \xrightarrow[HgSo_4, H_2SO_4]{H_2O, 60°C} X \Leftrightarrow CH_3CHO$

1) CH_3CH_2OH 2) $CH_3–O–CH_3$ 3) CH_3CH_2CHO 4) $H_2C = CHOH$

3. The reagent used for converting acetylene to oxalic acid is

1) $HgSO_4$/aqueous H_2SO_4 2) $HgSO_4/CH_3COOH$
3) $KMnO_4$/KOH, 25°C 4) CrO_3/H_2SO_4

4. Propyne and propene can be distinguished by

1) Conc. H_2SO_4 2) Br_2 in CCl_4 3) Dil $KMnO_4$ 4) $AgNO_3$ in ammonia

5. Which of these will not react with acetylene?

1) NaOH 2) Ammonical $AgNO_3$
3) Na 4) HC*l*

6. Benzene is obtaned by fractional distillation of

1) Light oil 2) Middle oil 3) Anthracene oil 4) Heavy oil

7. Benzene is used in the preparation of

1) polythene 2) gammaxene
3) chloroform 4) vinegar

8. Which of the following is used in the preparation of styrene

1) CH_3CHO 2) P_2O_5 3) CH_4 4) C_6H_6

9. Which one of the following compounds is prepared in the laboratory from benzene by a substitution reaction?

1) Glyoxal 2) Cyclohexane
3) Toluene 4) Hexabromo cyclohexane

10. The reagent used for converting benzene to ethyl benzene is :

1) C_2H_5Cl, anhydrous $AlCl_3$ 2) C_2H_5Cl, aqueous $AlCl_3$
3) C_2H_5OH, anhydrous $AlCl_3$ 4) C_2H_5Cl, $SOCl_2$

11. Benzene does not under go addition reaction easily because

1) It has six hydrogen atoms
2) It has a cyclic structure
3) Double bonds present in benzene are strong
4) Resonance stabilised system is to be preserved.

12. Ratio of π to σ bonds in benzene is

1) 1 : 4 2) 1 : 2 3) 3 : 1 4) 1 : 6

13. Aromatic compounds undergo

1) Electrophilic substitution 2) Electrophilic addition
3) Nucleophilic addition reaction 4) None of these

14. Coal tar is main source of

1) Cycloalkanes 2) Heterocyclic compounds
3) Aromatic compounds 4) Aliphatic compounds

15. In which of the following the bond length between carbon and carbon atom is equal

1) 2 – butene	2) Benzene
3) 1 – butene	4) 1 – propyene

16. Benzene on treating with a mixture of conc. HNO_3 and H_2SO_4 at 100°C gives

1) Nitrobenzene	2) m-dinitrobenzene
3) o-dinitrobenzene	4) p-dinitrobenzene

EXERCISE - I / ANSWERS

WORK SHEET - I

1) 3	**2) 3**	**3) 3**	**4) 2**	**5) 1**	**6) 4**	**7) 2**	**8) 3**	**9) 1**	**10) 2**
11) 4	**12) 3**	**13) 1**	**14) 2**	**15) 3**	**16) 1**	**17) 4**	**18) 2**	**19) 1**	**20) 3**
21) 2	**22) 4**	**23) 2**	**24) 4**	**25) 2**	**26) 1**	**27) 3**	**28) 1**	**29) 3**	**30) 1**
31) 3	**32) 1**	**33) 3**	**34) 3**	**35) 3**	**36) 3**	**37) 2**	**38) 3**	**39) 2**	**40) 1**
41) 4	**42) 4**	**43) 1**	**44) 1**	**45) 1**	**46) 2**				

WORK SHEET - II

1) 4	**2) 4**	**3) 3**	**4) 4**	**5) 3**	**6) 4**	**7) 1**	**8) 3**	**9) 3**	**10) 3**
11) 3	**12) 1**	**13) 3**	**14) 4**	**15) 2**	**16) 2**	**17) 2**			

WORK SHEET - III

1) 2	**2) 4**	**3) 3**	**4) 4**	**5) 1**	**6) 1**	**7) 2**	**8) 4**	**9) 3**	**10) 1**
11) 4	**12) 1**	**13) 1**	**14) 3**	**15) 2**	**16) 2**				

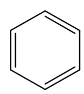
WORK SHEET - I

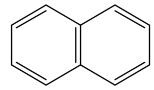
Topic : ARENES-INTRODUCTION -AROMATICITY,PREPARATORY METHODS OF BENZENE

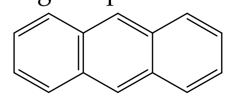
SECTION - A

Single correct answer Type Questions

1. The order of extent of aromaticity of the following compound is

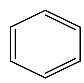

I

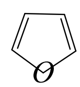

II

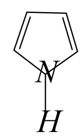

III

1) I>II>III 2) II>III>I 3) I>III>II 4) III>I>II

2. The aromatic character is maximum in which of these three compounds


I


II

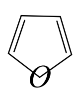

III

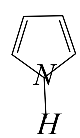
1) I 2) II 3) III 4) Same in all

3. When benzene sulphonic acid is hydrolysed with super heated steam, the product formed is

1) Phenol 2) Benzene 3) Benzene triphenol 4) Benzoic acid

4. The aromatic character is maximum in which of these three compounds


I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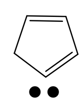

III

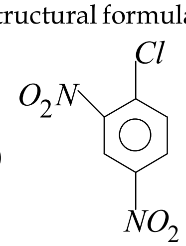
5. Isomerism shown by disubstituted benzene derivatives is

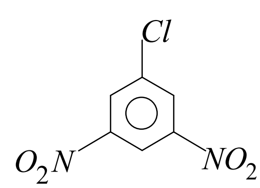
1) Chain isomerism 2) Positional isomerism
3) Optical isomerism 4) Geometrical isomerism

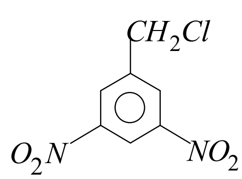
6. IUPAC name of benzyl chloride is

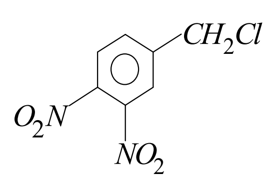
1) Chloro methyl Benzene 2) 1-chloro 1-phenyl methane
3) Chloro benzene 4) Benzene chloride

7. Structural formula for 3,5-dinitro benzyl chloride is

1) 

2) 

3) 

4) 

8. $CaC_2 \xrightarrow{2H_2O} X + Ca(OH)_2$

$3X \xrightarrow{\text{Red Hot Tube}} Y$

X & Y of the above reactions are

1) C_2H_2 & C_6H_6 2) C_2H_2 & *Toluene*

3) C_2H_2 & *meta – xylene* s) C_2H_2 & *Mesitylene*

9. $CaC_2 \xrightarrow{2H_2O} X + Ca(OH)_2$

$2X + propyne \rightarrow Y$

X, Y are

1) C_2H_2 & C_6H_6 2) C_2H_2 & *Toluene*

3) C_2H_2 & *meta – xylene* 4) C_2H_2 & *Mesitylene*

10. $CaC_2 \xrightarrow{2H_2O} X$

$X + 2CH_3 - C \equiv CH \rightarrow Y$ X and Y are

1) C_2H_2 & C_6H_6 2) C_2H_2 & *Toluene*

3) C_2H_2 & *meta – xylene* 4) C_2H_2 & *mesitylene*

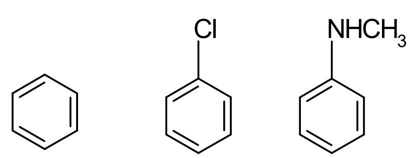
WORK SHEET - II

Topic : PROPERTIES OF ARENES

SECTION - A

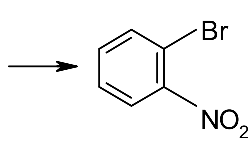
Single correct answer Type Questions

1. Rank the following in terms of increasing reactivity toward nitration with HNO_3, H_2SO_4, (least to most).



1 2 3

1) 1<2<3 2) 2<1<3 3) 3<1<2 4) 3<2<1

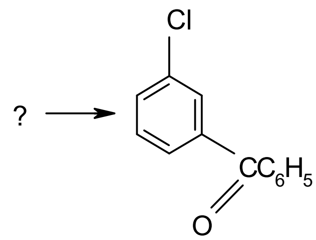
2. For the reaction ? 

the best reactants are :

1) $C_6H_5Br+HNO_3$, H_2SO_4 3) $C_6H_5Br+H_2SO_4$, heat

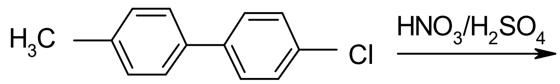
2) $C_6H_5NO_2+Br_2$, $FeBr_3$ 4) $C_6H_5NO_2+HBr$

3. For the reaction

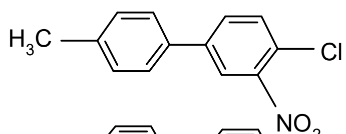


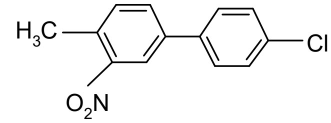
1) $C_6H_5Cl + C_6H_5COCl$, $AlCl_3$
2) $C_6H_5CO\,C_6H_5$, + Cl_2, Fe Cl_3
3) $C_6H_5CH_2C_6H_5$+Cl_2, $FeCl_3$, followed by oxidation with chromic acid.
4) None of these yields the deisred product.

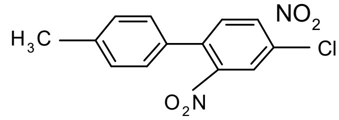
4. The reaction

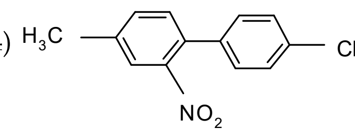


gives as the major product:

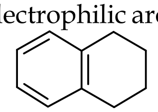
1) 

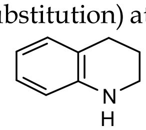
2) 

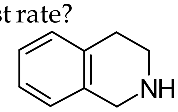
3) 

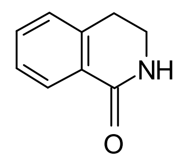
4) 

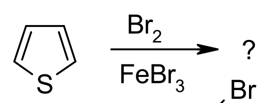
5. Which one of the following compounds undergoes bromination of its aromatic ring (electrophilic aromatic substitution) at the fastest rate?

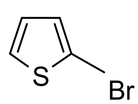
1) 

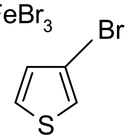
2) 

3) 

4) 

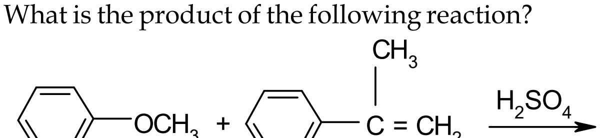
6. The major product of the reaction is 

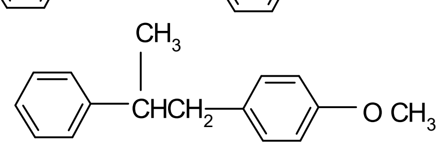
1) 

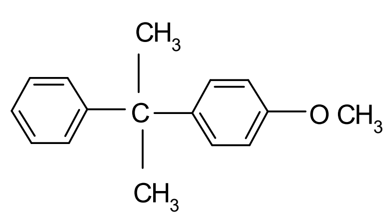
2) 

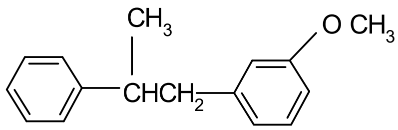
(3) An equal mixture of compound (1) and (2) would form
(4) None of these; substitution would not occur.

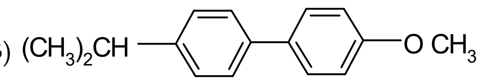
7. What is the product of the following reaction?



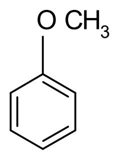
1) 

4) 

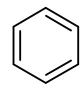
2) 

3) 

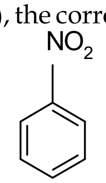
8. Among the following compounds (I - III), the correct order in reaction with electrophile is



I



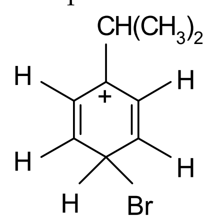
II



III

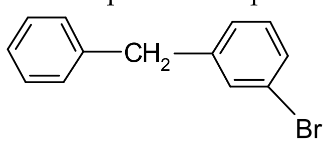
1) II > III > I 2) III < I < II 3) I > II > III 4) I = II > III

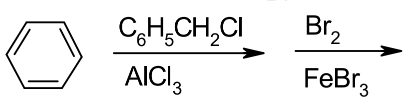
9. Which reactants combine to give the species shown as a reactive intermediate?

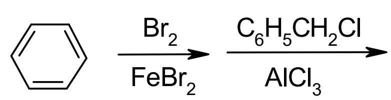


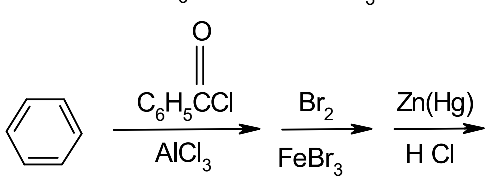
1) Benzene, isopropyl bromide, and HBr
2) Bromobenzene, isopropyl chloride, and $AlCl_3$
3) Isopropylbenzene, Br_2, and $FeBr_3$
4) Isopropylbenzene, Br_2, light, and heat
e) Isopropylbenzene, N-bromosuccinimide, Benzoyl peroxide, and heat

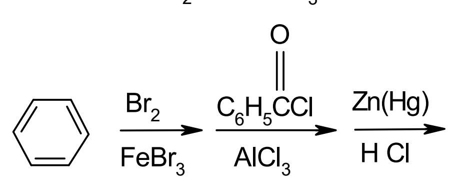
10. Which sequence of steps describes the best synthesis of the compound shown?



1) 

2) 

3) 

4) 

WORK SHEET - I

1) 1 2) 1 3) 2 4) 3 5) 2 6) 2 7) 3 8) 1 9) 2 10) 3

WORK SHEET - II

1) 2 2) 1 3) 2 4) 2 5) 2 6) 1 7) 4 8) 3 9) 3 10) 3

EXERCISE - I

WORK SHEET - I

1 If air is taken as a binary solution, the solvent is

1) N_2 2) O_2 3) CO_2 4) H_2

2. Homogeneous system among the following is

1) milk 2) sand in water
3) urea in water 4) benzene in water

3. The physical change among the following is

1) burning of coal 2) burning of sulphur
3) dissolution of Glucose in water 4) burning of white phosphorus

4 (A): Any part of the solution has identical chemical and physical properties
(R): Solution is always a homogeneous mixture

1) Both (1) and (R) are true and (R) is the correct explanation of (A)
2) Both (1) and (R) are true and (R) is not the correct explanation of (A)
3) (1) is true but (R) is false 4) (1) is false but (R) is true

5. The characterstic property of solution is

1) formation of solution is physical change
2) solute and solvent in the solution can be separated by filtration
3) solute and solvent in the solution can be separated by decantation
4) solution can be represented with a chemical formula

1) a, b 2) a 3) b,d 4) c, d

6. A binary solution constitute .... number of phases

1) one 2) two 3) three 4) four

7. A mixture of salt and water can be separated by

1) filtration 2) decantation 3) crystallisation 4) kept long standing

8. Which of the following differ from the others

1) ruby 2) elektron 3) bell metal 4) amalgam

9. Occlusion of Hydrogen on Palladium is an example for ..... type solution

1) gas in solid 2) solid in gas
3) gas in liquid 4) liquid in gas

10.

LIST - 1	LIST - 2
A) Gaseous solution	1) German silver
B) Liquid solution	2) Milk
C) Solid solution	3) Sand in water
D) Colloidal solution	4) Aqueous Alcoholic solution
	5) Air

	A	B	C	D		A	B	C	D
1)	5	4	1	2	2)	1	3	2	5
3)	4	2	5	1	4)	2	3	1	4

11. The units of Molarity are

1) gms. lit^{-1} 2) moles. lit^{-1} 3) equivalents. lit^{-1} 4) moles. kg^{-1}

12. To halve the molarity of a solution the following should be adopted

1) weight of the solute to be doubled

2) weight of the solvent to be doubled
3) volume of the solvent to be doubled
4) volume of the solution to be doubled

13. (1) : Molarity of a solution decreases with an increase of temperature
(R) : As temperature increases volumes of the solution increases.
The correct answer is
1) Both (1) and (R) are true and (R) is the correct explanation of (A)
2) Both (1) and (R) are true and (R) is not the correct explanation of (A)
3) (1) is true but (R) is false 4) (1) is false but (R) is true

14. (1) : Molarity of an aqueous solution at 0°C is less than the molarity of the same solution at 4°C.
(R) : Molarity increases with an increase of temperature
The correct answer is
1) Both (1) and (R) are true and (R) is the correct explanation of (A)
2) Both (1) and (R) are true and (R) is not the correct explanation of (A)
3) (1) is true but (R) is false 4) (1) is false but (R) is true

15. The units of Normality are
1) moles. lit^{-1} 2) moles. Kg^{-1} 3) equivalents. lit^{-1} 4) equivalents. Kg^{-1}

16. The following is not a fixed quantity
1) atomic weight of an element 2) equivalent weight of an element (or) compound
3) molecular weight of a compound 4) formula weight of a substance

17 In the reaction $2NaOH + H_3PO_4 \rightarrow Na_2HPO_4 + 2H_2O$, the Equivalent weight of the acid is
1) 49 2) 98 3) 32.6 4) 36.5

18 The equivalent weight of $CuSO_4$ when it is converted to Cu_2I_2 [M=mol.wt]
1) M/1 2) M / 2 3) M /3 4) 2 M

19. Which of the following acid has the same molecular weight and equivalent weight
1) H_3PO_2 2) H_3PO_3 3) H_3PO_4 4) H_2SO_4

20 'M' is the molecular weight of $KMnO_4$. The equivalent weight of $KMnO_4$ when it reacts according to the equation $2KMnO_4 + 3H_2SO_4 + 5H_2C_2O_4 \rightarrow K_2SO_4 + 2MnSO_4 + 8H_2O + 10CO_2$
1) M / 2 2) M /3 3) M 4)M /5

21. Molecular weight of $KMnO_4$ is "M". In a reaction $KMnO_4$ is reduced to K_2MnO_4. The equivalent weight of $KMnO_4$ is
1) M 2) M / 2 3) M/3 4) M/5

22. The equivalent weight of Hypo in the reaction $Na_2S_2O_3 + Cl_2 + H_2O \rightarrow Na_2SO_4 + 2HCl + S$ is [M=mol. wt]
1) M 2) M / 2 3) M/3 4) 2M

23. Molecular weight of Mohr's salt is 392. Its equivalent weight when it is oxidised by $KMnO_4$ in acidic medium is
1) 392 2) 196 3) 130.6 4) 78.5

24. The equivalent weight of CH_4 in the reaction $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ is [M=mol. wt]
1)M / 4 2) M / 8 3)M / 12 4)M / 16

25. At 25^0C for a given solution M = m, then at 50^0C the correct relationship is
1) M = m 2) M > m 3) M < m 4) M = 2M

SOLUTIONS

26 To change the molal conc. to one half, one of the following should be adopted

1) weight of the solute should be doubled 2) weight of the solvent should be doubled

3) volume of the solvent should be doubled 4) weight of the solution should be doubled

27. A one molal solution is one that contains

1) 1 g. of the solute in 1000 g. of solvent 2) 1 g. mole of solute in 1000 ml of solution

3) 1 g. mole of solute in 22.4 lits of solution 4) 1 g. mole of solute in 1000 g. of solvent

28. The units of molality are

1) moles. lit^{-1} 2) moles. ml^{-1} 3) moles. Kg^{-1} 4) g. equivalents Kg^{-1}

29. M = molarity of the solution m = molality of the solution

d = density of the solution (in g. ml^{-1}) M^1 = gram molecular weight of solute

Which of the following relations is correct

1) $m = \frac{M}{1000d - MM^1}$ 2) $m = \frac{M \times 1000}{d + MM^1}$

3) $m = \frac{M \times 1000}{(1000 \times d) - MM^1}$ 4) $M = \frac{m \times 1000}{(1000 \times d) - MM^1}$

30. (1) : Molality is independent of temperature

(R) : There is no volume factor in the expression of molality

The correct answer is

1) Both (1) and (R) are true and (R) is the correct explanation of (A)

2) Both (1) and (R) are true and (R) is not the correct explanation of (A)

3) (1) is true but (R) is false 4) (1) is false but (R) is true

31. (1) : One molar aqueous solution is always more concentrated than one molal aqueous solution.

(R) : The amount of solvent in 1M solution is less than in 1m solution. The correct answer is

1) Both (1) and (R) are true and (R) is the correct explanation of (A)

2) Both (1) and (R) are true and (R) is not the correct explanation of (A)

3) (1) is true but (R) is false 4) (1) is false but (R) is true

32. Regarding molarity, which of the following statements are correct

a) units of molarity gm-moles kg^{-1}

b) molarity of dibasic acid is half of its normality

c) $\frac{\textbf{Normality} \times \textbf{GEW}}{\textbf{GMW}}$

d) Molarity always equals to its molality

1) a, b 2) a, b 3) b, c 4) a, c

33. (A) : Mole fraction has no units

(R) : Mole fraction is a ratio of number of moles of solute to number of moles of solvent

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false 4) (A) is false but (R) is true

34.

LIST - 1	LIST - 2
1) Mole fraction	1) No.of g equivalents in 1000ml of solution
2) Molarity	2) Always less than one

3) Normality | 3) Greater than or equal to molarity
4) Molality | 4) No.of g moles present in 1000ml solution
 | 5) No.of g moles of solute 1kg of solvant

The correct match is

	A	B	C	D		A	B	C	D	1)
1	2	3	4	2)	2	3	1	5	3)	1
4	2	3	4)	2	4	3	5			

35. As temperature increases, vapour pressure of a liquid

1) increases linearly
2) decreases linearly
3) increases exponentially
4) decreases exponentially

36. Rate of evaporation depends up on

1) Nature of liquid
2) Surface area of the liquid
3) Temperature
4) Flow of air current over the surface

The correct answer is

1) a, b only 2) b, c only 3) a, b, and c only 4) a, b, c and d

37. At a given temperature

a) Vapour pressure of a solution containing nonvolatile solute is proportional to mole fraction of solvent

b) Lowering of vapour pressure of solution containing nonvolatile solute is proportaional to mole fraction of solute

c)Relative lowering of vapour pressure is equal to mole fraction of solute

The correct combination is

1) a only 2) a, b only 3) a, b and c only 4) b, c only

38. (1) : Increase in temperature increases vapour pressure of a liquid

(R) : Volume of a solution increases byincreasing the temperature.

1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false
4) (A) is false but (R) is true

39. (A): Rate of evaporation increases with an increase in the surface area of the vessel

(R): Evaporation is a surface phenomenon

The correct answer is

1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false
4) (A) is false but (R) is true

40. Which of the following statements are correct

a) the boiling point of a solution is greater than pure solvent

b) the temperature where the vapour pressure of liquid equals to atmospheric pressure is called its boiling point

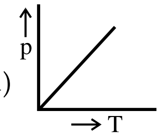
c) the vapour pressure of pure solvent is less than the vapour pressure of solution containing non volatile solute.

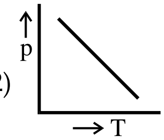
d) the temperature of liquid remained in the container after evaporation is more than before the evaparation

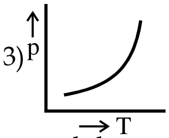
1) a, b 2) b, c 3) c, d 4) a, d

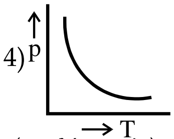
41. The graph obtained by taking vapour pressure (P) of a liquid on y-axis and temperature (T)

on x-axis will be

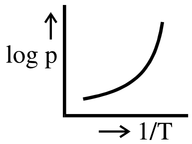
1) 

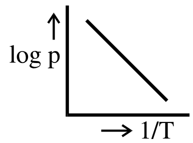
2) 

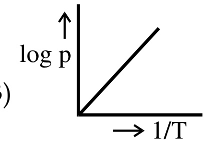
3) 

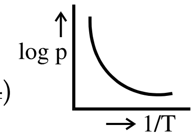
4) 

42. Which graph of the following represents the graph between log p (on Y - axis) and 1/T (on X - axis) ?

1) 

2) 

3) 

4) 

43. (A): Sea water boils at higher temperature than distilled water

(R): Addition of non volatile solute to a solvent lowers the vapour pressure

1) Both (1) and (R) are true and (R) is the correct explanation of (A)

2) Both (1) and (R) are true and (R) is not the correct explanation of (A)

3) (1) is true but (R) is false   4) (1) is false but (R) is true

44. (A): A pressure cooker reduces cooking time

(R): The boiling point of water inside the cooker is increased

1) Both (1) and (R) are true and (R) is the correct explanation of (A)

2) Both (1) and (R) are true and (R) is not the correct explanation of (A)

3) (1) is true but (R) is false   4) (1) is false but (R) is true

45. Which of the following solutions will have the lowest vapour pressure

1) 0.1M Glucose   2) 0.1M NaCl   3) 0.1 M $BaCl_2$ 4) 0.1 M $Al_2(SO_4)_3$

46. Which has greater lowering of vapour pressure

1) 0.1m Urea   2) 0.1m Glucose   3) 0.1m Sucrose   4) equal in all cases

47. The vapour pressure is least for

1) pure water   2) 0.1m aqueous urea

3) 0.2m aqueous urea   4) 0.3m aqueous urea

48. Relative lowering of vapour pressure is maximum for

1) 0.1m urea   2) 0.1m NaCl   3) 0.1m $MgCl_2$ 4) 0.1m $Al_2(SO_4)_3$

49. Boiling point is least for

1) 0.1m urea   2) 0.2m urea   3) 0.1m NaCl   4) 0.2m $MgCl_2$

50. A non-volatile solute (1) is dissolved in a volatile solvent (B). the vapour pressure of resultant solution is Ps. The vapour pressure of pure solvent is P_B^0. If "X" is mole fraction, which of the following is correct?

1) $P_S = P_B^0 . X_A$ 2) $P_B^0 = P_S X_B$ 3) $P_S = P_B^0 . X_B$ 4) $P_B^0 = P_S X_A$

51. A solution that obeys Raolult's law is called ***(1993)***

1) normal solution   2) non-ideal solution   3) ideal solution   4) saturated solution

52. LIST - 1 | LIST - 2

LIST - 1	LIST - 2
1) Lowering of vapour pressure	1) $\frac{P^o - P}{P^o}$
2) Relative lowering of vapour pressure	2) $\frac{P^o - P}{P^o} = \frac{w}{m} x \frac{M}{W}$
3) Raoult's law	3) $P^o - P$
4) Ideal solution	4) Obeying Raoults law
	5) Boiling point

The correct match is

	A	B	C	D		A	B	C	D	1)
3	2	1	4	2)	4	1	2	3	3)	3
1	2	4	4)	1	3	4	2			

53. (1) : Vapour pressure of 0.5M sugar solution is more than 0.5M KCl solution

(R) :Lowering of vapour pressure is directly proportional to the number of particles present in the solution

1) Both (1) and (R) are true and (R) is the correct explanation of (A)

2) Both (1) and (R) are true and (R) is not the correct explanation of (A)

3) (1) is true but (R) is false   4) (1) is false but (R) is true

54. (1) : For two solutions, 0.1m aqutous solution of glucose and 0.1 m urea in benzene, the lowering of vapour pressure is same.

(R) : Vapour pressure is always lowered when non – volatile solute is added to water.

1) Both (1) and (R) are true and (R) is the correct explanation of (A)

2) Both (1) and (R) are true and (R) is not the correct explanation of (A)

3) (1) is true but (R) is false   4) (1) is false but (R) is true

55. When KCl dissolved in water

1) ΔH = +Ve ΔS = +Ve ΔG = +Ve   2) ΔH = +Ve ΔS = –Ve ΔG = –Ve

3) ΔH = +Ve ΔS = +Ve = –Ve   4) ΔH = –Ve ΔS = –Ve ΔG = +Ve

56. (1) : In a pressure cooker, the water is brought to boil. The cooker is then removed from the stove, Now on removing the head of the presuure cooker, the water starts boiling again

(R) : The impurties in water bring down its boiling point

1) Both (1) and (R) are true and (R) is the correct explanation of (A)

2) Both (1) and (R) are true and (R) is not the correct explanation of (A)

3) (1) is true but (R) is false   4) (1) is false but (R) is true

57. For an ideal solution of two components A and B, If x_A and y_A are mole fractions of component 'A' in solution and vapour phase respectively, then the slope of linear line in the graph drawn between $1/x_A$ and $1/y_A$ is

1) $P^0_A + P^0_B$ 2) P^0_A / P^0_B 3) $P^0_B + P^0_A$ 4) $P_A^0 - P_B^0$

58. A liquid is in equilibrium with its vapour at its boiling point, on the average, the molecules in the two phases have equal

1) Inter molecular forces   2) Potential energy

3) Temperature   4) Kinetic energy

59. (A): If one component obeys Raoult's law over a certain range of composition, the other

component would not obey Henry's law in that range

(R): Raoult's law in a special case of Henry's law

1) Both (1) and (R) are true and (R) is the correct explanation of (A)

2) Both (1) and (R) are true and (R) is not the correct explanation of (A)

3) (1) is true but (R) is false 4) (1) is false but (R) is true

60. The properties of solutions which depend only on the number of particles of solute (or the number of moles of solute) but independent of the nature of the solute are called

1) extensive properties 2) intensive properties

3) colloidal properties 4) colligative properties

61. Which of the following is a colligative property

1) vapour pressure of a liquid 2) boiling point

3) freezing point 4) relative lowering of vapour pressure of a solution

62. The solublity of I_2 in KI solution is more than its solubllity in pure water because

1) I_2 dissociates in water 2) I_2 does not react with water

3) I_2 forms soluble complex KI_3 with KI 4) None of these

63. The freezing point of equimolal aqueous solution will be highest for

1) $C_6H_5NH_3Cl$ 2) $Ca(NO_3)_2$ 3) $La(NO_3)_3$ 4) $C_6H_{12}O_6$

64. If 0.1 M solution of glucose and 0.1 M solution of urea are placed on two sides of a semipermeable membrane to equal heights, then it will be correct to say that

1) Glucose will flow towards urea solution

2) There will be no net movement across membrane

3) Urea will flow towards glucose solution

4) Water will flow from urea solution to glucose

65. The relationship between the value of Osmotic pressue (π) of the solution obtained by dissolving 6 $g.L^{-1}$ of acetic acid (π_1) and 7.45 $g.L^{-1}$ of KCl (π_2) is

1) $\pi_1 < \pi_2$ 2) $\pi_1 > \pi_2$. 3) $\pi_1 = \pi_2$ 4) $\frac{\pi_1}{\pi_1 + \pi_2} = \frac{\pi_2}{\pi_1 + \pi_2}$

66. Solution A, B, C and D are respectively 0.1M Glucose, 0.05M NaCl, 0.05M $BaCl_2$ and 0.1M AlF_3. Which one of the following pairs is isotonic ?

1) A&C 2) B&C 3) A&B 4) A&D

67. Solution S_1 contains 3g of urea per litre and solution S_2 contains 9g glucose per litre. At 298 K, the osmotic pressure of

1) S_1 is greater than that S_2 2) S_1 is less than that of S_2

3) Both the solution is same 4) Both the solution is 1 atm.

68.

Set - I	Set - II
i) RBC in 0.5% NaCl solution	A) Swells
ii) RBC in 1% NaCl solution	B) Shrinks
iii) egg (outer shell remove4) in water	
iv) egg (outer shell remove4) in NaCl solution	

incorrect match is

1) i - A 2) ii - B

3) iii - A 4) iv - A

69. $FeCl_3$ on reaction with $K_4[Fe(CN)_6]$ in aq solution gives blue colour of these are separated by a semi permeable membrane AB as shown, Due to osmosis there is

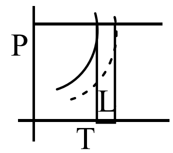
1) blue colour formation in side X

2) blue colour formation in side Y

3) blue colour formation in both sides X & Y 4) no blue colour formation

70. The phase diagrams for the pure solvent (solid lines) and the solution (non-volatile solute, dashed line) are recorded below. The quantity indicated by 'L' in the figure is

1) Δp 2) ΔT_f



3) $K_b.m$ 4) $K_f.m$

71. The degree of dissociation (α) of a weak electrolyte A_xB_y is related to Van't Hoff factor (i) by the expression

1) $\alpha = \frac{i-1}{(x+y-1)}$ 2) $\alpha = \frac{i-1}{x+y+1}$ 3) $\alpha = \frac{x+y-1}{i-1}$ 4) $\alpha = \frac{x+y+1}{i-1}$

72. When mercuric iodide is added to the aqueous solution of potassium iodide, the

1) freezing point is raised 2) freezing point doesnot change

3) freezing point is lowered 4) boiling point does not change

73. In the depression of freezing point experiment, it is found that

a) The vapour pressure of the solution is less than that of pure solvent

b) The vapour pressure of the solution is more than that of pure solvent

c) Only solute molecules solidify at the freezing point

d) Only solvent molecules solidify at the freezing point

1) a, b 2) b, c 3) a, d 4) a, b, c

74. During depression of freezing point in a solution the following are in equilibrium

1) Liquid solvent, Solid solvent 2) Liquid solvent, Solid solute

3) Liquid solute, Solid Solute 4) Liquid solute, Solid solvent

75. The molal elevation constant is the ratio of the elevation in boliing point to

1) Molarity 2) Molality

3) Mole fraction of solute 4) Mole fraction of solvent.

76. The relationship between osmotic pressure at 273 K when 10 g glucose (P_1), 10 g urea (P_2) and 10 g sucorse (P_3) are dissoved in 250 ml of water is.

1) $P_1 > P_2 > P_3$ 2) $P_3 > P_1 > P_2$ 3) $P_2 > P_1 > P_3$ 4) $P_2 > P_3 > P_1$

77. Which of the following statement is false?

1) Raoult's law states that vapour pressure of a component over a solution is proportional to its mole fraciton.

2) Osmotic pressure is given by the expression π = MRT where, M is molarity.

3) The correct order of osmotic pressures of 0.01 M aqueous solution of each compound is $BaCl_2$ > KCl> CH_3COOH > Sucrose.

4) Two sucrose solutions of same molarity prepared in different solvents will have same freezing point depressions.

78. Equimolar solutions of electrolytes in the same solvent have

1) Same boiling point but different freezing point

2) Same freezing point but different boiling point

3) Same boiling and same freezing points

4) Different boiling and different freezing point

79. If α is the degree of dissociation of Na_2SO_4, the Vant Hoff factor (i) used for calculating the molecular mass is

1) $1+\alpha$ 2) $1-\alpha$ 3) $1+2\alpha$ 4) $1-2\alpha$

80. Solution A contains 7g/L $MgCl_2$ and solution B contains 7g/L of NaCl. At room temperature, the osmotic pressure of

1) solution A is greater than B 2) both have same osmotic pressure

3) solution B is greater than A 4) Can't determine.

81. Which of the following aqueous solutions containing 10g of solute in each case, has highest melting point?

1) NaCl solution 2) KCl solution 3) Sugar solution 4) Glucose solution

82. Which of the following salt will have same value of Van't Hoff's factor [i] as that of $K_4[Fe(CN)_6]$

1) $Al_2(SO_4)_3$ 2) NaCl 3) $Al(NO_3)_3$ 4) Na_2SO_4

83. Blood is isotonic with

1) 0.16 M NaCl 2) Conc.NaCl 3) 50% NaCl 4) 30% NaCl

WORK SHEET - II

1. The number of Glucose molecules present in 10 ml of decimolar solution is

1) 6.0×10^{20} 2) 6.0×10^{19} 3) 6.0×10^{21} 4) 6.0×10^{22}

2. The number of ion s present in 1 ml of 0.1M $CaCl_2$ solution is

1) 1.8×10^{20} 2) 6.0×10^{20} 3) 1.8×10^{19} 4) 1.8×10^{21}

3. 100 ml of an aqueous solution contains 6.023×10^{21} solute molecules. The solution is diluted to 1 lit. The number of solute molecules present in 10ml of the dilute solution is

1) 6.0×10^{20} 2) 6.0×10^{19} 3) 6.0×10^{18} 4) 6.0×10^{17}

4. 11.1 g. of $CaCl_2$ is present in 100 ml of the aqueous solution. The chloride ion concentration is

1) 1M 2) 2M 3) 0.5M 4) 0.2M

5. 100 ml each of 1M $AgNO_3$ and 1M NaCl are mixed. The nitrate ion concentration in the resulting solution is

1) 1M 2) 0.5M 3) 0.75M 4) 0.25 M

6. H_2SO_4 is labelled as 9.8% by weight. Specific gravity of H_2SO_4 is 1.8. The volume of the acid to be taken to prepare 1000 ml of 0.18M solution is

1) 10ml 2) 100ml 3) 740 ml 4) 360 ml

7. HCl is labelled as 3.65% (w/v) 10ml of the solution is diluted to 1 lit. The proton concentration in the resulting solution is

1) 10^{-3} M 2) 2.5×10^{-2} M 3) 7.5×10^{-2} M 4) 10^{-2} M

8. 100 ml of 1M HCl, 200 ml 2M HCl and 300 ml 3M HCl are mixed. The Molarity of the resulting solution is

1) 1M 2) 2.66M 3) 2.33 M 4) 4.25 M

9. The volumes of 1M HCl and 5M HCl to be mixed to get 2 lit of 2M HCl are

1) 1 lit and 1 lit 2) 1.5 lit and 0.5 lit 3) 1.25 lit and 0.75 lit 4) 1.33 lit and 0.66 lit

10. A 20%(W/W) solution of NaOH is 5 M. The density of the solution is

1) 1 $g.ml^{-1}$ 2) 2 $g.ml^{-1}$ 3) 0.5 $g.ml^{-1}$ 4) 0.25$g.ml^{-1}$

11. Zinc reacts with $CuSO_4$ according to the equation $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$. If excess of zinc is added to 100ml of 0.05M $CuSO_4$, the amount of copper formed

1) 0.6354 g. 2) 0.3177 g. 3) 3.177 g. 4) 6.354 g.

12. 10.6 g of a substance of molecular weight 106 was dissolved in 100 ml. 10 ml of this solution was pipetted out into a 1000 ml flask and made up to the mark with distilled water. The molarity of the resulting solution is

1) 1 M 2) 10^{-2} M 3) 10^{-3} 4) 10^{-4} M

13. The volume of decamolar aquous solutions of hydrochloric Acid is required to prepare $2dm^3$ of 5M HCl solution is

1) 0.5L 2) 1L 3) 2L 4) 3L

14. The concentration of a 100 ml solution containing 'x' grams of Na_2CO_3 is yM. The values of x and y are

1) 2.12, 0.05 2) 1.06, 0.2 3) 1.06, 0. 1 4) 2.12, 0.1

15. The number of millimoles of H_2SO_4 present in 5 litres of 0.2N H_2SO_4 solution is

1) 500 2) 1000 3) 250 4) 0.5×10^{-3}

16. 200 ml of 1M H_2SO_4, 300 ml 3M HCl and 100 ml of 2M HCl are mixed and made up to 1 litre. The proton concentration in the resulting solution is

1) 1.25M 2) 1.5M 3) 2.5M 4) 0.75M

17. The volume of 0.025M $Ca(OH)_2$ solution which can neutralise 100 ml of 10^{-4}M H_3PO_4 is

1) 10 ml 2) 60 ml 3) 0.6 ml 4) 2.8 ml

18. The Molarity of 200 ml of HCl solution which can neutralise 10.6 g. of anhydrous Na_2CO_3 is

1) 0.1M 2) 1M 3) 0.6M 4) 0.75M

19. 10 millimoles of a diacidic base exactly neutralises 100 ml of an acid. Then the Normality of that acid is

1) 0.2 N 2) 0.1 N 3) 0.4 N 4) 0.5N

20. 100 ml of 0.1N $FeSO_4$ solution will be completely oxidised by 'x' gms of $K_2Cr_2O_7$ in acidic medium (Mol.wt = 294). The value of 'x' is

1) 4.9 2) 2.94 3) 0.49 4) 1.47

21. 100 ml of 2M *HCl* solution completely neutralises 10 g. of a metal carbonate. Then the equivalent weight of the metal is

1) 50 2) 20 3) 12 4) 100

22. What is the volume (in ml) of 0.1 M potasium permanganate solution required to completely oxidise 100 ml of 0.5 M ferrous sulphate solution in acidic medium?

1) 20 2) 200 3) 50 4) 100

23. The Normality of 0.98% (w/v) H_2SO_4 solution is

1) 0.1N 2) 0.2N 3) 0.4N 4) 1N

24. Molarity of 3N H_3PO_4 solution is

1) 9 M 2) 1.5 M 3) 6 M 4) 1 M

25. 0.1 gram mole of urea is dissolved in 100g. of water. The molality of the solution is

1) 1 m 2) 0.01 M 3) 0.01 m 4) 1.0 M

26. The molality of 2% (W/W) NaCl solution nearly

1) 0.02m 2) 0.35 m 3) 0.25 m 4) 0.45 m

27. 100 ml of ethyl alcohol [d = 0.92 g/ml] and 900 ml of water [d = 1 g/ml] are mixed to form 1 lit solution. The Molarity and molality of the resulting solution are

1) 2M and 2m 2) 2M and 2.22m 3) 2.2M and 1.1 m 4) 2M and 1m

28. Which of the following aqueous solutions is more concentrated [Assume the density of the solution as 1g/ml]

1) 1M Glucose 2) 1m Glucose 3) 0.5m Glucose 4) 0.5M Glucose

29. Which of the following solution is more concentrated

1) 0.3% H_3PO_4 2) 0.3M H_3PO_4 3) 0.3m H_3PO_4 4) 0.3N H_3PO_4

30. Molarity of 1m aqueous NaOH solution [density of the solution is 1.02 g/ml]

1) 1M 2) 1.02 M 3) 1.2 M 4) 0.98 M

31. 6 g. of Urea is dissolved in 90 g. of water. The mole fraction of solute is

1) 1/5 2) 1/50 3) 1/51 4) 1/501

32. A gaseous mixture contain four gases A, B, C and D. The mole fraction of "B" is 0.5. The mole fraction of "A" is

1) 0.525 2) 0.375 3) 0.625 4) 0.732

33. Aqueous NaOH solution is labelled as 10% by weight mole fraction of the solute in it is

1) 0.05 2) 0.0476 3) 0.052 4) 0.52

34. The mole percentage of oxygen in a mixture of 7 gm of Nitrogen and 8 gm of oxygen is

1) 8 2) 16 3) 21 4) 50

35. The mole fraction of solvent in 0.1 molal aqueous solution is

1) 0.9982 2) 0.0017 3) 0.017 4) 0.17

36. NaOH aqueous solution is labelled as 10%(w/v). Density of the solution is 1.02 g/ml. Then the mole fraction of the solute in the solution is

1) 0.05 2) 0.0466 3) 0.53 4) 0.053

37. The maximum allowable level of Nitrates in drinking water as set by U.S. is 45mg NO_3^{--} ions per dm^3, the level in ppm is

1) 15 2) 30 3) 45 4) 60

38. 6 g. of urea is dissolved in 90 g. of boiling water. The vapour pressure of the solution is

1) 744.8 mm 2) 758 mm 3) 761 mm 4) 760 mm

39. At 20^0C, the vapour pressure of diethyl ether is 442mm. When 6.4 g. of a non-volatile solute is dissolved in 50g. of ether, the vapour pressure falls to 410mm. The Molecular weight of the solute is

1) 150 2) 130.832 3) 160 4) 180

40. The vapour pressure of pure water at 25^0C is 30 mm. The vapour pressure of 10% (W/W) glucose solution at 25^0C is

1) 31.5 mm 2) 30.6 mm 3) 29.67 mm 4) 26.56 mm

41. The weight of urea to be dissolved in 100 g. of water to decrease the vapour pressure of water by 5% is

1) 20 g. 2) 14.66 g 3) 15.24 g 4) 16.66 g.

42. 139.18 g of glucose is added to 178.2 g of water the vapour pressure of water for this aqueous solution at 100^0 C is

1) 704 torr 2) 759 torr 3) 7.6 torr 4) 76 torr

43. The relative lowering of vapour pressure of 0.2 molal solution in which the solvent is Benzene is

1) 15.6×10^{-4} 2) 15.6×10^{-3} 3) 15.6×10^{-1} 4) 0.05

44. Vapour pressure of an aqueous solution is 2% less than that of the solvent. The molality of the solution is

1) 2m 2) 1.5 m 3) 1.13 m 4) 0.2 m

45. The amount of Glucose to be dissolved in 500 g. of water so as to produce the same lowering in vapour pressure as that of 0.2 molal aqueous urea solution

1) 9 g. 2) 18 g. 3) 36 g. 4) 1.8 g.

46. A Current of dry air was first passed through the bulb containing solution of 'A' in water and then through the bulb containing pure water. The loss in mass of a solution bulb is 1.92g gm Where as that in pure water bulb is 0.08g, then mole fraction of 'A' is

1) 0.86 2) 0.2 3) 0.96 4) 0.04

47. An aqueous solution containing one gram of urea boils at 100.25°C. The aqueous solution containing 3gm of glucose in the same volume will boil at

1) 100°C 2)100.25°C 3) 100.5°C 4) 100.75°C

48. A solution prepared by dissolving 0.8gm of naphthalene in 100g of CCl_4 has a boiling point elevation of 0.4°C. A 1.24 g of an un-known solute in same amount of CCl_4 produced boiling point elevation of 0.62°C, then molar mass of un-known solute is

1) 25g 2) 50g 3) 75g 4) 128g

49. Molality of an aqueous solution that produces an elevation of boiling point of 1.00 K at 1 atm pressure. (K_b for water = 0.512 K. kg. mol^{-1})

1) 0.512 M 2) 0.195 m 3) 1.95 m 4) 5.12 M

50. A current of dry air was bubbled through a bulb contaning 30 g of an organic compound in 200 g of water, then through a bulb at the same temparature, containing water and finally through a tube contaning anhydrous $CaCl_2$, the loss in mass of bulb containing water was 0.03 g and gain in mass of $CaCl_2$ tube was 2 g , then molecular mass of organic compound is

(Hint: $\dfrac{P^o - P}{P^o} = \dfrac{\text{Loss in mass of solvent bulb}}{\text{Gain in mass of } CaCl_2 \text{ tube}}$)

1) 180 2) 530.7 3) 280.7 4) 140.7

51. The solution containing 6.8g of non-ionic solute in 100g of water was found to freeze at -0.93°C. If K_f for water is 1.86, the molar Mass of solute is

1) 13.6 2) 68 3) 34 4) 136

52. The molal freezing point constant for water is 1.86 K.kg $mole^{-1}$. The freezing point of 0.1m NaCl solution is

1) -1.86°C 2) -0.372°C 3) -0.186°C 4) 0.372°C

53. Molal depression constant for water is 1.86 K.Kg.$mole^{-1}$. The freezing point of a 0.05 molal solution of a non electrolyte in water is

1) -1.86^0C 2) -0.93^0C 3) -0.093^0C 4) 0.93^0C

54. The depression in freezing point of 0.01 m aqueous solution of urea, sodium chloride and sodium sulphate is in the ratio

1) 1:1:1 2) 1:2:3 3) 1:2:4 4) 2:2:3

55. The Osmotic pressure of solution containing 4.0g of solute (molar mass 246) per litre at 27°C is (R = 0.082L atm k^{-1} mol^{-1}) :

1) 0.1 atm 2) 0.2 atm 3) 0.4 atm 4) 0.8 atm

56. Average osmotic pressure of human blood is 7.4 atm at 27°C, then total concentration of

various solutes is

1) 0.1 $molL^{-1}$ 2) 0.2 $molL^{-1}$ 3) 0.3 $molL^{-1}$ 4) 0.4 $molL^{-1}$

57. At 10°C, the osmotic pressure of urea solution was formed to be 500 mm. The solution is diluted 'x' times and the temperature raised to 25°C when the osmotic prssure was noticed to be 105.3mm, then 'x' is

1) 3 2) 4 3) 5 4) 12

58. The osmotic pressure of 5% aqueous solution of sugar (mol. Mass 342) at 15°C is

1) 4 atm. 2) 3.45 atm 3) 3.75 atm 4) 2.45 atm.

59. A 5% solution of cane suger is isotonic with 0.5% of X. The molecular weight of substance X is

1) 34.2 2) 119.96 3) 95.58 4) 126.98

60. At 273K, 100Cm^3 of a solution containing 3gm of an unidentified solute exhibits an osmotic pressure of 2.24atm, then molar mass of the solute is

1) 88$gmol^{-1}$ 2) 188$gmol^{-1}$ 3) 300$gmol^{-1}$ 4) 388$gmol^{-1}$

61. The osmotic pressure of the solution obtained by mixing 200cm^3 of 2% (mass-volume) solution of urea with 200cm^3 of 3.42% solution of sucrose at 20°C is

1) 4 bar 2) 1.2 bar 3) 5.2 bar 4) 15.4 bar

62. Correct order of osmotic pressure of the following solution is

1) 34.2 gmL^{-1} of glucose 2) 60 gm L^{-1} of urea

3) 90 gm L^{-1} of glucose 4) 58.5 gm L^{-1} of NaCl

1) A < B < C < D 2) A < C < B < D 3) A < D < B < C 4) A < C < D < B

63. A decimolar solution of $K_4[Fe(CN)_6]$ at 300K is 50% dissociated, then, osmotic pressure of the solution is

1) 3.61 atm 2) 7.38 atm 3) 12.32 atm 4) 21.34 atm

EXERCISE- I / ANSWERS

WORK SHEET - I

1) 1	2) 3	3) 3	4)1	5) 2	6) 1	7) 3	8) 1	9)1	10) 1
11) 2	12) 4	13) 1	14) 3	15) 3	16) 2	17) 1	18) 1	19) 1	20) 4
21) 1	22) 2	23) 1	24) 2	25) 3	26) 2	27) 4	28) 3	29) 3	30) 1
31) 1	32) 3	33) 3	34) 4	35) 3	36) 4	37) 3	38) 2	39) 1	40) 1
41) 3	42) 2	43) 1	44) 1	45) 4	46) 4	47) 4	48) 4	49) 1	50) 3
51) 3	52) 3	53) 1	54) 4	55) 3	56) 3	57) 3	58) 4	59) 4	60) 4
61) 4	62) 3	63) 4	64) 2	65) 1	66) 3	67) 3	68) 4	69) 4	70) 3
71) 1	72) 1	73) 3	74) 1	75) 2	76) 3	77) 4	78) 4	79) 3	80) 3
81) 3	82) 1	83) 1							

WORK SHEET - II

1) 1	2) 1	3) 2	4) 2	5) 2	6) 2	7) 4	8) 3	9) 2	10) 1
11) 2	12) 2	13) 2	14) 3	15) 1	16) 2	17) 3	18) 2	19) 1	20) 3
21) 2	22) 4	23) 2	24) 4	25) 1	26) 2	27) 2	28) 1	29) 2	30) 4
31) 3	32) 2	33) 2	34) 4	35) 1	36) 2	37) 3	38) 1	39) 2	40) 3
41) 4	42) 1	43) 2	44) 3	45) 2	46) 4	47) 2	48) 4	49) 3	50) 1
51) 4	52) 2	53) 3	54) 2	55) 3	56) 3	57) 3	58) 2	59) 1	60) 3
61) 3	62) 2	63) 2							

EXERCISE - I

WORK SHEET - I

1. Which one of the following materials conducts electricity ?
   1) diamond 2) barium sulphate 3) crystalline sodium chloride
   4) fused potassium chloride 5) molten sulphur
2. An electronic conductor is
   1) NaC*l* 2) Diamond 3) Ag 4) KC*l*
3. Which of the following is conductor of electricity
   1) diamond 2) graphite 3) carborundum 4) silica
4. In metallic conductor the current is conducted by flow of
   1) ions 2) atoms 3) electrons 4) molecules
5. In which of the following, HCl conducts electricity to large extent ?
   1) liquid HCl 2) HCl aq. solution
   3) HCl solution in benzene 4) gaseous HCl
6. Solid NaC*l* is a bad conductor of electricity because
   1) solid NaCl is a covalent compound 2) solid NaCl has no free ions
   3) solid NaCl has no free electrons 4) solid NaCl there is no migration of ions
7. The decrease in electrical conductivity of metals with increase in temperature is due to increase in
   1) the velocity of electrons 2) the resistance of the metal
   3) the number of electrons 4) the number of metal atoms
8. The reason for increase in electrical conduction of electrolyte with increase in temperature is
   1) increase in the number of ions 2) increase in the speed of ions
   3) increase in the degree of dissociation of electrolyte
   1) A, B only 2) B, C only 3) A, C only 4) A, B, C
9. Sodium metal in liquid ammonia is
   1) an ionic conductor 2) an electronic conductor
   3) a mixed conductor 4) non - conductor
10. A solution of Sodium metal in liquid ammonia is strongly reducing agent due to
    1) Sodium atoms 2) Sodium hydride 3) Sodamide 4) Solvated electrons
11. Choose the wrong statement
    1) electrical conductance of an electrolytic conductor increases with increase in temperature
    2) electrical conductance of a metallic conductor increases with increase in temperature
    3) electrical conductance of a metallic conductor decreases with increase in temperature
    4) degree of dissociation of an electrolyte increases with dilution
12.

LIST - 1	LIST - 2
1) Electronic conductor	1) Aqueous urea solution
2) Non-electrolyte	2) Solid sodium
3) Electrolytic dissociation	3) Electrolytic conductor
4) Arrhenius	4) Radioactivity increases
	5) Conductivity raises with temperature

The correct match is

	A	B	C	D		A	B	C	D
1)	5	1	2	3	2)	5	2	1	4
3)	2	1	5	3	4)	2	5	1	4

13. Which of the following is 100% ionised at any dilution ?
1) CH_3COOH 2) HCN 3) NaCl 4) NH_4OH
14. Which of the following (1M) conducts more electricity ?
1) sulphuric acid 2) boric acid 3) nitric acid 4) phosphorous acid
15. The degree of dissociation of an electrolyte in aqueous solution depends on
1) Temperature 2) Concentration of the electrolyte
3) Nature of the electrolyte
1) Only A 2) Only A, B 3) Only B, C 4) A, B, C
16. What happens at infinite dilution in a given solution ?
1) The degree of dissociation is unity for weak electrolytes
2) The electrolyte is 100% ionised 3) All inter ionic attractions disappear
4) All the three
17. At infinite dilution the degree of dissociation for sucrose in aqueous solution is
1) 0 2) 0.5 3) 0.99 4) 1
18. Choose the correct statement regarding electrolytic cell
1) It is a device in which chemical energy is converted into electrical energy
2) Anode is shown by negative sign
3) Oxidation reaction takes place at the anode
4) Electrons flow from cathode to anode
19. The following are some statements about electrolytic cell
1) in this, chemical energy converted into electrical energy
2) in this, cell electrons flow from cathode to anode
3) in this, cell reduction takes place at cathode
4) in this, cathode is a +ve electrode
The correct combination is
1) only B 2) only C 3) only C, D 4) only B, C
20. The reactions taking place at anode and cathode are
1) Oxidation and Reduction 2) Reduction and Oxidation
3) Oxidation and Hydrolysis 4) Reduction and Hydrolysis
21. The electrode through which the electrons enter the electrolytic solution is
1) cathode 2) anode
3) may be anode or cathode 4) neither anode nor cathode
22. As electrolysis is in progress, if the cathode plate is removed
1) the movement of ions stopped 2) the ions move at random
3) all ions move towards anode 4) only anions move towards the anode
23. In the electrolytic cell, flow of electrons is from
1) cathode to anode in the solution 2) cathode to andoe through external circuit
3) anode to cathode through external circuit 4) all of these
24. In electrolysis of dilute H_2SO_4, what is liberated at anode in presence of inert electrode ?
1) H_2 2) SO_2 3) SO_3 4) O_2
25. Which process occurs in the electrolysis of aqueous solution of nickel chloride at nickel

anode?

1) $Ni^{2+} + 2e \rightarrow Ni$ 2) $2H^+ + 2e \rightarrow H_2$ 3) $2Cl^- \rightarrow Cl_2 + 2e$ 4) $Ni \rightarrow Ni^{2+} + 2e$

26. Molten $CuCl_2$ is electrolysed using platinum electrode. The reaction occuring at anode is (E-01)

1) $2Cl^- \rightarrow Cl_2(g) + 2e^-$ 2) $Cl_2(g) + 2e^- \rightarrow 2Cl^-$

3) $Cu^{2+} + 2e^- \rightarrow Cu\ (s)$ 4) $Cu\ (s) \rightarrow Cu^{2+} + 2e^-$

27. During the electrolytic reduction of alumina, the reaction at cathode is

1) $2H_2O \rightarrow O_2 + 4H^+ + 4e^-$ 2) $3F^- \rightarrow 3F + 3e^-$

3) $Al^{3+} + 3e^- \rightarrow Al$ 4) $2H^+ + 2e^- \rightarrow H_2$

28. When an aqueous solution of copper sulphate is electrolysed using copper electrodes the reaction at the anode is represented by

1) $H^+ + e^- \rightarrow H$ 2) $Cu^{2+} + 2e^- \rightarrow Cu$

3) $SO_4^{2-}(aq) \rightarrow SO_4 + 2e^-$ 4) $Cu(s) \rightarrow Cu^{2+}(aq) + 2e^-$

29. Which of the following reaction is possible at anode ?

1) $2Cr^{3+} + 7H_2O \rightarrow Cr_2O_7^{2-} + 14H^+$ 2) $F_2 \rightarrow 2F^-$

3) $\frac{1}{2}O_2 + 2H^+ \rightarrow H_2O$ 4) None of these

30. Aqueous solution of $CuSO_4$ is electrolysed using inert electrodes till the blue coloured solution becomes colourless. The colourless solution formed is

1) $Cu(OH)_2$ 2) H_2SO_4 3) $CuSO_4$ 4) H_2O

31. After the electrolysis of aqueous solution of NaCl using Pt electrodes, the pH of the solution

1) increases 2) decreases 3) remains constant 4) becomes zero

32. During the electrolysis of aqueous solution of the following, molarity of the solution increases without changing the chemical composition

1) NaCl 2) HCl 3) $CuSO_4$ 4) H_2SO_4

33. Aqueous NaCl solution is electrolyzed using platinum electrodes. What is the product formed at cathode?

1) Na 2) H_2 3) O_2 4) Cl_2

34. At anode in the electrolysis of fused sodium chloride

1) Na^+ is oxidised 2) Cl^- is oxidised 3) Cl is reduced 4) Na is reduced

35. In electrolysis of NaCl when Pt electode is taken then H_2 is liberated at cathode while with Hg cathode, it forms sodium amalgam. This is because

1) Hg is more inert than Pt

2) More voltage is required to reduce H^+ at Hg than at Pt

3) Na is dissolved in Hg while it does not dissolve in Pt

4) Conc. of H^+ ions is larger when Pt electrode is taken

36. (A): Hydrogen gas always evolved only at cathode during electrolysis

(R): H^+ ions undergo reduction by gaining electrons

The correct answer is

1) Both (1) and (R) are true and (R) is the correct explanation of (A)

2) Both (1) and (R) are true and (R) is not the correct explanation of (A)

3) (1) is true but (R) is false

4) (1) is false but (R) is true

37. Which of the following ions is discharged at the cathode when an aqueous solution of sodium

hydroxide is electrolysed ?

1) Hydrogen 2) Hydroxyl 3) Oxygen 4) Sodium

38. During electrolysis of fused NaOH

1) H_2 is liberated at cathode 2) O_2 is liberated at cathode

3) H_2 is liberated at anode 4) O_2 is liberated at anode

39. Aqueous solution of $AgNO_3$ is electrolysed using inert electrodes. At the end of electrolysis

1) pH of the solution increases 2) pH of the solution decreases

3) pH of the solution remains unchanged 4) pH of the solution becomes 14

40. At cathode, the electrolysis of aqueous Na_2SO_4 gives

1) Na 2) H_2 3) SO_3 4) SO_2

41. An aqueous solution containing one mole per litre of each $Cu(NO_3)_2$, $AgNO_3$. $Hg(NO_3)_2$, $Mg(NO_3)_2$ is being electrolysed using inert electrodes. The values of standard electrode potential in volts (reduction potential) are

$Ag / Ag^+ = +0.80V$ $Hg / Hg^{2+} = +0.79V$ $Cu / Cu^{2+} = +0.34V$ $Mg / Mg^{2+} = -2.37V$

With increasing voltage, the sequence of deposition of metals on cathode will be

1) Ag, Hg, Cu, Mg 2) Mg, Cu, Hg, Ag 3) Ag, Hg, Cu 4) Cu, Hg, Ag

5) Cu, Hg, Ag, Mg

42. The electrolysis of an aqueous solution of KNO_3 between platinum electrode gives

1) K at the cathode NO_2 at the anode 2) H_2 at cathode and O_2 at anode

3) H_2 at cathode and NO_2 at anode 4) K at cathode and O_2 at anode

43. According to Faraday's first Law of electrolysis mass of substance liberated is equal to

1) eC 2) eQ 3) et 4) eCt/nF

44. When the same charge is passed through the solutions of different electrolytes in series, the amounts of elements deposited on the electrodes are in the ratio of their

1) atomic numbers 2) atomic weights

3) specific gravities 4) equivalent weights

45 According to 2nd law of Faraday's electrolysis the correct one is

i) $\dfrac{\text{wt. of } H_2 \text{ liberated}}{\text{wt. of } Cl_2 \text{ liberated}} = \dfrac{\text{eq. wt. of } H_2}{\text{eq. wt. of } Cl_2}$ ii) $\dfrac{m_{Ag}}{m_{Cu}} = \dfrac{E_{Ag}}{E_{Cu}}$

iii) $\dfrac{m_{Ag}}{m_{Cu}} = \dfrac{E_{Cu}}{E_{Ag}}$ iv) $\dfrac{m_{H_2}}{m_{Cu}} = \dfrac{E_{H_2}}{E_{Cu}}$

The correct combination is

1) only ii, iv 2) only i 3) only i, ii , iv 4) only ii, iii

46. One Faraday is equal to

1) 96.5 c mol^{-1} 2) 96500 c mol^{-1} 3) $6.023 \times 10^{23} \text{ mol}^{-1}$ 4) $96.5 \times 10^{23} \text{ c mol}^{-1}$

47. One Faraday of electricity will liberate 1 gram atom of the metal from the solution of

1) $CuCl_2$ 2) $CuSO_4$ 3) $AgNO_3$ 4) $AuCl_3$

48 For the discharge of equal masses of the following ions, the number of electrons required is maximum in the case of

1) H^+ 2) Cu^{2+} 3) Ag^+ 4) Al^{3+}

49. LIST - 1 LIST - 2

A) Faraday's first law 1) $e \times 96500$

B) Chemical equivalent 2) $\frac{m_1}{E_1} = \frac{m_2}{E_2}$

C) Faraday's second law 3) S.H.E.

D) Pt, H_2 (atm)/H^+(1M) 4) m = eQ

5) Salt bridge

The correct match is

	A	B	C	D		A	B	C	D
1)	4	1	3	2	2)	4	5	2	3
3)	1	1	2	3	4)	4	1	2	3

50. Copper can be deposited from acidified copper sulphate and alkaline cuprous cyanide. If the same current is passed for a definite time :

1) The amount of copper deposited from acidic copper sulphate will be higher

2) The amount of copper deposited from alkaline cuprous cyanide will be higher

3) The same amouont of copper will be deposited

4) None of the above

51. LIST - 1 LIST - 2

A) One faraday 1) Reduction

B) Anode 2) 96500 coulomb

C) Cathode 3) 6.24×10^{18} electrons

D) 1 coulomb 4) Oxidation

5) Z × 96,500

The correct match is

	A	B	C	D		A	B	C	D
1)	5	4	2	3	2)	2	4	1	3
3)	2	4	1	5	4)	5	2	1	3

52. During the electrolysis of cryolite, Aluminium and Fluorine are formed in the molar ratio of

1) 3 : 1 2) 1 : 3 3) 2 : 3 4) 3 : 2

53. The minimum conductance in fused state is shown by

1) $MgCl_2$ 2) $CaCl_2$ 3) $BaCl_2$ 4) $SrCl_2$

54. The ionic conductance of following cations in a given conc. is in the order

1) $Li^+ < Na^+ < K^+ < Rb^+$ 2) $Li^+ > Na^+ > K^+ > Rb^+$

3) $Li^+ < Na^+ > K^+ > Rb^+$ 4) $Li^+ = Na^+ < K^+ < Rb^+$

55. The value of molar conductivity of HCl is greater than that of NaCl at a particular temperature because

1) Molecular mass of HCl is greater than that of NaCl

2) Mobility of H^+ ions is more than that of Na^+ ions

3) HCl is strongly acidic

4) Ionisation of HCl is larger than that of NaCl

56. (1) : The conductivity of an aqueous solution of NaCl is greater than that of pure solvent.

(R) : Conductivity is independent upon the number of ions in solution.

57. The unit of specific conductivity is

1) ohms cm^{-1} 2) ohms cm^{-2} 3) $ohms^{-1}$ cm 4) ohm^{-1} cm^{-2}

5) $ohms^{-1}$ cm^{-1}

58. The unit of equivalent conductivity is

1) ohm cm 2) ohm^{-1} cm^2 (g equivalent)$^{-1}$

3) ohm cm^2 (g equivalent) 4) S cm^{-2}

59. The equivalent conductance of 1N solution of an electrolyte is nearly

1) Same as its specific conductance 2) 10^{-3} times its specific conductance

3) 10^2 times more than its specific conductance

4) 10^3 times more than its specific conductance

60. Assertion : The molar conductance of weak electrolytes is low as compared to that of strong electrolytes at moderate concentrations

Reason : Weak electrolytes at moderate concentrations dissociate to a much greater extent when compared to strong electrolytes

61. The highest electrical conductivity of the following aqueous solutions is of

1) 0.1 M acetic acid 2) 0.1 M chloroacetic acid

3) 0.1 M fluoroacetic acid 4) 0.1 M difluoroacetic acid

62. Conductance is directly proportional to area of the vessel and the concentration of solution in it and is inversly proportional to the length of the vessel, then the unit of the constant of proportionality is

1) S.m mol^{-1} 2) S.m^2 mol^{-1} 3) S^{-2}.m^2 mol 4) S^2.m^2 mol^{-2}

63. If the specific conductance and conductance of a solution is same, then its cell constant is equal to

1) 1 2) 0 3) 10 4) 100

64. Assertion :The conductivity of 0.1M solutions of different electrolytes is same.

Reason :The conductivity depends on the size of the ions.

65. Specific conductivity of a solution

1) increases with dilution 2) decreases with dilution

3) remains unchanged with dilution 4) depends on mass of electrolyte.

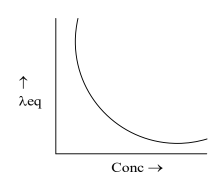
66. For measuring conductivity of an electrolyte, its solution should be prepared in

1) Tap water 2) Distilled water 3) Conductivity water 4) Polywater

67. A graph is drawn between the λ_{eq} values and concentrations of an electrolyte. Which of the following electrolyte will correspond to the graph given ?

1) KCl 2) $BaCl_2$

3) H_2SO_4 4) CH_3COOH



68. For which case 'λ' values v/s $\sqrt{c}$ shows a straight line

1) KCl 2) HCOOH 3) CH_3NH_2 4) CH_3COOH

69. According to Kohlrausch law, the limiting value of molar conductivity of an electrolyte A_2B is

1) $\lambda^{\infty}_{A^+} + \lambda^{\infty}_{B^{-2}}$ 2) $\frac{1}{2}\lambda^{\infty}_{A^+} + \lambda^{\infty}_{B^{-2}}$ 3) $2\lambda^{\infty}_{A^+} + \frac{1}{2}\lambda^{\infty}_{B^{-2}}$ 4) $2\lambda^{\infty}_{A^+} + \lambda^{\infty}_{B^{-2}}$

70. The equation representing Kohlrausch law from the following is

1) $\lambda_m = \frac{100K}{C_m}$ 2) $\lambda^0_m = \nu^+\lambda^0_+ + \nu^-.\lambda^0_-$ 3) $\lambda_{eq} = \frac{1000K}{C_{eq}}$ 4) $\lambda^0_m = \lambda_c + \lambda_a$

71. The expression showing the relationship between equivalent conductivity and molar conductivity is

1) $\lambda_m = Z \times \lambda_{eq}$ 2) $\lambda_{eq} = Z \times \lambda_m$ 3) $\lambda_m = \frac{\lambda_{eq}}{Z}$ 4) $\lambda_m = \lambda^2_{eq}$

72. The molar conductivities Λ^0_{NaOAc} and Λ^0_{HCl} at infinite dilution in water at 25^0C and 91.0 and 426.2 S cm^2 / mol respectively. To caculate Λ^0_{HOAc} the additional value required is

1) Λ^0_{NaCl} 2) $\Lambda^0_{H_2O}$ 3) Λ^0_{KCl} 4) Λ^0_{NaOH}

73. The equivalent conductances of two strong electrolyetes at infinite dilution in H_2O (where ions move freely through a solution) at 25^0C are given below

$\Lambda^o_{CH_3COONa}$ = 91.0 S cm^2 / equiv ; Λ^0_{HCl} = 426.2 S cm^2 / equiv

What additional information / quantity one needs to calculate Λ^0 of an aqueous solution of acetic acid?

1) Λ^0 of CH_3COOK 2) Λ^0 of H^+ 3) Λ^0 of $ClCH_2COOH$ 4) Λ^0 of NaC*l*

74. In a Galvanic cell, the electrons flow from

1) anode to cathode through the solution
2) cathode to anode through the solution
3) anode to cathode through the external circuit
4) cathode ot anode thorugh the external circuit.

75. Which of the following statements is wrong about galvanic cells

1) cathode is the positive electrode 2) cathode is the negative electrode
3) electrons flow from anode to cathode in the external circuit
4) reduction occurs at cathode

76. The following statements is correct w.r.t. both electrolytic cell and Galvanic cell

1) in both cells, anode is shown by +ve sign
2) in both cells, cathode is shown by –ve sign
3) in both cells, reduction reaction takes place at the cathode
4) in both cells, oxidation reaction takes place at the cathode

77. Saturated solution of KNO_3 is used to make salt bridge because

1) velocity of K^+ is greater than that of NO_3^- 2) velocity of NO_3^- is greater than that of K^+
3) velocities of both K^+ and NO_3^- are nearly the same
4) KNO_3 is highly soluble in water.

78. Assertion : A salt bridge allows the flow of current by completing the electrical circuit
Reason : A salt bridge maintains the electrical neutrality of the two half cells

79. The function of a salt bridge is

1) to provide a link between two half cells 2) to allow ions to go from one cell to another
3) to keep the emf of the cell positive
4) to maintain electrical neutrality of the solution in two half cells

80. Which of the following is correct?
1) Zinc acts as cathode in Daniel cell 2) In a Li–Zn couple, zinc acts as anode
3) Copper displaces iron from its salt solution
4) Zinc dsplaces tin from its salt solution

81. Which of the following statements is true for the electrochemical Daniell cell ?
1) Electrons flow from copper electrode to zinc electrode
2) Current flows from zinc electrode to copper electrode
3) Cations move towards copper electrode 4) Cations move toward zinc electrode

82. The cell reaction of the galvanic cell, Cu(s) / Cu^{2+}(aq) // Hg^{2+}(aq) / Hg(*l*) is
1) $Hg + Cu^{2+} \rightarrow Hg^{2+} + Cu$ 2) $Hg + Cu^{2+} \rightarrow Hg^{+} + Cu^{+}$
3) $Hg + Cu^{+} \rightarrow CuHg$ 4) $Cu + Hg^{2+} \rightarrow Cu^{2+} + Hg$

83. Assertion : The Daniel cell becomes dead after some time
Reason : Oxidation potential of zinc anode increases and that of copper cathode decreases
The correct answer is

84. The cell for which the cell reaction is $H_2 + Cu^{2+} \rightarrow 2H^{+} + Cu$ is represented as
1) $Cu/Cu^{2+}//H^{+}/H_2$ 2) $H_2(g)/H^{+}//Cu^{2+}/Cu$
3) Pt, H_2(1 atm), $H^{+}//Cu^{2+}/Cu$ 4) Pt, H_2/H^{+}(aq) (1atm)$//Cu^{2+}/Cu$

85. Which metal will dissolve if the cell works $Cu|Cu^{2+}||Ag^{+}|\ Ag$
1) Cu 2) Ag 3) Both (1) and (2) 4) None of these

86. The chemical reaction $2AgCl_{(s)} + H_{2(g)} \rightarrow 2HCl_{(aq)} + 2Ag_{(s)}$ taking place in a galvanic cell is represented by the notation.
1) $Pt(s)|H_2(g),1bar|1M\ KCl(aq)|AgCl(s)|Ag(s)$ 2)
$Pt(s)|H_2(g),1bar|1M\ HCl(aq)||1M\ Ag^{+}(aq)|Ag(s)$
3) $Pt(s)|H_2(g),1bar|1M\ HCl(aq)|AgCl(s)|Ag(s)$
4) $Pt(s)|H_2(g),1bar|1M\ HCl(aq)|Ag(s)|AgCl(s)$

87. Which is correct for cell reaction ?
1) $Zn + 2Ag^{+} \rightarrow Zn^{2+} + 2Ag$ 2) $2Ag + Zn^{+} \rightarrow 2Ag^{+} + Zn$
3) Both 4) None

88. Stronger the oxidising agent greater is the
1) Oxidation potential 2) Reduction potential
3) Redox potential 4) Hydration potential

89. The reaction, $1/2H_{2(g)} + AgCl_{(s)} \rightarrow H^{+}_{(aq)} + Cl^{-}_{(aq)} + Ag_{(s)}$ occurs in the galvanic cell :

1) $Ag|AgCl_{(s)}|KCl_{(Soln)}|AgNO_{3(soln)}|Ag$ 2) $Pt, H_{2(s)}|HCl_{(Soln)}|AgNO_{3(soln)}|Ag$

3) $Pt, H_{2(g)}||HCl_{(Soln)}||AgCl_{(s)}|Ag$ 4) $Pt, H_{2(g)}||KCl_{(Soln)}||AgCl_{(s)}|Ag$

90. For spontanity of a cell, which is correct ?

1) $\Delta G = 0, \Delta E = 0$ 2) $\Delta G = -Ve, \Delta E = 0$ 3) $\Delta G = +Ve, \Delta E = 0$ 4) $\Delta G = -Ve$

91. If the cell reaction is spontaneous

1) E^0 is -ve 2) Δ G is positive 3) E^0 is +ve 4) (Δ G + E^0) is positive

92. Assertion : If E^0 of Cu^{2+}/Cu = +0.34V and E^0 of Ag^+/Ag = +0.80V then galvanic cell constructed from these is $Ag/Ag^+//Cu^{2+}/Cu$

Reason : In any galvanic cell the reaction that takes place is a redox reaction

93. The metal that cannot displace hydrogen from dilute hydrochloric acid is

1) aluminium 2) iron 3) copper 4) zinc

94. A standard hydrogen electrode has zero electrode potential because

1) Hydrogen is easiest to oxidise

2) This electrode potential is assumed to be zero

3) Hydrogen atom has only one electron 4) Hydrogen is the lightest element

95. The following statements about electro chemical series are

i) the metals occupying top positions in the series do not liberate hydrogen with dilute acids

ii) the substances which are stronger reducing agents and stronger oxidising agents are placed below & top respectively

iii) a metal higher in the series will displace the metal from its solution which is lower in the series

iv) various electrodes are arranged in a series in the descending order of their potentials

The correct statements are

1) iv 2) iii 3) all 4) iii & iv

96. The following are some statements about normal hydrogen electrode (NHE)

1) when a 'Zn' electrode is in combination of NHE, Zn electrode acts as cathode

2) when a 'Cu' electrode is in combination with NHE, Cu electrode is the anode

3) when a 'Ag' electrode is in combination with NHE, Ag electrode is the anode

4) when a chlorine electrode is in combination with NHE, chlorine electrode is the anode

1) only (1) is correct 2) all are correct 3) all are incorrect 4) both (2) & (3) correct

97. Which defines the standard reduction electrode potential of Zn^{2+} ions?

1) $Zn^{2+}_{(aq)} + 2e \rightarrow Zn_{(s)}$; $[Zn^{2+}] = 1M$ 2) $Zn_{(g)} \rightarrow Zn^{(2+)} + 2e$; $[Zn^{2+}] = 1M$

3) $Zn^{2+}_{(aq)} \rightarrow Zn_{(s)} + 2e$; $[Zn^{2+}] = 1M$ 4) $Zn^{2+}_{(g)} \rightarrow Zn_{(s)} -2e$; $[Zn^{2+}] = 1M$

98. Assertion : Lithium has less electrode potential than caesium

Reason : Hydration energy of lithium ion is high.

99. The reference electrode is made by using

1) $ZnCl_2$ 2) $CuSO_4$ 3) $HgCl_2$ 4) Hg_2Cl_2

100. The more electro positive element has

1) positive reduction potential 2) negative reduction potential

3) tendency to gain electrons 4) negative oxidation potential

101. LIST - 1 LIST - 2

A) Very dilute H_2SO_4 by inert electrodes 1) $Hg/Hg_2Cl_2(S)$, KCl(salt)

B) Potential is zero Volts — 2) $H_2S_2O_8$ at anode

C) 50% H_2SO_4 by inert electrodes — 3) Daniel cell

D) $Zn/Zn^{+2}(aq)//Cu^{+2}(aq)/Cu$ — 4) O_2 at anode

5) Pt, H_2(1atm)/ H^+(1M)

The correct match is

	A	B	C	D		A	B	C	D
1)	4	5	2	3	2)	2	1	4	3
3)	2	5	4	3	4)	5	3	1	2

102. A smuggler could not carry gold by depositing iron on the gold surface since

1) Gold is denser
2) Iron rusts
3) Gold has higher reduction potential than iron
4) Gold has lower reduction potential than iron

103. Standard reduction electrode potential of three metals A, B and C are respectively +0.05 V, –3.0 and –1.2 V. The reducing powers of

1) B > C > A
2) A > B > C
3) C > B > A
4) A > C > B

104. The difference of potential of two electrodes in a galvanic cell is known as

1) EMF
2) Potential difference
3) Electrode difference
4) Ionic difference

105. The standard electrode potentials of four elements A, B, C and D are -2.65, -1.66, – 0.80 and +0.86 V. The highest chemical activity will be exhibited by

1) A
2) B
3) C
4) D

106. Zn gives H_2 gas with H_2SO_4 and HCI but not with HNO_3 because

1) Zn acts as oxidizing agent when reacts with HNO_3
2) HNO_3 is weaker acid than H_2SO_4 and HCI
3) In electrochemical series Zn is above hydrogen
4) NO_3^- is reduced in preference to hydronium ion

107. At 298 K the standard reduction potentials for the following half reactions are given as

$Zn^{2+}(aq) + 2e^- \rightarrow Zn(s)$; –0.762 V

$Cr^{3+}(aq) + 3e^- \rightarrow Cr(s)$; –0.740 V

$2H^+(aq) + 2e^- \rightarrow H_2(g)$; –0.00 V

$Fe^{3+}(aq) + e^- \rightarrow Fe^{2+}(aq)$; + 0.770 V

The strongest reducing agent is

1) Zn (s)
2) H_2(g)
3) Cr(s)
4) Fe^{2+}(aq)

108. When Zn piece is kept in $CuSO_4$ solution, copper gets precipitated because :

1) Standard reduction potential of zinc is more than copper
2) Standard reduction potential of zinc is less than copper
3) Atomic number of zinc is larger than copper
4) Atomic number of zinc is lower than copper

109. For $I_2 + 2e \rightarrow 2I^-$, standard reduction potential =+0.54 volt. For $2Br^- \rightarrow Br_2 + 2e^-$, standard oxidation potential = –1.09 volt. For $Fe \rightarrow Fe^{2+} + 2e^-$, standard oxidation potential = +0.44 volt. Which of the following reactions is non-spontaneous?

1) $Br_2 + 2I^- \rightarrow 2Br^- + I_2$
2) $Fe + Br_2 \rightarrow Fe^{2+} + 2Br^-$
3) $Fe + I_2 \rightarrow Fe^{2+} + 2I^-$
4) $I_2 + 2Br^- \rightarrow 2I^- + Br_2$

110. Beryllium is placed above magnesium in the IIgroup. When beryllium dust is added to $MgCl_2$ solution, will

1) Has no effect
2) Precipitate Mg metal
3) Precipitate MgO
4) Lead to dissolution of Be metal

111. Which reaction is not feasible ?

1) $2KI + Br_2 \rightarrow 2KBr + I_2$
2) $2KBr + I_2 \rightarrow 2KI + Br_2$
3) $2KBr + Cl_2 \rightarrow 2KCl + Br_2$
4) $2H_2O + 2F_2 \rightarrow 4HF + O_2$

112. E° for $Fe^{2+} + 2e \rightarrow Fe$ is –0.44 V ; E° for $Zn^{2+} + 2e \rightarrow Zn$ is –0.76 V. Then

1) Zn is more electropositive than Fe
2) Fe is more electropositive than Zn
3) Zn is more electronegative
4) None of the above

113. Based on the data given below, the correct order of reducing power is :

$Fe^{3+}_{(aq)} + e \rightarrow Fe^{2+}_{(aq)}$; E° = 0.77V

$Al^{3+}_{(aq)} + 3e \rightarrow Al_{(s)}$; E° = –1.66V

$Br_{2(aq)} + 2e \rightarrow 2Br^-_{(aq)}$; E° = +1.08V

1) $Br^- < Fe^{2+} < Al$
2) $Fe^{2+} < Al < Br^-$
3) $Al < Br^- < Fe^{2+}$
4) $Al < Fe^{2+} < Br^-$

114. For the cell prepared from electrode A : $Cr_2O_7^{2-}$ | Cr^{3+}, $E°_{red}$ = +1.33V and electrode B : Fe^{3+} | Fe^{2+}, $E°_{red}$ = 0.77V. Which of the following stament is correct?

1) The electrons will flow from B to A when connection is made
2) The e.m.f. of the cell will be 0.56V
3) A will be positive electrode
4) All of the above

115. The S.R.Ps of Cu^{2+}/Cu, Hg^{2+}/Hg and Zn^{2+}/Zn are respectively 0.34V, 0.85 V and -0.76 V. The wrong statement is

1) Cu reduces Hg^{2+}
2) Zn reduces Cu^{2+}
3) Hg reduces Zn^{2+}
4) Zn reduces both Cu^{2+} and Hg^{2+}

116. The $E°_{M^{3+}|M^{2+}}$ values for Cr, Mn, Fe and Co are –0.41, +1.57V, + 0.77 and +1.97V respectively. For wihch one of these metals the change in oxidation sate from +2 to +3 is easiest?

1) Co
2) Mn
3) Fe
4) Cr

117. Assertion : A blue colour is obtained when a copper wire is immersed in $AgNO_3$ solution

Reason : Silver reduces Cu^{2+} to copper

118. Standard electrode potentials are

Fe^{2+} / Fe (E^0 = – 0.44); Fe^{3+} / Fe^{2+} (E^0 = 0.77)

Fe^{2+}, Fe^{3+} and Fe blocks are kept together, then

1) Fe^{3+} increases
2) Fe^{3+} decreases
3) Fe^{2+}/Fe^{3+} remains unchanged
4) Fe^{2+} decreases.

119. The half cell reaction, with its standard reduction potentials are

I) $Pb^{2+} + 2e^- \rightarrow Pb$ (E^0 = –0.13 V)

II) $Ag^+ + e^- \rightarrow Ag$ (E^0 = + 0.80 V)

Which of the following reactions will occur ?

1) $Pb^{2+} + 2Ag \rightarrow 2Ag^+ + Pb$
2) $Pb^+ + H_2 \rightarrow 2H^+ + Pb$

3) $2H^+ + 2Ag \rightarrow 2Ag^+ + H_2$ 4) $2Ag^+ + Pb \rightarrow Pb^{2+} + 2Ag$

120. The standard reduction potentials of Zn and Ag in water at 298 K are, $Zn^{2+} + 2e^- \rightarrow Zn$; $E^0 = -0.76V$ and $Ag^+ + e^- \rightarrow Ag$; $E^0 = +0.80V$ Which of the following reactions take place?

1) $Zn^{2+}_{(aq)} + Ag^+_{(aq)} \rightarrow Zn_{(s)} + Ag_{(s)}$ 2) $Zn_{(s)} + Ag_{(s)} \rightarrow Zn^{2+}_{(aq)} + Ag^+_{(aq)}$

3) $Zn^{2+}_{(aq)} + 2Ag_{(s)} \rightarrow 2Ag^+_{(aq)} + Zn_{(s)}$ 4) $Zn_{(s)} + 2Ag^+_{(aq)} \rightarrow Zn^{2+}_{(aq)} + 2Ag_{(s)}$

121. A student made the following observations in the laboratory,

1) Clean copper metal did not react with 1 molar $Pb(NO_3)_2$ solution

B)Clean lead metal dissolved in a 1 molar $AgNO_3$ solution and crystals of Ag metal appeared

C)Clean silver metal did not react with 1 molar $Cu(NO_3)_2$ solution.

The order of decreasing reducing character of the three metals is :

1) Cu, Pb, Ag 2) Cu, Ag, Pb 3) Pb, Cu, Ag 4) Pb, Ag, Cu

122. For the electrochemical cell, $M|M^+||X^-|X, E°_{M^+/M} = -0.44V$ and $E°_{X/X^-} = 0.33V$. From this data, one can deduce that :

1) $M+X \rightarrow M^+ + X^-$ is the spontaneous reaction

2) $M^+ + X^- \rightarrow M+X$ is the spontaneous reaction

3) $E_{cell} = 0.11V$ 4) $E_{cell} = -0.77V$

123. Four colourless salt solutions are placed in separate test tubes and a strip of copper is placed in each. Which solution finally turns blue?

1) $Pb(NO_3)_2$ 2) $Zn(NO_3)_2$ 3) $AgNO_3$ 4) $Cd(NO_3)_2$

124. Assertion : In the construction of Galvanic cell, lithium electrode can not be used as cathode

Reason : Lithium has the highest negative S.R.P value.

125. The potential of single electrode depends upon

1) the nature of the electrode 2) temperature

3) concentration of the ion with respect to which it is reversible

4)all the above

126. The Nernst equation giving dependence of electrode potential on concentration is

1) $E = E^0 + \frac{2.303\ RT}{nF} \log \frac{[M]}{[M^{n+}]}$ 2) $E = E^0 + \frac{2.303\ RT}{nF} \log \frac{[M^{n+}]}{[M]}$

3) $E = E^0 - \frac{2.303\ RT}{nF} \log \frac{[M^{n+}]}{[M]}$ 4) $E = E^0 - \frac{2.303\ RT}{nF} \log [M^{n+}]$

127. Consider the following four electrodes:

A = Cu^{2+} (0.0001 M) / Cu (s) B = Cu^{2+} (0.1 M) / Cu (s)

C = Cu^{2+} (0.01 M)/ Cu (s) D = Cu^{2+} (0.001 M)/Cu (s)

If the standard reduction potential of /Cu is +0.34V, the reduction potentials (in volts) of the above electrodes follow the order

1) A > D > C > B 2) B > C > D > A 3) C > D > B > A 4) A > B > C > D

128. The Nernst equation for the reduction potential of a non metal A when $[A^{n-}] = C$ is given by

1) $E^0 + \frac{0.059}{n} \log C$ 2) $E^0 - \frac{0.059}{n} \log C$

3) $E^0 + \frac{0.059}{n} \log C^n$ 4) $E^0 - \frac{0.059}{n} \log \frac{1}{C}$

129. Which of the following is not correct ?

1) Aqueous solution of $NaCl$ is an electrolyte

2) The units of electrochemical equivalent are g.coulomb.

3) In the Nernst equation, 'n' represents the number of electrons transferred in the elctrode reaction.

4) Standard reduction potential of hydrogen electrode is zero volts.

130. The e.m.f. of the following Daniell cell at 298 K is E_1; $Zn / ZnSO_4(0.01M) // CuSO_4\ (1.0M) / Cu$ When the concentration of $ZnSO_4$ is 1. 0 M and that of $CuSO_4$ is 0.01 M, the e.m.f. changed to E_2. What is the relationship between E_1 and E_2 ?

1) $E_1 > E_2$ 2) $E_1 < E_2$ 3) $E_1 = E_2$ 4) $E_2 = 0 \neq E_1$

131. $Zn\ (s) + Cl_2(1atm) \rightarrow Zn^{2+} + 2Cl^-$, The E^0 of the cell is 2.12 V. To increase E

1) Zn^{2+} concentration should be increased 2) Zn^{2+} concentration should be decreased

3) Cl^- concentration should be increased 4) partial preassure of Cl_2 should be decreased.

132. For the cell $Zn / Zn^{2+} // Cu^{2+} / Cu$, if the concentration of Zn^{2+} and Cu^{2+} ions is doubled, the emf of the cell

1) doubles 2) reduces to half 3) remains same 4) remains zero

133. In a cell that utilises the reaction $Zn_{(s)} + 2H_{(aq)}^{+} \rightarrow Zn^{2+}{}_{(aq)} + H_{2(g)}$ addition of H_2SO_4 to cathode compartment, will

1) lower the E and shift equilibrium to the left

2) increase the E and shift equlibrium to the left

3) increase the E and shift equlibrium to the right

4) lower the E and shift equilibrium to the right

134. For a cell reaction, $Cu^{2+}(C_1, aq) + Zn(s) \rightarrow Zn^{2+}(C_2, aq) + Cu(s)$ of an electro chemical cell, the change in standrad free energy, ΔG^0 at a given temperature is

1) $\ln C_1$ 2) $\frac{0.0591}{2} \log \frac{C_2}{C_1}$ 3) $\ln C_2$ 4) $\ln(C_1 + C_2)$

135. The relationship between standard reduction potential of a cell and equilibrium constant is shown by (M.P.C.E.T.2002)

1) $E^0_{cell} = \frac{n}{0.059} \log K_c$ 2) $E^0_{cell} = \frac{0.059}{n} \log K_c$ 3) $E^0_{cell} = 0.059\, n \log K_c$ 4) $E^0_{cell} = \frac{\log K_c}{n}$

136. For a spontaneous reaction the ΔG, equilibrium constant (K) and E^0_{cell} will be respectively

1) –ve , >1, +ve 2) –ve, >1, –ve 3) –ve, <1, –ve 4) –ve, >1, –ve

137. For the reaction $Pt / H_2(1atm) / H^+(aq) // Cl^-(aq) / AgCl/Ag$; K_c (equilibrium constant) is represented as

1) $K_c = \frac{[Cl^-][AgCl]}{[H^+][H_2]}$ 2) $K_c = [H^+][Cl^-]$ 3) $K_c = \frac{[H^+][H_2]}{[Cl^-][AgCl]}$ 4) $K_c = \frac{[H_2]}{[Ag]}$

138. The relationship between free energy and electrode potential is

1) $\Delta G = -nFE$ 2) $\Delta G = n FE$ 3) $\Delta G = \frac{nFE}{R}$ 4) $\Delta G = \frac{\Delta H}{nFE}$

139. The correct relationship between free energy change in a reaction and the corresponding equilibrium constant K_C is

1) $\Delta G^0 = RT \ln K_c$ 2) $\Delta G^0 = -RT \ln K_C$ 3) $\Delta G = RT \ln K_C$ 4) $\Delta G = RT \ln K_C$

140. When an electric cell is charged, then

1) voltage of cell increases 2) electrolyte of cell dilutes

3) resistance of cell increases 4) None of these.

141. When lead storage battery is discharged

1) SO_2 is evolved 2) Lead sulphate is consumed

3) lead is formed 4) H_2SO_4 is consumed

142. When lead storage battery is charged

1) PbO_2 dissolves

2) The lead electrode becomes coated in the lead sulphate

3) H_2SO_4 is regenerated 4) The amount of acid decreases

143. During the charging of lead storage battery, the reaction occuring at cathode is represented by

1) $Pb \rightarrow Pb^{2+} + 2e^-$ 2) $Pb^{2+} + 2e^- \rightarrow Pb$

3) $Pb^{2+} + SO_4^{2-} \rightarrow PbSO_4$ 4) $PbSO_4 + 2H_2O \rightarrow PbO_2 + 4H^+ + SO_4^{2-} + 2e^-$

144. With respect of fuel cell prepared from H_2 and O_2 gases, the false statement is

1) It is free from pollution

2) This is more efficient than conventional method of generating electricity

3) The reaction occuring at anode is $O_{2(g)} + 2H_2O + 4e^- \rightarrow 4OH^-$

4) These take little time to go into operation.

WORK SHEET - II

1. During the electorlysis of cryolite, aluminium and fluorine are formed in ..... molar ratio

1) 1: 2 2) 2 : 3 3) 1 : 1 4) 1 : 3

2. Weight of copper (atomic mass 63.5) deposited when 2 Faradays of electricity is passed through cupric salt solution is

1) 63.5g. 2) 31.15g. 3) 127g. 4) 2g.

3. By passing 0.1 Faraday of electricity through fused sodium chloride, the amount of chlorine liberated is

1) 35.45 g 2) 70.9 g 3) 3.545 g 4) 17.77 g

4. The number of coulombs required to deposit 5.4 g. of Aluminium when the given electrode reaction is represented as $Al^{3+} + 3e^- \longrightarrow Al$

1) 1.83×10^5 C 2) 57900 C 3) 5.86×10^5 C 4) 3F

5. The number of electrons involved in the electro deposition of 63.5 g. of Cu from a solution of $CuSO_4$ is

1) 6.0×10^{23} 2) 3.011×10^{23} 3) 12.04×10^{23} 4) 6.02×10^{22}

6. The electrochemical equivalent of a metal is "x" g. coulomb^{-1}. The equivalent weight of metal is

1) x 2) x × 96500 3) x/96500 4) $1.6 \times 10^{-19} \times x$

7. The electro chemical equivalent of an element is 0.0006735 g/C. Its equiva-lent weight is

1) 65 2) 67.35 3) 130 4) 32.5

8. The current strength required to displace 0.1 g. of H_2 in 10 sec is

1) 9.65 amp 2) 1.988 amp 3) 198 amp 4) 965 amp

9. On electrolysing a sample of acidified water, 22.4 ml of hydrogen was obtained. The volume of oxygen in ml obtained is

1) 22.4 2) 44.8 3) 11.2 4) 2.24

10. An electrolytic cell is constructed for preparing hydrogen. For the average current of 1 ampere in the circuit, the time required for producing 112 ml of H_2 at STP is approximately

1) 500 sec 2) 800 sec 3) 1930 sec 4) 965 sec

11. One coulomb of charge passes through solutions of $AgNO_3$ and $CuSO_4$. The ratio of the amounts of silver and copper deposited on platinum electrodes used for electrolysis is

1) 108 : 63.5 2) 54 : 31.75 3) 108 : 31.75 4) 215.8 : 31.75

12. When electricity is passed through molten $AlCl_3$, 13.5 g. of Al is deposited. The number of Faradays must be

1) 0.5 2) 1.0 3) 1.5 4) 2.0

13. One Faraday charge was passed through the electrolytic cell placed in series containing solutions of Ag^+, Ni^{2+} and Cr^{3+}. Then Ag, Ni and Cr deposited will be (Atomic masses ; Ag= 108, Ni = 59 and Cr = 52)

	Ag	Ni	Cr
1)	108 g	29.5 g	17.3 g
2)	108 g	59 g	52 g
3)	108 g	108 g	108 g
4)	108 g	116 g	156 g

14. The weight in grams of O_2 formed at Pt anode during the electrolys of aq. K_2SO_4 solution during the passage of one coulomb of electricity is

1) $\frac{16}{96800}$ 2) $\frac{8}{96500}$ 3) $\frac{32}{96500}$ 4) $\frac{64}{96500}$

15. When one ampere current is passed through a Cu wire for 10 sec., the number of electrons passing through it is

1) 1.6×10^{19} 2) 1×10^{35} 3) 1×10^{16} 4) 6.24×10^{19}

16. How many coulombs of electricity are requiredfor the reduction of 1 mol of MnO_4^- to Mn^{2+} ?

1) 96500 C 2) 1.93×10^5 C 3) 4.83×10^5 C 4) 9.65×10^6 C
5) 5.62×10^5 C

17. Electric charge on 1gm ion of N^{3-} is

1) 4.8×10^{-19} C 2) $10 \times 1.6 \times 10^{-19}$ C 3) 1.6×10^{-19} C 4) 2.89×10^5 C

18. The charge required for the oxidation of one mole of Mn_3O_4 to MnO_4^{2-} in alkaline medium is -------- Faradays.

1) 10 2) 5 3) 3.34 4) 2

19. Time required to deposit one millimole of aluminium metal by the passage of 9.65 amperes through aqueous solution of aluminium ions is

1) 30 s 2) 10 s 3) 30,000 s 4) 10,000 s

20. Two electrolytic cells, one containing acidified ferrous sulphate and another acidified ferric

chloride, are in series. The ratio of masses of Iron deposited at the cathode in the two cells will be

1) 3 : 1 2) 2 : 1 3) 1 : 1 4) 3 : 2

21. On passing current through molten KCl, 19.5 g of K is deposited. The amount of Al deposited by the same quantity of electricity when passed through molten $AlCl_3$ is

1) 4.5 g 2) 9 g 3) 13.5 g 4) 2.7 g

22. When an electric current is passed through acidulated water, 112 ml of hydrogen gas at NTP is collected at the cathode in 965 seconds. The current passed in amperes is

1) 1.0 2) 0.5 3) 0.1 4) 2.0

23. The amount of chlorine evolved when 2 amperes of current is passed for 30 minutes in an aqueous solution of NaCl

1) 66 g 2) 1.32 g 3) 33 g 4) 99 g

24. The conductivity of 0.001 M acetic acid is 5×10^{-5} S cm^{-1} and $\wedge^0$ is 390.5 S cm^2 mol^{-1} then the calculated value of dissociation constant of acetic acid would be

1) 81.78×10^{-4} 2) 81.78×10^{-5} 3) 18.78×10^{-6} 4) 18.78×10^{-5}

25. The distance between two electrodes of a cell is 2.5 cm and area of each electrode is 5 cm^2 the cell constant (in cm^{-1}) is

1) 2 2) 12.5 3) 7.5 4) 0.5

26. The limiting molar conductivities (Λ^0) for NaCl, KBr an KCl are 126, 152 and 150 S. cm^2 mol^{-1} respectively. Then Λ^0 for NaBr is

1) 128 S cm^2 mol^{-1} 2) 302 S cm^2 mol^{-1} 3) 278 S cm^2 mol^{-1} 4) 176 S cm^2 mol^{-1}

27. Which of the following solutions of NaCl has the higher specific conductance ?

1) 0.001N 2) 0.01N 3) 0.1 N 4) 1 N

28. Molar conductivity of a solution is $1.26 \times 10^2 \, \Omega^{-1}$ cm^{2}mol^{-1}. Its molarity is 0.01M. Its specific conductivity will be

1) 1.26×10^{-5} 2) 1.26×10^{-3} 3) 1.26×10^{-4} 4) 0.0063

29. The values of equivalent conductivity at infinte dilutions for NH_4Cl , NaOH and NaCl are respectively 149.74, 248.1 and 126.4 ohm^{-1} cm^2 equi^{-1}. The value of λ^{∞}_{eq} of NH_4OH is

1) 371.44 2) 271.44

3) 71.44 4) It cannot be calculated from the data given

30. Specific conductance of 0.1 M Nitric acid is 6.3×10^{-2} ohm^{-1} cm^{-1}. The molar conduc-tance of the solution is

1) 630 ohm^{-1} cm^2 2) 315 ohm^{-1} cm^2 3) 100 ohm^{-1} cm^2 4) 6300 ohm^{-1}cm^2

5) 63.0 ohm^{-1} cm^2

31. For an electrolytic solution of 0.05 mole litre^{-1}, the conductivity has been found to be 0.0110 Scm^{-1}. The molar conductivity (in Scm^{2}mole^{-1}) is

1) 0.055 2) 550 3) 0.22 4) 220

32. Molar ionic conductivities of a bivalent electrolyte are 57 and 73. The molar conductivity of the solution will be

1) 130 S cm^2 mol^{-1} 2) 65 S cm^2 mol^{-1} 3) 260 S cm^2 mol^{-1} 4) 187 S cm^2 mol^{-1}

33. EMF of a cell in terms of reduction potential of its left and right electrodes is

1) $E = E_{left} - E_{right}$ 2) $E = E_{left} + E_{right}$ 3) $E = E_{right} - E_{left}$ 4) $E = -(E_{right} + E_{left})$

34. E^0 for the half cell Zn^{2+}/Zn is -0.76V. emf of the cell $Zn/Zn^{2+}(1M)//H^+(1M)/H_2$ at 1 atm is

1) –0.76 V 2) + 0.76 V 3) –0.38 V 4) + 0.38 V

35. If the standard electrode protential of Cu^{2+}/ Cu electrode is 0.34 V, what is the electrode potential at 0.01 M concentration of Cu^{2+}? (T = 298^0K)

1) 0.399 V 2) 0.281 V 3) 0.222 V 4) 0.176 V

36. The potential of hydrogen electrode is -118 mV. The H^+ concentration of the solution is

1) 0.01M 2) 2M 3) 10^{-4} M 4) 1M

37. The standard potentials (E^0) for the half reactions are as Zn ® $Zn^{2+} + 2e^-$, E^0 = + 0.76 V

Fe ® $Fe^{2+} + 2e^-$, E^0 = + 0.41 Vthe emf for the cell reaction Fe^{2+} + Zn ® Zn^{2+} + Fe is

1) – 0.35 V 2) + 0.35 V 3) + 1.17 V 4) – 1.17 V

38. E^0 for $F_2 + 2e^-$ ® $2F^-$ is 2.8 V; E^0 for 1/2 $F_2 + e^-$ ® F^- is

1) 2.8 V 2) 1.4 V 3) –2.8 V 4) –1.4 V

39. Consider the following E^0 values

E^0 Fe^{3+} / Fe^{2+} = + 0.77 V; E^0Sn^{2+} / Sn = – 0.14 V Under standard conditions the potential for the reaction Sn (s) + $2Fe^{3+}$ (aq) $\rightarrow$ $2Fe^{2+}$ (aq) + Sn^{2+} (aq) is

1) 1.68 V 2) 0.63 V 3) 0.91 V 4) 1.40 V

40. E^0 for the reaction Fe + Zn^{2+}® Zn + Fe^{2+} is –0.35 V. The given cell reaction is

1) feasible 2) not feasible 3) explosive 4) slow

41. E.M.F of the cell reaction, $2Ag^+ + Cu \rightarrow 2Ag + Cu^{2+}$ is 0.46 V. If $E^0_{Cu^{2+}/Cu}$ is + 0.34 V, $E^0_{Ag^+/Ag}$ is

1) 0.80 V 2) 0.12 V 3) 0.40 V 4) 1.60 V

42. The EMF of the cell Ni/Ni^{2+} (0.01M)// Cl^-(0.01M)/Cl_2, pt is ---- V if the SRP of nickel and chlorine electrodes are –0.25V and +1.36V respectively

1) +1.61 2) –1.61 3) +1.79 4) –1.79

43. The standard electrode potential of the two half cells are given below

$Ni^{+2} + 2e^- \rightarrow Ni$; E^o = – 0.25 Volt $Zn^{+2} + 2e^- \rightarrow Zn$; E^o = – 0.77 volt

The voltage of cell formed by combining the two half cells would be

1) –1.02 2) +0.52 volt 3) +1.02 volt 4) –0.52 volt

EXERCISE- I / ANSWERS

WORK SHEET - I

1) 4	2) 3	3) 2	4) 3	5) 2	6) 2	7) 2	8) 4	9) 3	10) 4
11) 2	12) 3	13) 3	14) 1	15) 4	16) 4	17) 1	18) 3	19) 2	20) 1
21) 1	22) 2	23) 3	24) 4	25) 4	26) 1	27) 3	28) 4	29) 1	30) 2
31) 1	32) 4	33) 2	34) 2	35) 2	36) 4	37) 1	38) 4	39) 2	40) 2
41) 3	42) 2	43) 2	44) 4	45) 3	46) 2	47) 3	48) 1	49) 4	50) 2
51) 2	52) 3	53) 3	54) 1	55) 2	56) 3	57) 5	58) 2	59) 4	60) 3
61) 4	62) 2	63) 1	64) 4	65) 2	66) 2	67) 4	68) 1	69) 4	70) 2
71) 1	72) 1	73) 4	74) 3	75) 2	76) 3	77) 3	78) 1	79) 4	80) 4
81) 3	82) 4	83) 3	84) 3	85) 1	86) 3	87) 1	88) 2	89) 3	90) 4
91) 3	92) 4	93) 3	94) 2	95) 2	96) 3	97) 1	98) 1	99) 4	100) 2
101) 1	102) 3	103) 1	104) 1	105) 1	106) 4	107) 1	108) 2	109) 4	110) 1
111) 2	112) 1	113) 1	114) 4	115) 3	116) 4	117) 3	118) 2	119) 4	120) 4
121) 3	122) 1	123) 3	124) 1	125) 4	126) 2	127) 2	128) 2	129) 2	130) 1
131) 2	132) 3	133) 3	134) 2	135) 2	136) 1	137) 2	138) 1	139) 2	140) 1
141) 4	142) 3	143) 4	144) 3						

WORK SHEET - II

1) 2	2) 1	3) 3	4) 2	5) 3	6) 2	7) 1	8) 4	9) 3	10) 4
11) 3	12) 3	13) 1	14) 2	15) 4	16) 3	17) 4	18) 1	19) 1	20) 4
21) 1	22) 1	23) 2	24) 3	25) 4	26) 1	27) 4	28) 2	29) 2	30) 1
31) 4	32) 1	33) 3	34) 2	35) 2	36) 1	37) 2	38) 1	39) 3	40) 2
41) 1	42) 3	43) 2							

EXERCISE - I

WORK SHEET - I

1. Which of the following reactions occurs at measurable rate ?
1) reaction between H^+ and OH^- ions in aqueous solution
2) reaction between $AgNO_3$ and NaCl aqueous solutions
3) hydrolysis of methyl acetate
4) reaction between hydrogen and oxygen gases at room temperature

2. Which of the following reaction is spontaneous at room temperature
1) $I_2 + H_2O \rightarrow$ 2) $2H_2 + O_2 \xrightarrow{Pt} 2H_2O$
3) $N_2 + O_2 \rightarrow 2NO$ 4) $2HCl \rightarrow H_2 + Cl_2$

3. Among the following slowest reaction under identical conditions is
1) $H^+ + OH^- \rightarrow H_2O$
2) $2KMnO_4 + 5H_2C_2O_4 + 3H_2SO_4 \rightarrow K_2SO_4 + 10CO_2 + 2MnSO_4 + 8H_2O$
3) $2KMnO_4 + 10FeSO_4 + 8H_2SO_4 \rightarrow K_2SO_4 + 2MnSO_4 + 5Fe_2(SO_4)_3 + 8H_2O$
4) $AgNO_{3(aq)} + NaCl_{(aq)} \rightarrow AgCl_{(s)} + NaNO_{3(aq)}$

4. The rate of reaction for $N_2 + 3H_2 \rightarrow 2NH_3$ may be represented as
1) $r = -\frac{d[N_2]}{dt} = -\frac{1}{3}\frac{d[H_2]}{dt} = +\frac{1}{2}\frac{d[NH_3]}{dt}$ 2) $r = -\frac{d[N_2]}{dt} = \frac{1}{3}\frac{d[H_2]}{dt} = +\frac{1}{2}\frac{d[NH_3]}{dt}$
3) $r = -\frac{d[N_2]}{dt} = 3\frac{d[H_2]}{dt} = +\frac{1}{2}\frac{d[NH_3]}{dt}$ 4) $r = -\frac{d[N_2]}{dt} = -\frac{1}{3}\frac{d[H_2]}{dt} = +2\frac{d[NH_3]}{dt}$

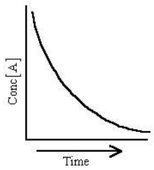
5. The rate of a chemical reaction
1) increases as the reaction proceeds 2) decreases as the reaction proceeds
3) may increase or decrease during the reaction
4) remains constant as the reaction proceeds

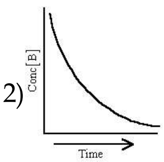
6. The chemical reaction occurring between covalent molecules involve
1) breaking of existing bonds 2) formation of new bonds
3) evolution of heat energy 4) 1& 2

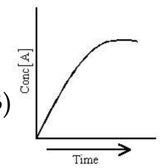
7. In a reaction 2A + B $\longrightarrow$ A_2B, the reactant 'A' will disappear at
1) half the rate at which B disappears 2) the same rate at which B disappears
3) the same rate at which A_2B is formed 4) twice the rate at which B disappears

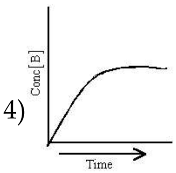
8. If the first order reaction involves gaseous reactants & gaseous products, the units of its rate are
1) atm 2) atm. sec 3) atm. sec^{-1} 4) $atm^2\ sec^{-2}$

9. For the reaction A $\rightarrow$ B; following curves represent reaction

1) 

2) 

3) 

4) 

The correct curves are

1) 1, 2 only 2) 2, 3 only 3) 1, 4 only 4) 3, 4 only

10. The reactions $2NO + O_2 \rightarrow 2NO_2, 2CO + O_2 \rightarrow 2CO_2$ look to be identical, yet the first is faster than the second. The reason is that

1) The first reaction has lower enthalpy change than the second
2) The first reaction has lowe internal energy change than the second
3) The first reaction has lower activation energy than the second
4) The first reaction has higher activation energy than the second

11. For $3A \rightarrow xB$, $\frac{d[B]}{dt}$ is found to be $2/3^{rd}$ of $\frac{d[A]}{dt}$. Then, the value of x is

1) 1.5 2) 3 3) 1/2 4) 2

12. Burning of coal is represented as $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$. The rate of this reaction is increased by

1) decrease in the concentration of oxygen 2) powdering the lumps of coal
3) decreasing the temperature of coal 4) providing inert atmosphere

13. For a hypothetical reaction; $A \rightarrow L$ the rate expression is, rate = $-\frac{dC_A}{dt}$

1) negative sign represents that rate is negative
2) negative sign pertains to the decrease in the concentrations of reactant
3) negative sign indicates the attractive forces between reactants
4) all of the above are correct

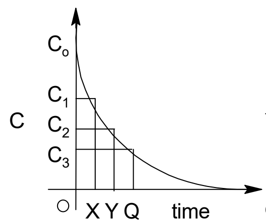
14. For the reaction ; $2HI \rightarrow H_2 + I_2$, the expression $-\frac{1}{2}\frac{d[HI]}{dt}$ represents

1) The rate of formation of HI 2) The rate of disappearance of HI
3) The instantaneous rate of the reaction 4) The average rate of reaction

15. For a reaction $A \rightarrow 2B$, as time proceeds

1) $[A]\downarrow$ but $[B]\uparrow$
2) Rate of disappearance of A $\downarrow$, but that of rate of appearance of B $\uparrow$
3) Rate of disappearance of A $\uparrow$, but that of rate of apparance of B $\downarrow$
4) Rate with respect to A and B remain same

16. From the graph



X = 10 min;

Y = 20 min;

Q = 30 min

Now, correct relationship is

1) $\dfrac{C_o - C_1}{X} = \dfrac{C_1 - C_2}{Y} = \dfrac{C_2 - C_3}{Q}$ 2) $\dfrac{C_2 - C_3}{Q} > \dfrac{C_1 - C_2}{Y} > \dfrac{C_0 - C_1}{X}$

3) $\dfrac{C_0 - C_1}{X} > \dfrac{C_1 - C_2}{Y - X} > \dfrac{C_3 - C_2}{Q - Y}$ 4) $\dfrac{C_1 - C_3}{Q - X} = \dfrac{C_0 - C_2}{Y}$

17. At 298 K, 1 atm, among

1) $2H_2 + O_2 \rightarrow 2H_2O$ 2) $H_2 + Cl_2 \rightarrow 2HCl$

3) $N_2 + O_2 \rightarrow 2NO$ 4) $H_2SO_4 + KOH \rightarrow$ products, correct order of reaction rates is

1) D > A > C> B 2) D < A < B < C 3) D > B > A > C 4) D > B = C > A

18. In which of the following cases, rate of disappearance of any reactant at a given instant equals to rate of appearance of any product

1) $H_2 + F_2 \rightarrow 2HF$ 2) $N_2 + 3H_2 \rightarrow 2NH_3$ 3) $PCl_5 \rightarrow PCl_3 + Cl_2$

4) $H_2 + \frac{1}{2}O_2 \rightarrow H_2O$

19. For $\frac{1}{2}X_2 + Y_2 \rightarrow XY_2$, relative rates of species given as

1) $\text{Rate} = \dfrac{-d[x_2]}{dt} = \dfrac{-d[y_2]}{dt} = +\dfrac{d[xy_2]}{dt}$ 2) $\text{Rate} = -2\dfrac{d[x_2]}{dt} = \dfrac{-d[y_2]}{dt} = +\dfrac{d[xy_2]}{dt}$

3) $\text{Rate} = \dfrac{-1}{2}\dfrac{d[x_2]}{dt} = \dfrac{-d[y_2]}{dt} = +\dfrac{d[xy_2]}{dt}$ 4) $\text{Rate} = -\dfrac{1}{2}\dfrac{d[x_2]}{dt} = \dfrac{+d[y_2]}{dt} = +\dfrac{d[xy_2]}{dt}$

20. For $N_2 + 3H_2 \rightarrow 2NH_3$, rates of dis-appearance of N_2 and H_2 and rate of appearance of NH_3 respectively are a, b and c, then

1) a > b > c 2) a < c < b 3) a = b > c 4) a = b = c

21. The reaction $CH_3COOC_2H_5 + H_2O \xrightarrow{H^+}$ products is a/an _____ process

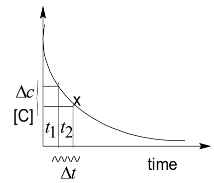
1) Instantaneous 2) Spontaneous 3) Moderately slow

Then correct statement(s) is/are

1) A & C 2) B & C 3) A only 4) C only

22. From the graph the value $\frac{\Delta c}{\Delta t}$ and the value of rate of reaction at X respectively are called

1) Average rate and instantaneous rate
2) Instantaneous rate and average rate
3) Average rate only
4) Instantaneous rate only



23. The rate of reaction which does not involve gases, does not depend upon

1) temperature 2) concentration 3) pressure 4) catalyst

24. The specific rate constant of a reaction depends on the

1) concentration of the reactant 2) time
3) temperature 4) concentration of the product

25. A catalyst accelerates the reaction, because

1) it brings the reactants closer 2) it lowers the activation energy
3) it changes the heat of reaction 4) it increases the activation energy

26. The unit of rate constant depends on

1) number of reactants 2) concentration terms
3) order of reaction 4) molecularity of reaction

27. The temperature coefficient of a reaction is

1) the rate constant at a fixed temperature 2) the ratio of rate constants at two temperatures
3) the ratio of rate constants at two different temperatures differing by 10°C
4) the ratio of rate constants at two pressures

28. If concentration of reactants is made 'x' times, the rate constant k becomes

1) $e^{k/x}$ 2) k/x 3) unchanged 4) x/k

29. The temperature coefficient of most of the reactions lies between

1) 1 & 3 2) 2 & 3 3) 1 & 4 4) 2 & 4

30. For a rection, $\frac{Kt+10}{Kt} = x$. When temperature is increased from 10^0C to 100^0C, rate constant (K) increased by a factor of 512. Then, value of x is

1) 1.5 2) 2.5 3) 3 4) 2

31. Increase of temperature will increase the reaction rate due to ***[Minipal 2002]***

1) increase of number of effective collisions 2) increase of mean free path
3) increase of number of molecules 4) increase of number of collisions

32. The rate constants of a reaction at 300K & 280K respectively are K_1&K_2.Then

1) $K_1=20K_2$ 2) $K_2=4K_1$ 3) $K_1=4K_2$ 4) $K_1=0.5\,K_2$

33. The rate constant K_1 of a reaction is found to be double that of rate constant K_2 of another reaction. The relationship between corresponding activation energies of the two reactions E_1 and E_2 can be represented as

1) $E_1 > E_2$ 2) $E_1 < E_2$ 3) $E_1 = E_2$ 4) $E_1 = 2E_2$

34. The Arhenius equation expressing the effect of temperature on the rate constant of reaction is

1) $K = Ea/RT$ 2) $K = A\,e^{-Ea/RT}$ 3) $K = \log_e \frac{Ea}{RT}$ 4) $K = e^{-Ea/RT}$

35. Activation energy depends on

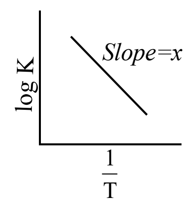
1) pressure 2) concentration of reactants
3) concentration of product 4) nature of reactants

36. A catalyst in a chemical reaction does not change
1) Average energy of reactants or products 2) Enthalpy of the reaction
3) Activation energy of the reaction 4) Both 1 and 2

37. In general the rate of a given reaction can be increased by all the factors except
1) Increasing the temperature
2) Increasing the concentration of reactants
3) Increasing the activation energy 4) Using a positive catalyst

38. The effect of temperature on a reaction rate for which Ea is zero is given by
1) with increase of temperature rate increases
2) with increase of temperature rate decreases
3) rate is independent of temperature 4) reaction never occurs

39. The graph of log K versus 1/T is given below. Here 'x' is equal to
[Where K = rate constant and T = absolute temperature]



1) $\frac{-E_a}{2.303}$ 2) $\frac{-E_a}{2.303R}$
3) $\frac{-2.303}{E_a.R}$ 4) $\frac{-2.303R}{E_a}$

40. In the graph drawn between log K and 1/T, intercept equals to
1) $\frac{-Ea}{2.303R}$ 2) log A 3) ln A 4) (log 1) / 2.303

41. In the Arrhenius equation, the Boltzmann factor $e^{-Ea/RT}$ represents the .... of the molecules possessing energy in excess of activation energy
1) number 2) fraction 3) weight 4) percentage

42. Rate constantof a reaction can be expressed by Arrhenius equation as $K = Ae^{-E/RT}$. In this equation, E represents
1) the fraction of molecules with energy greater than the activation energy of the reaction
2) the energy above which all the colliding molecules will react
3) the energy below which colliding molecules will not react
4) the total energy of the reacting molecules at a temperature, T

43. Activation energies for different reactions are given below
1) $A \rightarrow$ products, Ea=14 K.Cal 2) $B \rightarrow$ products, Ea=16 K.cal
3) $C \rightarrow$ products, Ea=12 K.Cal 4) $D \rightarrow$ products, Ea=10K.cal

If the temperature increases by 10^0C for which reactions the temperature coefficients $\left(\frac{k_1 + 10}{k_1}\right)$ are maximum and minimum respectively.
1) a & b 2) b & c 3) b & d 4) d & b

44. Which of the following parameters of a chemical reaction are increased when a catalyst is used ?
1) Rate & activation energy 2) Rate constant & enthalpy
3) Enthalpy & time duration 4) Rate & Rate constant

45. Which of the following influence the rate of reaction
1) Nature of reactants 2) Concentration of reactants

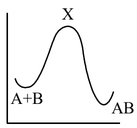
3) Temperature 4) Molecularity

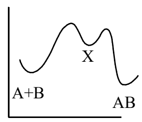
1) A,B 2) B,C,D 3) C,D 4) A, B,C

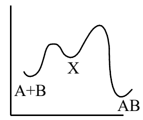
46. For an exothermic chemical process occurring in two steps as

i) A + B $\rightarrow$ X (slow) ii) X $\rightarrow$ AB (fast)

The progress of the reaction can be best described by

1) 

2) 

3) 

4) All are correct

47. Which of the following does not affect the rate of reaction ?

1) Amount of the reactants taken 2) Physical state of the reactants

3) ΔH of reaction 4) Size of the vessel

48. The rate expression gives the relation between rate of reaction and

1) conc. of reactants 2) conc. of products

3) rate constant 4) rate law

49. Rate of a reaction can be expressed by Arrhenius equation $k = A.e^{-E_a/RT}$. In this equation, E_a represents

1) The energy above which not all the colliding molecules will react

2) The energy below which colliding molecules will not reacts

3) The total energy of the reacting molecules at temperature T

4) The fraction of molecules which energy greater than the activation energy of the reaction

50. The minimum energy required for molecules to enter into chemical reaction is called

1) Kinetic energy 2) Potential energy 3) Threshold energy 4) Activation energy

51. In a reaction, threshold energy is equal to

1) activation energy 2) normal energy of the reactants

3) activation energy + energy of reactants

4) activation energy - energy of reactants

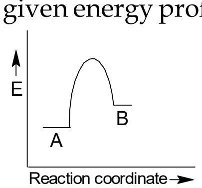
52. The value of activation energy for a chemical reaction is primarily depends on

1) temperature 2) nature of the reacting species

3) the collision frequency

4) concentration of the reacting species

53. For a reversible reaction, **A $\rightleftharpoons$ B,** which one of the following statements is wrong from the given energy profile diagram ?



1) Activation energy of forward reaction is greater than that of backward reacton.

2) The threshold energy is less than that of activation energy

3) The forward reaction is endothermic

4) Activation energy of forward reaction is equal to the sum of heat of reaction and the activation energy of backward reaction.

54. Wrong statement among the following is

1) effective collisions are more if activation energy is less

2) zero order reaction proceeds at a constant rate independent of concentration or time

3) reactions with highest rate constant values have lowest activation energies

4) if initial concentration increases half life decreases in zero order

55. For the reaction $\mathbf{A + B \Leftrightarrow C + D}$, the forward reaction is exothermic. The activation energy of formation of A + B is .... that for the formation of C + D

1) equal to 2) less than 3) greater than 4) double

56. Collision theory satisfactorily explains

1) First order reaction 2) Zero order reaction

3) Bimolecular reaction 4) Any order reaction

57. According to collision theory of reaction rates, the activation energy is

1) the energy gained by the molecule on colliding with other molecules.

2) the energy that molecule should possess in order to undergo reaction

3) the energy it should possess so that it can enter into an effective collision

4) the energy it has to acquire so that it can enter into an effective collision.

58. Increase in the concentration of the reactants leads to the change in

1) Heat of reaction 2) Activation energy

3) Collision frequency 4) Threshold energy

59. The population of activated molecules can be increased by

1) increase in temperature 2) using a catalyst

3) increase of concentration of reactants 4) All

60. Consider an endothermic reaction $X \rightarrow Y$ with the activation energies E_b and E_f for the backward and forward reactions, respectively. In general

1) $E_b < E_f$ 2) $E_b > E_f$ 3) $E_b = E_f$

4) no definite relation

61. An endothermic reaction $A \rightarrow B$ has an activation energy as xKJ.mol^{-1} of A. If energy change of the reaction is yKJ, the activation energy of the reverse reaction is

1) - x 2) x - y 3) x + y 4) y - x

62. Which of the following explains the increase of reaction rate by a catalyst ?

1) Catalyst provides the necessary energy to the colliding molecules to cross the barrier

2) Catalyst decreases the rate of backward reaction so that the rate of forward reaction increases

3) Catalyst decreases the enthalpy change of the reaction

4) Catalyst provides an alternative path of lower activation energy.

63. The plot of log k vs $\frac{1}{T}$ helps to calculate

1) Energy of activation2) Rate constant of the reaction

3) Order of the reaction

4) Energy of activation as well as the frequency factor

64. The activation energy of a reaction can be determined by

1) changing the concentration of reactants

2) evaluating rate constant at standard temperature

3) evaluating rate constants at two different temperatures

4) by doubling conc. of reactants

65. Which of the following is correct ?

1) Molecularity of a reaction is always same as the order of reaction

2) In some cases molecularity of the reaction is same as the order of reaction

3) Molecularity of the reaction is always more than order of reaction

4) Molecularity never be equal to order

66. The rate equation for the reaction $2A+B \rightarrow C$ is found to be : rate=K[A][B]. The correct statement in relation to this reaction is

1) unit of k must be sec^{-1}

2) value of k is independent of the initial concentrations of A and B

3) rate of formation of C is twice the rate of disappearance of A

4) $t_{1/2}$ is a constant

67. If the rate for the chemical reaction is expressed as Rate = K [A] $[B]^n$, then

1) order of reaction is one
2) order of reaction is n
3) order of reaction is 1 + n
4) order of reaction is 1 - n

68. Which of the following statements is correct regarding order of reaction

1) first order reaction should be bimolecular
2) order of reaction must be positive
3) order depends upon stoichiometry
4) order is determined by experimental results

69. If the rate of gaseous reaction is independent of pressure, the order of reaction is

1) 0 2) 1 3) 2 4) 3

70. For the reaction $H_2 + Br_2 \rightarrow 2HBr$, the rate expression is, rate = K $[H_2]$ $[Br_2]^{1/2}$ which statement is true about this reaction

1) The reaction is of second order
2) Order of the reaction is 3/2
3) The unit of K is sec^{-1}
4) Molecularity of the reaction is 2

71. For the following elementary step $(CH_3)_3CBr_{(aq)} \rightarrow (CH_3)\overset{+}{C}_{(aq)} + \overset{-}{Br}_{(aq)}$ the molecularity is

1) Zero 2) 1 3) 2 4) fractional

72. The units of rate constant for the reaction obeying rate expression, r = $k[A][B]^{2/3}$ is

1) $mole^{-2/3}\ lit^{2/3}\ time^{-1}$
2) $mole^{2/3}\ lit^{-2/3}\ time^{-1}$
3) $mole^{-5/3}\ lit^{5/3}\ time^{-1}$
4) $mole^{2/3}\ lit^{2/3} time^{-1}$

73. Two gases 'A' and 'B' are in a container. The experimental rate law for the reaction between them has been found to be rate = $k[A]^2[B]$. Predict the effect on the rate of the reaction when the partial pressure of each reactant is doubled :

1) the rate is doubled
2) rate becomes four times
3) the rate becomes six times
4) the rate becomes eight times

74. In the following sequence of reactions $M \xrightarrow{K_1} N \xrightarrow{K_2} O \xrightarrow{K_3} P$: $K_1 < K_2 < K_3$, then the

rate determining step is

1) $M \rightarrow N$ 2) $N \rightarrow O$ 3) $O \rightarrow P$ 4) $M \rightarrow P$

75. Taking the reaction $x+2y \rightarrow$ products to be of second order, which of the following is / are the rate law expression/s for the reaction

I) $\frac{dx}{dt} = K[x][y]$ II) $\frac{dx}{dt} = K[x][y]^2$

III) $\frac{dx}{dt} = K[x]^2$ IV) $\frac{dx}{dt} = K[x] + K[y]^2$

Then the correct answers can be

1) I only 2) I and III only

3) I and II only 4) I and IV only

76. .... of a reaction cannot be determined experimentally.

1) order 2) rate

3) rate constant 4) molecularity

77. The rate expression for the reaction $A_{(g)} + B_{(g)} \rightarrow C_{(g)}$ is rate = $kC_A^2 C_B^{1/2}$ What changes in the initial concentrations of A and B will cause the rate of reaction to increase by a factor of eight?

1) $C_A \times 2; C_B \times 2$ 2) $C_A \times 2; C_B \times 4$ 3) $C_A \times 1; C_B \times 4$ 4) $C_A \times 4; C_B \times 1$

78. For a reaction pA+ qB $\rightarrow$ products, the rate law expression is $r = k[A]^l[B]^m$ then

1) (p+q) = (l+ m) 2) (p + q) > (l + m)

3) (p + q) may or may not be equal to (l + m) 4) (p + q) $\neq$ (l + m)

79. For $H_2 + Cl_2 \xrightarrow{X} 2HCl$, rate law is given by R=K. Then, X is

1) Pt 2) Ni 3) $h\upsilon$ 4) Water

80. If both $\frac{dc}{dt}$ & specific rate have same units, then rate law is

1) $R=K[A]^2$ 2) $R=K[A]^{1/2}$ 3) $R=K[a]^{-2}$ 4) R=K

81. For A+B $\rightarrow$ C+D, when [A] alone is doubled,rate gets doubled. But, when [B] alone is increased by 9 times, rate gets tripled. Then, order of reaction is

1) 3/4 2) 3/2 3) 4/9 4) 2

82. Rate law for 2A+B $\rightarrow$ C+D from following data:

S.No	[A] (M)	s[B] (M)	Rate (M/s)
1	0.01	0.01	2.5
2	0.01	0.02	5
3	0.03	0.02	45

1) $r=K[A]^{1/3}[B]$ 2) $r=K[A]^2[B]$ 3) $r=K[A][B]^{1/3}$ 4) $r=K[a]^{2/3}[B]^{1/3}$

83. Which of the following relation is correct for a first order reaction? (k = rate constant; r = rate of reaction ; c = conc. of reactant

1) $k = r \times c^2$ 2) $k = r \times c$ 3) $k = \frac{c}{r}$ 4) $k = \frac{r}{c}$

84. $\frac{dc}{dt}$ of a first order reaction depends on

1) time 2) concentration 3) Temperature 4) All

85. Which of the following is correct for a first order reaction ? (K= rate constant $t_{1/2}$ = half-life)

1) $t_{1/2} = 0.693 \times K$ 2) $k.t_{1/2} = \frac{1}{0.693}$ 3) $k.t_{1/2} = 0.693$ 4) $6.93 \times k \times t_{1/2} = 1$

86. The half life for a given reaction was doubled as the initial concentration of the reactant was doubled. The order of the reaction is

1) Zero 2) 1st 3) 2nd 4) 3rd

87. The inversion of cane sugar into glucose and fructose is

1) 1st order 2) 2nd order 3) 3rd order 4) zero order

88. The half-life of a first order reaction is

1) independent of the initial concentration of the reactant

2) directly proportional to the initial concentration of the reactant

3) inversely proportional to the initial concentration of the reactant

4) directly proportional to the square of the initial concentration of the reactant.

89. The hydrolysis of ester in the presence of alkali solution is a ...... order reaction

1) 1 2) 2 3) 0 4) 3

90. $CH_4 + Cl_2 \xrightarrow{h\upsilon} CH_3Cl + HCl;$ the order of this reaction is

1) 0 2) 1 3) 2 4) 3

91. $RCOOR+H_2O \xrightarrow{HCl} RCOOH + ROH$ follows ...... reaction kinectics [karnataka 2001]

1) 2^{nd} order 2) unimolecular

3) pseudo unimolecular 4) Zero order

92. Order of a reaction is decided by

1) molecularity 2) law of mass action

3) performing experiment 4) Lechatlier principle

93. $2A \rightarrow B+C$ would be a zero order reaction when rate of reaction

1) is directly proportional [A] 2) is directly proportional $[A]^2$

3) is independent of change of [A] 4) is independent of [B] & [C]

94. Which of the following is a first order reaction

1) $2N_2O_5 \rightarrow 4NO_2 + O_2$ 2) $2H_2O_2 \rightarrow 2H_2O+O_2$

3) $CH_3COOC_2H_5 + H_2O \xrightarrow{H^+}$ products 4) All the above

95. If a reaction obeys the following equation $k = \frac{2.303}{t}\log\frac{a}{a-x}$ the order of the reaction will be

1) zero 2) one 3) two 4) three

96. The rate constant for a reaction is 2.05×10^{-5} mole $lit^{-1}.sec^{-1}$. The reaction obeys .... order

1) First 2) Second 3) Zero 4) Half

97. A reaction involves two reactants. The rate of reaction is directly proportional to the concentration of one of them and inversely proportional to the concentration of the other.

The overall order of reaction will be

1) One 2) Two 3) Zero 4) fractional

98. In the reaction of $aA + bB + cC \rightarrow$ Products,

i) If concentration of A is doubled, keeping conc. of B and C constant the rate of reaction becomes double.

ii) If concentration of B is halved keeping conc. of A and C constant, the rate of reaction remains unaffected

iii) If concentration of C is made 1.5 times, the rate o reaction becomes 2.25 times.The order of reaction is

1) 1 2) 2.5 3) 3 4) 3.5

99. In the reaction $2A+B \rightarrow$ Products, the order w.r.t A is found to be one and w.r.t B equal to 2. Concentration of A is doubled and that of B is halved, the rate of reaction will be

1) Doubled 2) Halved 3) Remain unaffected 4) Four times

100. While studying the decomposition of gaseous N_2O_5, it is observed that a plot of logarithm of its partial pressure versus time is linear. The kinetic parameter obtained from this observation is

1) Specific rate 2) Reaction rate

3) Energy of activation 4) Molecularity

101. The correct expression for the rate constant for reactions of zero order is

1) $k - [A_\circ]/2t$ 2) $k = \frac{1}{t}\{[A_0]-[A]\}$

3) $k = \frac{1}{t}\{[A]-[A_0]\}$ 4) $k = \frac{2.303}{t}\log\{[A_0]-[A]\}$

102. If 'a' is the initial concentration of the reactant, the time taken for completion of the reaction, if it is of zero order, will be

1) a/k 2) a/2k 3) 2a/k 4) k/a

103. For the first order reaction $A \rightarrow$ Products, which one of the following is the correct plot of log (a-x) versus time ?

1) log(a–x) 2) log(a–x) 3) log(a–x) 4) log(a–x)

104. The slowest step of a particular reaction is found to be $\frac{1}{2}X_2+Y_2 \rightarrow XY_2$

The order of the reaction is

1) 2 2) 3 3) 3.5 4) 1.5

105. For the reaction $\mathbf{A \rightarrow B}$, the rate law expression is : rate = K[A]. Which of the following statements is incorrect ?

1) The reaction follows first order kinetics

2) The $t_{1/2}$ of reaction depends on initial concentration of reactants

3) K is constant for the reaction at a constant temperature

4) The rate law provides a simple way of predicting the conc. of reactants and products at any time after the start of the reaction

106. What are the units of the rate constant of a reaction in which the half life is doubled by halving the initial concentration of reactants.

1) $M\text{-}s^{-1}$ 2) $M^{-1}s^{-1}$ 3) sec^{-1} 4) $M^{-2}s^{-1}$

CHEMICAL KINETIC

107. Which of the following represents the expression for 3/4 th life of 1st order reaction

1) $\frac{2.303}{k}\log 3/4$ 2) $\frac{2.303}{k}\log 3$ 3) $\frac{2.303}{k}\log 4$ 4) $\frac{K}{2.303}\log 4$

108. The formation of gas at the surface of tungsten due to adsorption is --------- order reaction

1) 0 2) 1 3) 2 4) Insufficient data

109. The rate law for a reaction between the substances A and B is given by Rate = $k[A]^m [B]^n$ On doubling the concentration of A and halving the concentration of B, the ratio of the new rate to the earlier rate of the reaction will be as

1) (m + n) 2) (n - m) 3) $2^{(m-n)}$ 4) $\frac{1}{2^{(m+n)}}$

110. For the reaction system : $2NO(g) + O_2(g) \longrightarrow 2NO_{2(g)}$ volume is suddenly reduced to half its value by increasing the pressure on it. If the reaction is of first order with respect to O_2 and second order with respect to NO, the rate of reaction will

1) diminish to one-eighth of its initial value 2) increase to eight times of its initial value

3) increase to four times of its initial value 4) diminish to one-fourth of its initial value

111. In a first order reaction, the concentration of the reactant, decreases from 0.8M to 0.4M in 15 minutes. Then, 0.1M becomes 0.025M in

1) 7.5 minutes 2) 15 minutes 3) 30 minutes 4) 60 minutes

1) Both (1) and (R) are true and (R) is the correct explanation of (1)

2) Both (1) and (R) are true and (R) is not the correct explanation of A

3) (1) is true but (R) is false 4) (1) is false but (R) is true

112. Assertion : Spontaneous reaction may be slow or fast.

Reason : Spontaneous nature deals with feasibility of the reaction but not rate.

113. Assertion : Rate of reaction increases with increase in concentration of reactants.

Reason : Number of effective collisions increases with increase in concentration of reactants.

114. Assertion : Rate constant of a reaction at a particular temperature is constant

Reason : The value of rate constant 'K' is independent of initial concentration.

115. Assertion : Hydrolysis of an ester is a slow reaction

Reason : Reactions between covalent species involve breaking and making of bonds.

116. Assertion : As time passes the rate of non zero order reaction w.r.t reactants (or) products decreases

Reason : Rate of a reaction is directly proportional to $(\text{Concentration})^{\text{order}}$

117. Assertion : All collisions lead to chemical reaction (R)

Reason : Activated molecules bring about effective collisions

118. Assertion : Lesser the activation energy, greater is the rate of reaction

Reason : Activation energy of a reaction is independent of temperature

119. Assertion :Order of reaction is evaluated from the mechanism of a reaction

Reason : Order of reaction can be zero

120. Assertion : A catalyst increases the rate of a reaction.

Reason : In presence of a catalyst, the activation energy of the reaction increases.

121. Set -I | Set - II $\left(t_{\frac{1}{2}}\right)$

Set -I	Set - II
1) $H_2 + I_2 \rightarrow 2HI$	1) Independent of C_o
2) $2H_2O_2 \rightarrow 2H_2O + O_2$	2) Proportional to $[C_o]^{-1}$
3) $2NO + Cl_2 \rightarrow 2NOCl$	3) Proportional to $[C_o]^{1}$
4) $CH_4 + Cl_2 \xrightarrow{h\vartheta} CH_3Cl + HCl$	4) Proportional to $[C_o]^{-2}$
Correct match is	5) Inversely proportional to $[C_o]^{-2}$

	A	B	C	D		A	B	C	D
1)	2	1	5	3	2)	2	1	4	5
3)	2	1	4	3	4)	1	2	3	5

122. Set - I (process) | Set - II (unit of K)

Set - I (process)	Set - II (unit of K)
1) $2HI \xrightarrow{Au}$ products	1) Sec^{-1}
2) $SO_2Cl_2 \rightarrow$ products	2) mol - ltr^{-1} - sec^{-1}
3) $R_1COOR_2 + H_2O \xrightarrow{OH^-}$ products	3) lit^2 - mol^{-2} - sec^{-1}
4) $2NO + Cl_2 \rightarrow$ products	4) lit - mol^{-1} - sec^{-1}

Correct match is

	A	B	C	D		A	B	C	D
1)	1	2	3	4	2)	4	2	3	1
3)	2	1	4	3	4)	2	4	3	1

WORK SHEET - II

01. For the reaction $N_2 + 3H_2 \rightarrow 2NH_3$, the rate $\frac{d[NH_3]}{dt} = 2\times10^{-4}\ Ms^{-1}$. Therefore the rate $-\frac{d[N_2]}{dt}$ is given as :

1) $10^{-4}\ M\sec^{-1}$ 2) $10^{4}\ M\sec^{-1}$ 3) $10^{-2}\ M\sec^{-1}$ 4) $10^{-4}\ \sec^{-1} M^{-1}$

02. The rate of a heterogeneous reaction such as iron (soli4) and any gas (oxygen) does not depend on :

1) Concentration of reactants 2) Surface area of reactants

3) Pressure of reactant gases 4) Potential energy of reactant

03. For the reaction : $[Cu(NH_3)_4]^{2+} + H_2O \rightleftharpoons [Cu(NH_3)_3H_2O]^{2+} + NH_3$. The net rate of reaction at any time is given by : rate =
$2.0\times10^{-4}\left[[Cu(NH_3)_4]^{2+}\right][H_2O] - 3.0\times10^{5}\left[[Cu(NH_3)_3H_2O]^{2+}\right][NH_3]$. Then correct statment is/are

1) Rate constant for forward reaction = $2\text{x}\ 10^{-4}$

2) Rate constant for backward reaction = $3\ \text{x}\ 10^{5}$

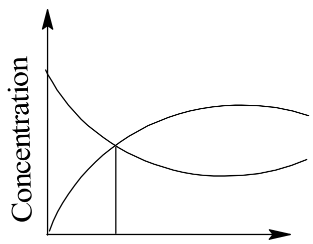
3) Equilibrium constant for the reaction = $6.6\ \text{x}\ 10^{-10}$

4) All of these

04. Consider the reaction : $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$. The equally relationship between $-\frac{d[NH_3]}{dt}$ and $-\frac{d[H_2]}{dt}$ is :

1) $\frac{d[NH_3]}{dt} = -\frac{3}{2}\frac{d[H_2]}{dt}$
2) $\frac{d[NH_3]}{dt} = -\frac{d[H_2]}{dt}$
3) $\frac{d[NH_3]}{dt} = \frac{1}{3}\frac{d[H_2]}{dt}$
4) $\frac{d[NH_3]}{dt} = -\frac{2}{3}\frac{d[H_2]}{dt}$

05. The accompanying figure depicts the change in concentration of species X and Y for the reaction



$X \rightarrow Y$, as a function of time. The point of intersection of the two curves represents

1) $t_{1/2}$ 2) $t_{3/4}$ 3) $t_{2/3}$ 4) $t_{1/4}$

06. Benzene diazonium chloride (1) decomposes into chlorobenzene (2) and N_2(g) in first-order reaction. Volumes of N_2 collected after 5 min and at the complete decomposition of A are 10 mL. and 50 mL. The rate constant for the reaction is .

1) 0.446 min^{-1} 2) 0.0446 min^{-1} 3) 0.223 min^{-1} 4) 0.112 min^{-1}

07. For the reaction $N_2O_5 \rightarrow 2NO_2 + O_2$; Given $\frac{-d[N_2O_5]}{dt} = K_1[N_2O_5]$

$\frac{d[NO_2]}{dt} = K_2[N_2O_5]$ and $\frac{d[O_2]}{dt} = K_3[N_2O_5]$. The relation in between K_1, K_2 and K_3 is :

1) $2K_1 = K_2 = 4K_3$ 2) $K_1 = K_2 = K_3$ 3) $2K_1 = 4K_2 = K_3$ 4) None of these

08. For the reaction, $2A + B \rightarrow 3C + D$; which of the following does not express the reaction rate :

1) $\frac{d[D]}{dt}$ 2) $-\frac{d[A]}{2dt}$ 3) $-\frac{d[C]}{3dt}$ 4) $-\frac{d[B]}{dt}$

09. Hydrogenation of vegetable ghee at 25^0C reduces pressure of H_2 from 2 atm to 1.2 atm in 50 minute. The rate of reaction in terms of molarity per second is :

1) 1.09×10^{-6} 2) 1.09×10^{-5} 3) 1.09×10^{-7} 4) 1.09×10^{-9}

10. In reversible reaction : $2NO_2 \underset{k_2}{\overset{k_1}{\rightleftharpoons}} N_2O_4$ the rate of disappearance of NO_2 is equal to

1) $\frac{2k_1}{k_2}[NO_2]^2$
2) $2k_1[NO_2]^2 - 2k_2[N_2O_4]$

3) $2k_1[NO_2]^2 - k_2[N_2O_4]$ 4) $(2k_1 - k_2)[NO_2]$

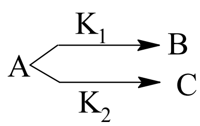
WORK SHEET - III

01. The rate constant (K) for the reaction. $2A+B \rightarrow$ Product was found to be 2.5×10^{-5} litre mol^{-1} sec^{-1} after 15 sec, 2.60×10^{-5} litre mol^{-1} sec^{-1} after 30 sec and 2.55×10^{-5} litre mol^{-1} sec^{-1} after 50 sec. The order of reaction is :

1) 2 2) 3 3) Zero 4) 1

02. A first order reaction is carried out with an initail concentration of 10 mol per litre and 80% of the reactant changes into the product in 10 sec. Now if the same reaction is carried out with an initail concentration of 5 mol per litre. The percentage of the reactant changing to the product in 10 sec is :

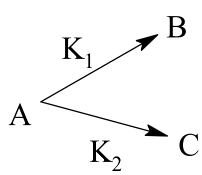
1) 40 2) 80 3) 60 4) 50

03. For a first order reaction  which of the following relation is not correcet :

1) $K = K_1 + K_2$ 2) $\frac{1}{\tau} = \frac{1}{\tau_1} + \frac{1}{\tau_2}$

3) $\frac{1}{t_{1/2}} = \left(\frac{1}{t_{1/2}}\right)_1 + \left(\frac{1}{t_{1/2}}\right)_2$ 4) $\frac{1}{K} = \frac{1}{K_1} + \frac{1}{K_2}$

04. A substance undergoes first order decomposition. The decomposition follows two parallel first order reactions as :



and $K_1 = 1.26 \times 10^{-4}$ sec^{-1}, $K_2 = 3.80 \times 10^{-5}$ sec^{-1}

The percentage distribution of B and C are :

1) 80% B and 20%C 2) 76.83% B and 23.17% C

3) 90% B and 10% C 4) 60% B and 40% C

05. Half life (t_1) of the first order reaction and half life (t_2) of the second order reaction are equal. Hence ratio of the rate at the start of the reaction:

1) 1 2) 2 3) 0.693 4) 1.44

06. For a first order reaction, the half-life is 50 sec. Identify the correct statement from the following.

1) the reaction is almost gets complete in 500 sec

2) the same quantity of reactant is consumed for every 50 sec of the reaction

3) quantity of reactant remaining after 100 sec is half of what remains after 50 sec

4) All the above three

CHEMICAL KINETIC

07. For a first order reaction, if the time taken for completion of 50% of the reaction is 't' second, the time required for completion of 99.9% of the reaction is:

1) 10t 2) 5t 3) 100t 4) 2t

08. In a first order reaction, the concentration of the reactant, decreases from 0.8 M to 0.4 M in 15 minutes. The time taken for the concentration to change from 0.1 M to 0.025 M is

1) 30 minutes 2) 60 minutes 3) 7.5 minutes 4) 15 minutes

09. The following data are obtained from the decomposition of a gaseous compound Initial pressure, atm 1.6 0.8 0.4

Time for 50% reac., min 80 113 160

The order of the reaction is

1) 0.5 2) 1.0 3) 1.5 4) 2.0

10. In a zero order reaction, 47.5&% of the reactant remains at the end of 2.5 hours. The amount of reactant consumed in one hour is

1) 10.5 % 2) 32.0 % 3) 52.6 % 4) 21.0 %

EXERCISE - I / ANSWERS

WORK SHEET - I

1) 3	2) 2	3) 2	4) 1	5) 2	6) 4	7) 4	8) 3	9) 3	10) 3
11) 4	12) 2	13) 2	14) 3	15) 1	16) 3	17) 3	18) 3	19) 2	20) 2
21) 2	22) 1	23) 3	24) 3	25) 2	26) 3	27) 3	28) 3	29) 2	30) 2
31) 1	32) 3	33) 2	34) 2	35) 4	36) 4	37) 3	38) 3	39) 2	40) 2
41) 2	42) 3	43) 3	44) 4	45) 4	46) 2	47) 3	48) 1	49) 2	50) 4
51) 3	52) 2	53) 2	54) 4	55) 3	56) 3	57) 4	58) 3	59) 4	60) 1
61) 2	62) 4	63) 4	64) 3	65) 2	66) 2	67) 3	68) 4	69) 1	70) 2
71) 2	72) 1	73) 4	74) 1	75) 2	76) 4	77) 2	78) 3	79) 3	80) 4
81) 2	82) 2	83) 4	84) 4	85) 3	86) 1	87) 1	88) 1	89) 2	90) 1
91) 3	92) 3	93) 3	94) 4	95) 2	96) 3	97) 3	98) 3	99) 2	100) 1
101) 2	102) 1	103) 2	104) 4	105) 2	106) 2	107) 3	108) 1	109) 3	110) 2
111) 3	112) 1	113) 1	114) 2	115) 1	116) 1	117) 4	118) 2	119) 4	120) 3

WORK SHEET - II

1) 1	2) 4	3) 4	4) 4	5) 1	6) 2	7) 1	8) 3	9) 2	10) 2

WORK SHEET - III

1) 1	2) 2	3) 4	4) 2	5) 3	6) 4	7) 1	8) 1	9) 3	10) 4

EXERCISE- II

63. Column - I | Column - II

Column - I	Column - II
1) Decomposition of H_2O_2	p) $10t_{1/2}$
2) $\frac{k_{308K}}{k_{298K}}$	q) 1^{st} order
3) Arrhenius equation	r) Temperature coefficient
4) $t_{99.9\%}$	s) $\log\frac{k_2}{k_1}=\frac{E_a}{2.303R}\left(\frac{T_2-T_1}{T_1T_2}\right)$
	t) 2 to 3

64.

Column - I	Column - II
1) Decomposition of H_2O_2	p) First order reaction
2) Decomposition of ozone	q) Order of reaction with respect to oxygen is -1
3) Decomposiiton of N_2O_5	r) Half life is independent of initial conc
4) $RCOOR + H_2O \xrightarrow{H^+} RCOOH + ROH$	s) Pseudo unimolecular reaction
	t) Units of rate of reaction are M.time^{-1}

65. Match the Order of Reaction (in Column-I) with its Property (in Column-II) :

Column - I (Order)	Column - II (Property)
1) Zero	p) Half Life $\propto \frac{1}{a^2}$
2) First	q) Half Life $\propto \frac{1}{a}$
3) Second	r) Half Life is doubled on doubling the initial concentration
4) Third	s) 50% reaction takes same time even if concentration is halved (or) doubled

EXERCISE- II / ANSWERS

63) 1-q; 2-r,t; 3-s; 4-p 64) 1-p,r,t; 2-p,q,r,t; 3-p,r,t; 4-p,r,s,t

65) 1-r; 2-s; 3-q; 4-p

EXERCISE - I

WORK SHEET - I

1. Which of the following is transition element
1) Pb 2) Sn 3) Cr 4) Zn

2. Liquid metal among d-block elements is
1) Hg 2) Zn 3) Nb 4) Cd

3. Outer electronic configuration of the element Palladium is
1) $4d^5 5s^1$ 2) $4d^9 5s^2$ 3) $4d^{10} 5s^1$ 4) $4d^{10} 5s^0$

4. In 3d series which element has highest M.P and B.P
1) V 2) Zn 3) Cu 4) Cr

5. Which of the following orbitals are filled progressively in the transition elements
1) s 2) p 3) d 4) f

6. Which set of elements among the following are called non-transitional elements
1) Cu, Ag and Au 2) Fe, Co and Ni 3) Zn, Cd and Hg 4) Re, Os and Ir

7. The catalyst used in the manufacture of HNO_3 by Ostwald's process is
1) Pt 2) Ni 3) Fe 4) Mo

8. Iron catalyst is used in
1) Contact process 2) Ostwald's process
3) Birkland-Eyde process 4) Haber's process

9. The changed name of Khurchatovium (Z=104) is
1) Joliotium 2) Dubnum 3) Rutherfordium 4) Hatrium

10. The number of electrons in 4d-subshell of 'Pd' is
1) 7 2) 8 3) 9 4) 10

11. Electron configuration of Ferrous ion is
1) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^0$ 2) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^2$
3) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$ 4) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^0$

12. The following pair of ions have the same electronic configuration
1) Cr^{3+} and Fe^{3+} 2) Fe^{3+} and Mn^{2+} 3) Fe^{3+} and Co^{3+} 4) Sc^{3+} and Cr^{3+}

13. How many 'd' electrons are present in Cr^{2+} ion?
1) 4 2) 5 3) 6 4) 3

14. What kind of electronic transition take place in the exhibition of colour by transition metal ions
1) d to s 2) s to p 3) d to d 4) f to s

15.

Outermost EC	**Element**
1) $5s^1 4d^5$	A) Cu
2) $6s^1 5d^{10}$	B) Pd
3) $4s^1 3d^{10}$	C) Mo
4) $5S^o 4d^{10}$	D) Cr
	E) Au

The correct match is
1) 1-C, 2-A, 3-A, 4-B 2) 1-C, 2-E, 3-B, 4-A
3) 1-C, 2-E, 3-A, 4-B 4) 1-E, 2-C, 3-A, 4-B

16. (A) : Fe^{+3} is more stable than that of Fe^{+2}.
(R) : Fe^{+3} ion has half filled 3d orbital whereas Fe^{+2} does not.
1) Both A & R are correct and R is correct explanation for A
2) Both A & R are correct and R is not correct explanation for A
3) A is true but R is false 4) A is false but R true

17. Number of 'd' electrons present in M shell of Ag+ ion?
1) 10 2) 20 3) 18 4) 16

18 The atomic numbers of vanadium chromium, manganese and iron are respecrively 23, 24, 25 and 26. Which one of these may be expected to show highest second ionization enthalpy
1) V 2) Cr 3) Mn 4) Fe

19. Of the following outer electronic configurations of atoms, the highest oxidation state is achieved by which one of them?
1) $(n-1)d^8ns^2$ 2) $(n-1)d^5ns^2$ 3) $(n-1)d^3ns^1$ 4) $(n-1)d^5ns^1$

20. The common oxidation state of transition elements is
1) + II 2) + IV 3) + VI 4) + VII

21. Which of the following transition elements exhibit +8 oxidation state
1) Cu and Zn 2) Ru and Os 3) W and Pb 4) Ag and Au

22. Manganese exhibits oxidation states from
1) + II to + VII 2) + I to + VI 3) + I to + V 4) + III to + V

23. The most stable oxidation state of Iron is
1) + II 2) + III 3) + I 4) + VI

24. The maximum oxidation state in 3d series elements is shown by
1) Cu 2) V 3) Mn 4) Fe

25. The transition element that has stable configuration in +1 oxidation state is
1) Cu 2) Zn 3) Sc 4) Mn

26. Divalent Manganese is more stable due to
1) $3d^4$ configuration 2) $3d^2$ configuration 3) $3d^5$ configuration 4)$3d^3$ configuraton

27. The oxidation state of "Ni" in $Ni(CO)_4$ is
1) + II 2) zero 3) + III 4) + VIII

28. The element which has half-filled d-orbitals in its '+1' oxidation state is
1) Mn 2) Cr 3) Zn 4) Fe

29. Coloured complexes absorb radiation in the
1) visible region 2) infrared region 3) U.V. region 4) far IR region

30. Coloured ion among the following is
1) Zn^{2+} 2) Mn^{2+} 3) Cu^{1+} 4) Ti^{4+}

31. In aqueous solution which of the following colour is exhibited by $NiCl_2$
1) pink 2) green 3) blue 4) yellow

32. The ion which exhibits orange red colour in aqueous solution is
1) $Cr_2O_7^{2-}$ 2) MnO_4^{2-} 3) MnO_4^- 4) Cr^{3+}

33. The following ion is colourless in aqueous solution ?
1) Ti^{2+} 2) Cu^{2+} 3) Ni^{2+} 4) Zn^{2+}

34. Which of the following pairs of ions are colourless ?
1) Ti^{+3}, Cu^{+2} 2) Sc^{+3}, Zn^{+2} 3) Co^{+2}, Fe^{+3} 4) Ni^{+2}, V^{+3}

35. The following ion exhibits colour in aqueous solution ?

1) Sc^{3+} 2) Cu^{+} 3) Ni^{2+} 4) Zn^{2+}

36. A : Sc^{+3} ion in aqueous solutions is colorless
R : Ions with d^0 configuration are colorless
The correct answer is
1) Both (A) and (R) are true and (R) is thecorrect explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false 4) (A) is false but (R) is true

37. The atomic number of an element 'M' is 26. How many electrons are present in the M-shell of the element in its M^{3+} state ?
1) 5 2) 14 3) 12 4) 13

38. Paramagnetism is the property of
1) completely filled electronic subshells 2) unpaired electrons
3) non-tranistion elements 4) vacant orbitals

39. The formula to calculate paramagnetic moment of a substance is
1) $\mu_S = \sqrt{4S(S+2)}$ B.M 2) $\mu_s = \sqrt{n(n+2)}$ B.M
3) $\mu_s = \sqrt{n(n+4)}$ B.M 4) $\mu_s = \sqrt{L(L+2)}$ B.M

40. The units of Magnetic moment are
1) Newton - ohm 2) Torrs 3) Bohr Magneton 4) Pascals

41. The value of B.M in SI units is
1) 9.273×10^{-23} J.T^{-1} 2) 9.273×10^{24} J.T^{-1}
3) 9.273×10^{-24} J.T^{-1} 4) 9.273×10^{23} J.T^{-1}

42. Which atom would be attracted towards magnetic field
1) Zn 2) Mn 3) Mg 4) Cd

43. Magnetic moment of diamagnetic substance in Bohr magnetons is
1) 1.73 2) 2.83 3) 5.0 4) 0

44. Which of the following set of elements are Ferromagnetic in nature
1) Zn, Cd and Hg 2) Cu, Ag and Au 3) Fe, Co and Ni 4) Sc, Ti and U

45. Substances which are repelled by the external magnetic field are called
1) diamagnetic 2) paramagnetic
3) ferromagnetic 4) antiferromagnetic

46. The following is paramagnetic
1) $CaCl_2$ 2) $CuCl_2$ 3) $ZnCl_2$ 4) NaCl

47. The following ion exhibits highest magnetic moment ?
1) Cu^{2+} 2) Ti^{3+} 3) Ni^{2+} 4) Mn^{2+}

48. The calculated magnetic moment of Cu^{2+} ion is
1) 1.73 B.M. 2) zero 3) 2.6 B.M. 4) 3.4 B.M.

49. Ferrous ion changes to 'X' ion, on reacting with acidified hydrogen peroxide. The number of
d-electrons present in 'X' and its magnetic moment are
1) 6 and 6.93 B.M. 2) 5 and 5.92 B.M. 3) 5 and 4.9 B.M. 4) 4 and 5.92 B.M.

50. A : The spin only magnetic moment of Sc^{+3} is 1.73BM
R : The spin only magnetic moment (in BM) of an ion is equal to $\sqrt{n(n+2)}$
1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false   4) (A) is false but (R) is true

51. A : Cu^{+} is diamagnetic

R : Ions with d^{10} configuration are diamagnetic

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false   4) (A) is false but (R) is true

52. Which of the following pair of transition metal ions, have the same calculated values of spin only magnetic moment ?

1) Ti^{+2} & V^{+2} 2) Fe^{+2} & Ci^{+2} 3) Cr^{+2} & Fe^{+2} 4) Co^{+2} & Ti^{+2}

53. Which one of the following has diamagnetism?

1) Co^{2+} 2) Cu^{2+} 3) Mn^{2+} 4) Sc^{3+}

54 Which of the following ions has the maximum magnetic moment

1) Mn^{+2} 2) Fe^{+2} 3) Ti^{+2} 4) Cr^{+3}

55. The spin only magnetic moment of Ni^{2+} in aquous solution would be

1) 1.73BM   2) 2.84BM   3) 4.9 BM   4) 0

56. Metals constitute brass are

1) Zn and Cu   2) Cu and Sn   3) Sn and Zn   4) Cu, Zn and Sn

57. Bronze is an alloy of

1) Cu + Sn   2) Cu + Zn   3) Pb + Sn + Zn   4) Pb + Zn

58. The metal not present in German silver is

1) Ag   2) Cu   3) Ni   4) Zn

59. Steels are generally prepared by----------- method

1) Compressed method 2) Oxidation   3) Quenching   4) Electrylytic deposition

60. Percentage of carbon in the steels is nearly

1) 3%   2) 2%   3) 0.2%   4) 10%

61. The alloy used to reduce nitrites to ammonia

1) Type metal   2) Devarda's metal   3) Wood's metal   4) Solder metal

62. Which among the following is an example of Ferrous alloy

1) Wood's metal   2) Type metal   3) Invar   4) Solder metal

63. Which of the following alloys does not contain copper

1) Devarda alloy   2) Aluminium bronze   3) German silver   4) Magnalium

64. Gunmetal is an alloy of

1) Cu and Fe   2) Cu, Sn and Zn   3) Ni, Fe and Cr   4) Al and Mg

65. Which of the following is ferrous alloy ?

1) German Silver   2) Gunmetal   3) Nichrome   4) Devarda's alloy

WORK SHEET - II

1. The following represents the electronic configuration of a transition element

1) $ns^2\ np^3$ 2) $ns^2\ np^6\ nd^3\ (n+1)s^2$

3) $ns^2\ np^6\ nd^{10}\ (n-1)s^2\ (n+1)p^4$ 4) $ns^2\ np^5$

2. Which of the following element has high density

1) Sc   2) Zn   3) Cu   4) Co

3. Which of the following statements concerning transition elements is not true?

1) They are all metals   2) They easily form complexes

3) Compounds containing their ions are coloured

4) They show multiple oxidation states always differing by two units.

4. The atomic number of element having pseudo inert gas configuration in it's atomic state is

1) 46 2) 45 3) 47 4) 48

5. The highly stable pair of ions are

1) Fe^{2+} and Fe^{3+} 2) Fe^{2+} and Mn^{3+} 3) Fe^{3+} and Mn^{2+} 4) Fe^{3+} and Fe^{4+}

6. Which ion has three unpaired d-electrons

1) Ti^{2+} 2) V^{3+} 3) Cr^{3+} 4) Mn^{2+}

7. A transition metal ion has configuration $[Ar]3d^4$ in its tripositive oxidation state. Its atomic number is

1) 25 2) 26 3) 32 4) 19

8. The number of 'd' electrons in Fe^{2+} is not equal to that of

1) s-electrons in Mg 2) p-electrons in Ne 3) p-electrons in Cl 4) d-electrons in Fe

9. The pair of ions which do not have same number of unpaired electrons is

1) Mn^{2+} and Fe^{3+} 2) Ti^{2+} and Ni^{2+} 3) Cu^{2+} and Ti^{3+} 4) Fe^{2+} and Ni^{2+}

10. (A) : Outermost electronic configuration of Pt is $5d^9 6s^1$

(R) : Pt in its ion attains pseudo inert gas configuration

The correct answer is

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false

4) (A) is false but (R) is true

11. (A) : Elements of second and third transition series have nearly same atomic radii

(R) : Lanthanide contraction is observed in the elements from atomic number 58 to 71.

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false

4) (A) is false but (R) is true

12. Identify the correct statements among the following

I) The transition elements have partially filled (n-1)d orbitals.

II) Cu is a better conductor of electricity than that of Ag.

III) Sc^{+3}, Zn^{+2} are diamagnetic whereas Ti^{+4} is paramagnetic.

IV) Transitional elements are less electro-positive than alkalimetals.

1) I, II only 2) I, II, III only 3) I, IV only 4) I, III only

13. Gold can exhibit the oxidation states

1) + I and + II 2) + II and + III 3) + I and + III 4) + II and + IV

14. The electronic configuration of a transition element is $[Ar]4s^2 3d^3$. The possible oxidation states are

1) +1, +2 and +3 2) +2 and +3 3) +2, +3, +4 and +5 4) +2 and +5

15. The highest oxidation state is exhibited by the transition metal with electronic configuration

1) $(n-1)d^5 ns^1$ 2) $(n-1)d^5 ns^2$ 3) $(n-1)d^8 ns^2$ 4) $(n-1)d^6 ns^2$

16. The transition element having highest oxidation state belongs to which group?

1) VIII 2) VII_B 3) V_B 4) IV_B

17. The formation of coloured ions by transition metals is due to
1) incompletely filled 'd' orbitals 2) completely filled 'd' orbitals
3) completely filled 's' and 'd' orbitals 4) formation of interstitial compounds

18. Element furnishing coloured ions in the aqueous medium is
1) Zn 2) Hg 3) Cu 4) Al

19. Hydrated Cu^{2+} ions absorb light of ...... colour and transmit light of .... colour
1) red and blue 2) green and purple 3) purple and red 4) blue and red

20. CrO_4^{2-} and MnO_4^- ions exhibit colour due to
1) presence of unpaired electrons in 'd' orbtials of Cr and Mn
2) charge transfer phenomenon 3) d-d electron transition
4) close packing crystal structure

21. The colour of $[Ti(H_2O)_6]^{3+}$ is due to
1) transfer of electron from Titanium to another atom of Titanium
2) presence of water molecules 3) d-d transition
4) intra molecular vibration

22. Transition metal which forms green compounds in its +3 oxidation state and orange red compounds in its +6 oxidation state is
1) Cobalt 2) Chromium 3) Iron 4) Nickel

23. Complementary colour of green light of wavelength 5000 A^o is
1) purple 2) blue 3) red 4) grey

24 Ti^{3+} is purple but Ti^{4+} is colourless. This is because
1) d^1 configuration of Ti^{3+} 2) d^o configuration of Ti^{3+}
3) d^3 configuration of Ti^{3+} 4) d^{10} configuration of Ti^{3+}

25. A transitional metal ion X^{+2} ion in its hydrated state has six 3d electrons. The colour of ion is expected as
1) Green 2) Pink 3) Blue 4) Yellow

26. (A) : Transition metals form colored ions
(R) : They have completely filled d-orbitals in the nth shell.
The correct answer is
1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false 4) (A) is false but (R) is true

27. The magnetic moment of Cr^{3+} is similar to that of
1) Fe^{2+} 2) Fe^{3+} 3) Co^{3+} 4) Co^{2+}

28. The magnetic moment of an ion in its +3 oxidation state is 3.85 BM. The number of unpaired d-electrons present in it are
1) 2 2) 3 3) 4 4) 5

29. The atomic number of an element is 26. The magnetic moment exhibited by its ion in its +2 oxidation state is
1) 5.92 BM 2) 2.84 BM 3) 3.87 BM 4) 4.9 BM

30. The ion with highest magnetic moment is
1) V^{3+} 2) Cr^{3+} 3) Fe^{3+} 4) Co^{3+}

31. The pair of ions which do not have diamagnetic nature
1) Cu^{1+} and Zn^{2+} 2) Sc^{3+} and Ti^{4+} 3) Ca^{2+} and Zn^{2+} 4) V^{2+} and Fe^{2+}

32. The magnetic moment of an ion is $\sqrt{24}$ B.M. Then that ion may be

1) Mn^{2+} 2) Fe^{2+} 3) Fe^{3+} 4) Cu^{2+}

33. The highest degree of paramagnetism is shown by

1) $CoCl_2 . H_2O$ 2) $MnSO_4 . 4H_2O$ 3) $FeCl_2 . 4H_2O$ 4) $NiCl_2 . 6H_2O$

34. M^{3+} ion of the first transition series metal 'M' has a magnetic moment 1.73 BM. The atomic number of the metal 'M' is

1) 21 2) 24 3) 29 4) 22

35. M^{x+} ion has magnetic moment 2.84 BM. Then 'x' is (Z of M = 23)

1) 3 2) 2 3) 4 4) 1

36. The value of paramagnetic moment of Ti^{+3} ion in Joule/Tesla is

1) 273×10^{-24} 2) 16.042×10^{-24} 3) 26.34×10^{-24} 4) 16.042×10^{-27}

37. What is the correct order of spin only magnetic moment (in BM) of Mn^{+2}, Cr^{+2} and V^{+2}?

1) $Mn^{+2} > V^{+2} > Cr^{+2}$ 2) $V^{+2} > Cr^{+2} > Mn^{+2}$ 3) $Mn^{+2} > Cr^{+2} > V^{+2}$ 4) $Cr^{+2} > V^{+2} > Mn^{+2}$

38. (A): Magnetic moment of Mn^{+2} is 5.8 B.M

(R): Mn^{+2} has five unpaired electrons

The correct answer is

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false

4)(A) is false but (R) is true

39. Spin only magnatic moment can be calculated by using $\mu = \sqrt{n(n+2)}$ where 'n' represents

1) Principal Quantum No. 2) Magnetic Quantum No.

3) Number of unpaired electrons 4) Spin Quantum No.

40. In which of the following 'd' subshells are degenerate

1) $Cu^{2+}_{(aq)}$ 2) $Fe^{2+}_{(aq)}$ 3) $Fe^{3+}_{(aq)}$ 4) $Cu^{1+}_{(aq)}$

41. Transition elements form alloys easily because they have

1) same number of shells 2) same electronic configuration

3) nearly same atomic size 4) same atomic weight

42. The common metal present in German Silver, Bell metal and Brass is

1) Fe 2) Cu 3) Zn 4) Sn

43. The correct statement among the following is

1) The colour of $Cr_2O_7^{2-}$ ion is due to d-d transition of unpaired electrons

2) Transition elements form a large number of alloys, because of similar boiling points

3) Bronze is an alloy of Copper and Zinc

4) Salt of Fe^{2+} ion has greenish colour

44. Alloy formation ability of transition elements is due to

1) same crystalline structures 2) same atomic radii

3) similar chemical properties 4) any one of these properties

45. The alloy containing highest percentage composition of copper is

1) German silver 2) Aluminium Bronze 3) Bell metal 4) Brass

46. Which of the following is used for sharply defined castings

1) Soldermetal 2) Wood's metal 3) Type metal 4) Devarda's alloy

47. Identify the correct statements among the following

I) Both Cr and Cu show +1 oxidation state

II) The complementary colour of absorbed green colour of visible radiation is purple.

III) Ni^{+2} ion in its hydrated state exhibits green colour

IV) Devarda's alloy contains least percentage of 'Zn

1) All 2) I, II, III only 3) I, IV only 4) I, III only

48. The percentage of copper, tin and zinc metales present in 'Gun metal' respectively are

1) 88, 2, 10 2) 88, 10, 2 3) 80, 20, Zero 4) 80, Zero, 20

EXERCISE- I / ANSWERS

WORK SHEET -I

1) 3	2) 1	3) 4	4) 1	5) 3	6) 3	7) 1	8) 4	9) 2	10) 4
11) 1	12) 2	13) 1	14) 3	15) 3	16) 1	17) 1	18) 2	19) 2	20) 1
21) 2	22) 1	23) 2	24) 3	25) 1	26) 3	27) 2	28) 2	29) 1	30) 2
31) 2	32) 1	33) 4	34) 2	35) 3	36) 1	37) 4	38) 2	39) 2	40) 3
41) 3	42) 2	43) 4	44) 3	45) 1	46) 2	47) 4	48) 1	49) 2	50) 4
51) 1	52) 3	53) 4	54) 1	55) 2	56) 1	57) 1	58) 1	59) 3	60) 2
61) 2	62) 3	63) 4	64) 2	65) 3					

WORK SHEET - II

1) 2	2) 3	3) 4	4) 1	5) 3	6) 3	7) 1	8) 3	9) 4	10) 3
11) 1	12) 3	13) 3	14) 3	15) 4	16) 1	17) 1	18) 3	19) 1	20) 2
21) 3	22) 2	23) 1	24) 1	25) 1	26) 3	27) 4	28) 2	29) 4	30) 3
31) 4	32) 2	33) 2	34) 4	35) 1	36) 2	37) 3	38) 1	39) 3	40) 4
41) 3	42) 2	43) 4	44) 2	45) 2	46) 3	47) 1	48) 2		

EXERCISE - II

1. **Column- I(Property)** — **Column - II (Transition elements)**

Column- I(Property)	Column - II (Transition elements)
1) Highest oxidation state	p) Cr
2) Highest density	q) Os
3) Element with maximum unpaired electrons	r) Tc
4) 1st synthetic transition element	s) Ru

2.

Column- I	Column - II
1) Tc	p) Transition element
2) Hg	q) Not found in nature
3) Zn	r) Last element of third transition series
4) Es	s) Used in galvanization of iron

3.

Column- I	Column - II
1) Zn, Cd, Hg	p) Ferromagnetic metals
2) Fe, Co, Ni	q) Coin metal
3) Cu, Ag, Au	r) Noble metals
4) Au, Pt, Hg	s) Non transition metals

4.

Column- I (Compounds)	Column - II (Oxidation state of Cr)
1) $\left[Cr\left(H_2O\right)_6\right]C\ell_3$	p) 5
2) CrO_5	q) 4
3) K_3CrO_8	r) 6
4) $\left(NH_4\right)_2 CrO_4$	s) 3

5.

Column- I	Column - II
1) Ni^{2+}	p) Alloy
2) Ti	q) Diamagnetic character
3) Misch metal	r) $3d^2$
4) Hg	s) $\sqrt{8}$ B.M. (Magnetic moment)

6.

Column- I	Column - II
1) German silver	p) Cu
2) Gun metal	q) Zn
3) Brass	r) Ni
4) Solder	s) Sn

7. **Column- I (Alloys)** — **Column - II (Composition)**

Column- I (Alloys)	Column - II (Composition)
1) Fe, Cr, V	p) Chrome steel
2) Cu, Zn & Ni	q) German silver
3) Cu, Sn & Zn	r) Gun metal
4) Fe, Cr & Ni	s) Stainless steel

8.

Column- I	Column - II
1) K_2MnO_4	p) Transition element in +6 state
2) $KMnO_4$	q) Oxidising agent in acid medium
3) $K_2Cr_2O_7$.	r) manufactured from pyrolusite ore
4) K_2CrO_4	s) manufactured from chromite ore

9.

Column- I	Column - II
1) Ag^+ (Isoelectroni3) with, and	p) Diamagnetic
2) Zn^{2+}	q) Cd^{2+}
3) Element with lowest density	r) Sc
4) Cr	s) Paramagnetic

EXERCISE - II / ANSWERS

01) 1 - Q,S ; 2 - Q ; 3 - P ; 4 - R

02) 1 - P,Q ; 2 - P,R ; 3 - S ; 4 - Q

03) 1 - S; 2 - P ; 3 - Q ; 4 - R

04) 1 - S ; 2 - R ; 3 - P ; 4 -Q

05) 1 - S ; 2 - R ; 3 - P ; 4 - Q

06) 1 - P,Q,R ; 2 - P,Q,S ; 3 - P,Q ; 4 - S

07) 1 - P; 2 - Q ; 3 - R ; 4 - S

08) 1 - P,R ; 2 - Q,R ; 3 - P,Q,S ; 4 - P,S

09) 1 - P,Q ; 2 - P ,R; 3 - R ; 4 - S

EXERCISE - I

WORK SHEET - I

1. Ligand in a metal carbonyl complex is
   1) CO_2 2) CO 3) $CoCl_2$ 4) $C_2O_4^{2-}$
2. In complex compounds the metal atom acts as a
   1) Lewis acid 2) Lewis base 3) Bronsted acid 4) Bronsted base
3. A ligand should contain
   1) odd electrons 2) even number of electrons
   3) lone pair of electrons to donate 4) vacant orbital to accept the lone pair
4. The oxidation state of Iron in $[Fe(CN)_6]^{-3}$ ion
   1) + 1 2) + 2 3) + 3 4) zero
5. The primary valency of 'Fe' in the complex $K_4[Fe(CN)_6]$ is
   1) 2 2) 3 3) 6 4) 4
6. In which of the following compounds Iron has zero oxidation state
   1) $Fe(CO)_5$ 2) Fe_2O_3 3) FeO 4) Fe_3O_4
7. The hybridisation of metal ion in square planar complexes is
   1) dsp^2 2) sp^3d 3) d^3sp^3 4) sp^3
8. The charge on Cobalt in $[Co(CN)_6]^{3-}$ is
   1) -3 2) +3 3) -6 4) +6
9. The hybridisation of Iron in $K_4[Fe(CN)_6]$ is
   1) dsp^2 2) sp^3 3) d^2sp^3 4) d^2sp^2
10. A bidentate ligand is
    1) pyridine 2) thiocyanate 3) ethylene diammine 4) water
11. Which of the following is a polynuclear compound
    1) $[Co(NH_3)_4Cl_2]Cl$ 2) $NaFe[Fe(CN)_6]$
    3) $[Cr(H_2O)_5Cl]Cl_2$ 4) $[Co_2(NH_3)_6(OH)_3]Cl_3$
12. One mole of the complex compound $Co(NH_3)_5Cl_3$ gives 3 moles of ions on dissolution in water. One mole of the same complex reacts with two moles of $AgNO_3$ solution to yield two moles of AgCl(s). The structure of the complex is
    1) $[Co(NH_3)_5Cl]Cl_2$ 2) $[Co(NH_3)_3Cl_3].2NH_3$
    3) $[Co(NH_3)_4Cl_2].Cl.NH_3$ 4) $[Co(NH_3)_6]Cl_3$
13. The coordination number of a central metal atom in a complex is determined by
    1) The number of ligands around a metal ion bonded by sigma bonds
    2) the number of only anionic ligands bonded to the metal ion
    3) the number of ligands around a metal ion bonded by sigma and pi-bonds both
    4) the number of ligands around a metal ion bonded by pi-bonds
14. In the IUPAC version, the ligand OH^- is named as
    1) hydroxide 2) hydroxyl 3) hydroxo 4) ol
15. The formula of 'nitrosyl' group
    1) NO 2) NO^+ 3) NO^- 4) ONO
16. Name of 'oxalate' in IUPAC version changes to
    1) Oxalite 2) Oxalato 3) Oxalito 4) Oxalide

17. (A) : Structure of $[Co(NH_3)_6]^{+3}$ ion is octahedral
(R) : The coordination number of the metal ion is 6
1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false 4) (A) is false but (R) is true

18. 'Metal-Isothiocyanato' is indicated by its chemical symbol as
1) M–NCS 2) M–SCN 3) M–CNS 4) M–CSN

19. $[Pt\,Br\,Cl(NO_2)\,(NH_3)]I$ on ionisation gives the ion
1) Cl^- 2) Br^- 3) I^- 4) NO_2^-

20. A racemic mixture has a net rotation
1) to right of original plane 2) to left of original plane
3) to right or left of original plane 4) zero

21. Optical isomers differ in
1) chemical properties 2) molecular formulae
3) physical properties 4) optical properties

22. IUPAC Name Formulae of ligand

IUPAC Name	Formulae of ligand
i) Bromo	A) CO
ii) Carbonyl	B) $C_6H_5COO^-$
iii) Benzoato	C) H_2O
iv) Aquo	D) Br^-

The correct match is

	i	ii	iii	iv		i	ii	iii	iv
1)	D	A	B	C	2)	D	B	A	C
3)	D	A	C	B	4)	D	C	A	B

23. Fac and mer isomerism is associated with the general formula
1) MA_3X_3 2) $M(AA)_3$ 3) MABCD 4) $M(AA')_3$

24. Which of the following is an example of ambidentate ligand
1) CO 2) CN^- 3) H_2O 4) SO_4^{2-}

25.

LIST - I	**LIST - II**
A) Haber's process	1) Cu
B) Contact process	2) V_2O_5
C) Hydrogenation of oils	3) Pt
D) Ostwald's process	4) Fe
	5) Ni

The correct match is

	A	B	C	D		A	B	C	D
1)	4	3	5	1	2)	4	2	3	5
3)	4	2	5	3	4)	3	1	5	2

26. Coordination isomerism is exhibited by
1) $[Cr\,(H_2O)_6]\,Cl_3$ 2) $[Cr(NH_3)_6]\ [Co(CN)_6]$
3) $[Cr(en)_2]NO_2$ 4) $[Ni(NH_3)_6]\ [BF_4]_2$

27. Which is not amphoteric (CPMT)
1) Al^{+3} 2) Cr^{+3} 3) Fe^{+3} 4) Zn^{+2}

28. Which of the following has maximum number of unpaired d-electrons (BIT)
1) Zn 2) Fe^{+2} 3) Ni^{+3} 4) Cu^{+1}

29. Haemoglobin is made up of
1) 4 haeme units and one globular protein 2) 4 haeme units and four globular protein

3) 2 haeme units and one globular protein 4) 4 haeme units and two globular protein

30. Globular protein in haemoglobin is made up of
1) two polypeptide chains 2) four polypeptide chains
3) one polypeptide chain 4) eight polypeptide chains

31. Geometry of orbitals around the transition metal ion in haem of haemoglobin is
1) square planar arrangement 2) tetrahedral arrangement
3) plane trigonal arragement 4) octahedral arrangement

32. The number of moles of KI required to prepare one mole of $K_2[HgI_4]$ is
1) 4 2) 3 3) 2 4) 1

33. The protein part of the Haemoglobin and non protein part of Haemoglobin are coordinated through
1) N of the pyrrole 2) N-of the Histidine
3) N of 2,3-dimethyl Benzimidazole
4) N of the 5,6-dimethyl Benzimidazole

34. In metallurgy the metal used to displace silver from its cyano complex is
1) Zn 2) Au 3) F_2 4) Cl_2

35. Which of the following releases metal slowly which gives uniform coating in electroplating
1) Metal salts 2) Double salts 3) Complex salts 4) Alums

36. The metal present in chlorophyll is
1) Fe 2) Mg 3) Co 4) Zn

37. Number of dative bonds around Mg^{2+} ion in chlorophyll is
1) 2 2) 3 3) 4 4)6

38. Which element among the lanthanides has the smallest atomic radius
1) Cerium 2) Lutetium
3) Europium 4) Gadolinium

39. Which of the following elements belongs to actinide series
1) La 2) Gd 3) Lu 4) Th

40. The electronic configuration of gadolinium (At No. = 64) is
1) $\left[Xe\right]4f^8 5d^9 6s^2$ 2) $\left[Xe\right]4f^7 5d^1 6s^2$
3) $\left[Xe\right]4f^3 5d^5 6s^2$ 4) $\left[Xe\right]4f^6 5d^2 6s^2$

41. Across the lanthanide series, the basic strength of the lanthanide hydroxides
1) Increases 2) Decreases
3) First increases and then decreases 4) First decreases and then increases

42. Which of the following statement is not correct
1) $La(OH)_3$ is less basic than $Lu(OH)_3$
2) In lanthanide series, ionic radius of Ln^{3+} ions decreases
3) La is actually an element of transition series rather than lanthanide series
4) Atomic radii of Zr and Hf are same because of lanthanide contraction

43. The catalytic activity of the transition metals and their compounds is ascribed to
1) Their chemical reactivity 2) Their magnetic beaviour
3) Their unfilled d - orbitals
4) Their ability to adopt multiple valencies

44. Most common oxidation states shown by cerium are
1) +2, +4 2) +3, +4 3) +3, +5 4) +2, +3

45. Arrange $\mathbf{Ce^{3+}, La^{3+}, Pm^{3+}}$ **and** $\mathbf{Yb^{3+}}$ in increasing order of their ionic radii

1) $Yb^{3+} < Pm^{3+} < Ce^{3+} < La^{3+}$ 2) $Ce^{3+} < Yb^{3+} < Pm^{3+} < La^{3+}$

3) $Yb^{3+} < Pm^{3+} < La^{3+} < Ce^{3+}$ 4) $Pm^{3+} < La^{3+} < Ce^{3+} < Yb^{3+}$

46. The basic character of the transition metal monoxides follows the order

1) VO > CrO > TiO > FeO 2) CrO > VO > FeO > TiO

3) TiO > FeO > VO > CrO 4) TiO > VO > CrO > FeO

47. Cerium (Z = 58) is an important member of lanthanoids. Which of the following statement about cerium is incorrect

1) The common oxidation states of cerium is +3 and +4

2) The +3 oxidation state of cerium is more stable than the +4 oxidation state

3) The +4 oxidation state of cerium is not known in solutions

4)Cerium (iv) acts as an oxidising agent

48. Which of the following is a lanthanide ?

1) Ta 2) Rh 3) Th 4) Lu

49. Which of the following belongs to the actinide series of elements ?

1) Y 2) Ta 3) U 4) Lu

50. Which of the following is a lanthanide element?

1) Ac 2) Als 3) Nd 4) Pd

51. Cerium shows oxidation state of +4 because

1) It resembles alkali metals 2) It has very low I.E

3) It has tendency to attain noble gas configuration

4) It has tendency to attain f^0 configuration

52. Which of the two have almost similar size

1) $_{22}$Ti and $_{40}$Zr 2) $_{41}$Nb and $_{73}$Ta 3) $_{39}$Y and $_{57}$La 4) $_{20}$Ca and $_{31}$Ir

53. In aqueous solutions Eu^{2+} acts as

1) an oxidising agent 2) a reducing agent

3) can act either of these 4) can act as redox agent

54. The radius of La^{3+} (Z=57) is 1.06A^0. Which one of the following given values will be closest to the radius of Lu^{3+}

1) 1.60A° 2) 1.40A° 3) 1.06A° 4) 0.85A°

55. Cerium (Z=58) is an important member of the lanthanoids. Which of the following statements about cerium is incorrect?

1) The common oxidation states of cerium are +3 and +4

2) Cerium(IV) acts as an oxidizing agent

3) The +4 oxidation state of cerium is more stable in solutions

4) The +3 oxidation state of cerium is more stable than the +4 oxidation state

WORK SHEET - II

1. The primary valency of the central transition metal ion in a complex compound $[Cr(NH_3)_4Cl_2]Cl$

1) 3 2) 2 3) 1 4) 0

2. The number of ions given by $[Co(NH_3)_3Cl_3]$ in aqueous solution is

1) 1 2) 2 3) 3 4) zero

3. The primary and secondary valencies of the central metal ion in the complex $[Co(NH_3)_6]Cl_3$ respectively are

1) 6 and 3 2) 6 and 6 3) 3 and 3 4) 3 and 6

4. The complex compound which does not give precipitate with $AgNO_3$ solution is

1) $[Co(NH_3)_5Cl]Cl_2$ 2) $[Co(NH_3)_6]Cl_3$ 3) $[Co(NH_3)_4Cl_2]Cl$ 4) $[Co(NH_3)_3Cl_3]$

5. The configuration of an element 'X' is $4s^1 3d^{10}$. The wrong statement regarding the element 'X' is

1) it forms complexes 2) it exhibits variable valency

3) it forms paramagnetic ions only 4) It can form coloured salts

6. The oxidation state of Cr in $[Cr(NH_3)_4Cl_2]Cl$

1) +3 2) +2 3) +1 4) 0

7. When 1 mole of $[Co(NH_3)_3Cl_3]$ is added to excess of $AgNO_3$ solution the weight of AgCl precipitated is

1) 143.5g 2) 108 g 3) zero 4) 54 g

8. The primary valency of Iron in $K_4[Fe(CN)_6]$ is satisfied by

1) Six CN^- ions 2) Two CN^- ions 3) Four K^+ ions 4) Two K^+ ions

9. The secondary valency of Chromium in $[Cr(en)_3]Cl_3$ is

1) 6 2) 3 3) 2 4) 4

10. Which of the following is wrong with respect to $[Co(NH_3)_5Cl]Cl_2$

1) central metal ion is Co and the ligands are NH_3 and Cl^- ion

2) oxidation number of Co is +2 3) co-ordination number of Co is 6

4) the number of ions formed when 1 mole of the compound dissolves in water is 3 moles

11. The deep blue complex produced by adding excess of Ammonia to $CuSO_4$ solution is

1) $[Cu(NH_3)_2]^{2+}$ 2) $[Cu(NH_3)_4]^{2+}$ 3) $[Cu(NH_3)_6]^{2+}$ 4) Cu^{2+}

12. A complex in which central atom carries zero oxidation state is

1) $[Co(NH_3)_3Cl_3]$ 2) $PtCl_4.2NH_3$ 3) $Ni(CO)_4$ 4) $Na_2[(Ni(CN)_4)]$

13. $K_2SO_4.Al_2(SO_4)_3.24H_2O$ is

1) a complex salt 2) a double salt

3) a complex salt & double salt 4) a basic salt

14. Number of dative bonds in the complex $CoCl_3.5NH_3$ is

1) 5 2) 6 3) 3 4) 4

15. Coordination number and oxidation number respectively for the complex $[Co(NH_3)_4Cl_2]ClO_4$

1) 6, +3 2) +6, +2 3) 6, +1 4) 4, +3

16. The number of ions formed when cupra ammonium sulphate is dissolved in water

1) 1 2) 2 3) 4 4) zero

17. A complex of Co^{+3} having molecular formula $CoCl_3.XNH_3$ when dissolved in water three ions are produced. The number of Cl^- ions satisfying both primary and secondary valencies

is

1) 3 2) 1 3) 4 4) zero

18. **LIST - I** **LIST - II**

A) Ti^{+3} 1) Charge transfer phenomenon

B) MnO_4^- 2) Impurities

C) F_2 3) s-s transition

D) Gems 4) d-d transition

5) Excitation of electron

The correct match which is responsible for colour

	A	B	C	D		A	B	C	D
1)	4	1	2	5	2)	4	1	5	2
3)	4	5	1	2	4)	5	2	3	4

19. **LIST - I (complex)** **LIST - II (Charge on co-ord. sphere)**

A) $CoCl_3.6NH_3$ 1) +1

B) $CoCl_3.5NH_3$ 2) +2

C) $CoCl_3.4NH_3$ 3) +3

D) $CoCl_3.3NH_3$ 4) +4

5) 0

The correct match in terms of the charge on the complex

	A	B	C	D		A	B	C	D
1)	3	2	5	1	2)	3	1	2	5
3)	3	2	1	5	4)	4	3	2	1

20. **Prop. of transition element** **Reason**

1) Colour of ion A) unpaired e^- in (n-1)d orbital

2) Variable oxdn. states B) Same crystal structure

3) formation of alloys C) d-d- transition

4) paramagnetic D) high magnitude of + ve charge

E) slight energy difference between ns & (n–1)d shells

1) 1-C, 2-E, 3-A, 4-B 2) 1-C, 2-E, 3-B, 4-A 3) 1-C, 2-B, 3-E, 4-A 4) 1-B, 2-A, 3-E, 4-B

21. Give the correct increasing order of electrical conductivity of aqueous solutions of following complex entities

I) $\left[Pt(NH_3)_6\right]Cl_4$ II) $\left[Cr(NH_3)_6\right]Cl_3$ III) $\left[Co(NH_3)_4Cl_2\right]Cl$ IV) $K_2\left[PtCl_6\right]$

1) III < IV < II < I 2) IV < II < III < I 3) II < I < IV < III 4) I < II < IV < III

22. Co–ordination number of Cr is 6. A complex entity with $C_2O_4^{-2}$, en, superoxide as ligands is

$[Cr(C_2O_4)_x(en)_y(O_2)_z]^{+}$. The ratio of x : y : z is

1) 1 : 1: 2 2) 1 : 1 : 1 3) 1 : 2 : 2 4) 2 : 1 : 1

23. Pick up true statement about the complex compound with formula $[Co(NH_3)_3Cl_3]$

1) The EAN of cobalt is 39 2) The complex can exhibit fac and mer isomerism

3) The complex can show optical isomerism 4) The hybrid state of cobalt is dsp^3

24. In Aqueous solution meta aluminate ion exists as

1) Neutral complex 2) Cationic complex 3) Cationic double salt 4) Anionic complex

25. In the complex $MCl_3.5H_2O$, the Co-ordination number of the metal M is six and there is no molecule of hydration. Then the volume of 0.1M $AgNO_3$ solution needed to precipitate the free chloride ions in 200ml of 0.01M solution of the complex is

1) 80 ml 2) 40 ml 3) 20 ml 4) 120 ml

26. Ammonia forms the complex ion $[Cu(NH_3)_4]^{2+}$ with copper ions in alkaline solutions but not in acidic solutions, What is the reason for it?

1) In acidic solutions hydration protects copper ions

2) In acidic solutions protons coordinate with ammonia molecules forming NH_4^+ ions and NH_3 molecules are not available

3) In alkaline solutions insoluble $Cu(OH)_2$ is precipitated which is soluble in excess of any alkali

4) Copper hydroxide is an amphoteric substance.

27. Nickel combines with a uninegative monodentate ligand X to form a paramagnetic complex $[NiX_4]^{2-}$. The number of unpaired electron/s in the nickel and geometry of this complex ion are respectively 1) two, square planar 2) one, tetrahedral 3) two, tetrahedral 4) one, square planar

28. How many EDTA molecules are required to make an octahedral complex with a Ca^{+2} ion?

1) Two 2) Six 3) Three 4) one

29. Which of the following is neutral molecular complex

1) $CoCl_3.3NH_3$ 2) $Ni(CO)_4$ 3) $Pt.Cl_4.2NH_3$ 4) All

30. Neutral complex among the following

1) $CuSO_4.4NH_3$ 2) $[Co(NH_3)_6]Cl_3$ 3) $Ni(CO)_4$ 4) $[Pt(NH_3)_2]Cl_2$

31. Cationic complex is

1) Potassium ferrocyanide 2) Cryolite

3) Cuprammonium (II) sulphate 4) Sodium argentothiosulphate

32. The following complex representation violates IUPAC rule

1) $[Cu(NH_3)_4]SO_4$ 2) $K_4[Fe(CN)_6]$ 3) $[Co(NH_3)_3]Cl_3$ 4) $TiCl_3.6H_2O$

33. Effective atomic number of Cobalt in the complex ion $[Co(en)_2Cl_2]^+$ is

1) 27 2) 36 3) 33 4) 35

34. Effective atomic number of $[Co(NH_3)_6]Cl_3$ is

1) 24 2) 27 3) 35 4) 36

35. The number of CO ligands that can be attached to Fe(Z = 26) on the basis of EAN concept

1) 4 2) 5 3) 6 4) 10

36. Complex in which effective atomic number is not equal to atomic number of the noble gas

1) $[Ni(CN)_4]^{2-}$ 2) $[Fe(CN)_6]^{4-}$ 3) $[Ni(CO)_4]$ 4) $[Co(NH_3)_6]^{3+}$

37.

Complex	**EAN value**
A) $Fe(CO)_5$	i) 34
B) $Fe(CN)_6^{3-}$	ii) 35
C) $Fe(CN)_6^{4-}$	iii) 36
	iv) 37

The correct match is

1) A – iv, B–ii, C–iii 2) A – i, B–ii, C–iii 3) A–iii, B–ii, C–i 4) A–iii, B–ii, C–iii

38. Stable complex based on EAN rule

i) $K_4[Fe(CN)_6]$ ii) $[Co(NH_3)_5Cl]Cl_2$ iii) $[Ni(CO)_4]$ iv) $K_2[Ni(CN)_4]$

1) i only 2) i & ii only 3) i, ii & iii only 4) all

39. IUPAC name of $Ni(CO)_4$ is

1) tetra carbonyl Nickel(II) 2) tetra carbonyl Nickel (O)

3) tetra carbonyl Nickelate (II) 4) tetra carbonyl Nickelate (O)

40. Potassium hexa chloro platinate (IV) is

1) $Pt_2[K(Cl)_6]$ 2) $K[Pt(Cl)_6]$ 3) $K_2[Pt(Cl)_6]$ 4) $K_4[Pt(Cl)_6]$

41. IUPAC name of $K_3[Al(C_2O_4)_3]$

1) potassium alumino oxalte 2) potassium trioxalato aluminate (III)

3) potassium aluminium oxalate (III) 4) potassium trioxalato aluminate (VI)

42. IUPAC name of $Li[AlH_4]$ is

1) Lithium Aluminium hydride 2) Lithium Tetra hydrido aluminate[III]

3) Tetrahydride Aluminium Lithionate 4) Aluminium Lithium hydride

43. The neutral complex, diammine dibromo dichloro platinum(IV) is best represented as

1) $[Pt\ (NH_3)_2\ Br_2\ Cl_2]$ 2) $[Pt\ Cl_2\ Br_2\ (NH_3)_2]$ 3) $[Pt\ Br_2\ Cl_2\ (NH_3)_2]$ 4) $[Pt\ (NH_3)_2\ Cl_2\ Br_2]$

44. IUPAC name of $[Fe(CN)_6]^{4-}$ is

1) ferrocyanide 2) hexacyanoferrate (II)

3) ferricyanide 4) hexacyanoferrate (III)

45. When $AgNO_3$ solution is added in excess to 1lit. of $CoCl_3$ x NH_3solution, one mole of AgCl is formed. What is the value of 'x'?

1) 1 2) 2 3) 3 4) 4

46.

Complex	**Type**
A) $CoCl_3 . 3NH_3$	i) Anionic complex
B) Na_2ZnCl_4	ii) Cationic complex
C) $PtCl_4 . 5NH_3$	iii) Neutral complex

The correct match is

1) A – ii, B–iii, C–i 2) A–iii, B–i, C–ii 3) A–ii, B–i, C–iii 4) A–iii, B–ii, C–i

47. (A) : IUPAC name of $[Co(H_2O)_4Cl_2]Cl . 2H_2O$ is tetra aquadichloro cobalt (III) chloride.

(R) : Water of crystallisation is represented by Arabic numerical before its name

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false   4) (A) is false but (R) is true

48. (A) : IUPAC name of $[Pt\,Br_2(en)_2]Cl_2$ is dibromobis (1, 2-ethane diamine) platinum (IV) chloride.

(R) : (en) represents ethylenediamine and it is a ligand where prefix di- is already included in its designation.

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false   4) (A) is false but (R) is true

49. (A) : $[Co_2(OH)_3(NH_3)_6]Cl_3$ is an example of polynuclear complex compound.

(R) : Compound in which the number of central metal atoms is more than one is called polynuclear compound.

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false   4) (A) is false but (R) is true

50. The IUPAC name of the coordination compound $K_3[Fe(CN)_6]$

1) Potassium hexacyanoferrate(II)   2) potassium hexacyanoferrate (III)

3) potassium hexacyanoiron (II)   4) tropotassium hexacyano iron (II)

51. The IUPAC name of the complex $[Co(NO_2)(NH_3)_5]Cl_2$ is

1) pentaammine nitrito-N-cobalt(III) chloride 2) nitrito-N-pentaamminecobalt(III) chloride

3) nitrito-N-pentaamminecobalt(II) chloride

4) pentaamminenitrito-N-cobalt(II) chloride

52. Example showing ionisation isomerism

1) $[Co(NO_3)(NH_3)_5]SO_4$ & $[Co(SO_4)(NH_3)_5]NO_3$ 2) $[Co(NH_3)_4Cl_2]Cl$ & $[CO(NH_3)_5Cl]Cl_2$

3) $[Cr(H_2O)_5Cl]Cl_2.H_2O$ & $[Cr(H_2O)_4Cl_2]Cl.2H_2O$

4) $[Pt(NH_3)_4]\,[Pt\,Cl_4]$ & $[Pt(NH_3)_3Cl]_2[Pt\,Cl_4]$

53. When two ligands of the same type occupy opposite positions to each other in a coordination polyhydron, the isomer is called

1) trans–   2) cis–   3) fac–   4) mer–

54. Geometrical isomerism in square planar complexes is given by

1) Ma_4 type complex   2) Mabcd type complex

3) Ma_2b_2 type complex   4) Mb_4 type complex

55. Both geometrical and optical isomerism was shown by

1) $[Pt\,(NH_3)_2Cl_2]$ 2) $[Pt(NH_3)_4Cl_2]$ 3) $Pt\,[(en)_2Cl_2]$ 4) $[Pt\,(en)_3]$

56. (A):A cis-isomer has a net dipole moment zero.

(R) : A cis- isomers has two ligands of the same type occupying adjacent positions.

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false   4) (A) is false but (R) is true

57. Optical isomerism is exhibited by a complex with

1) coordination number 4, with a bidentate ligand

2) coordination number 4, with two bidentate ligands

3) coordination number 6, with a bidentate ligand

4) coordination number 6, with three tridentate ligands

58. Ligands with which linkage isomerism is possible

A) NO_2 B) CN^- C) SCN^-

1) A only 2) A & B 3) B & C 4) A,B & C

59. Optical isomers have

A) property of chirality B) almost identical chemical properties

C) almost identical physical properties D) similar rotation of plane polarised light

1) A,B,C are correct 2) B,C,D are correct 3) A,C,D are correct 4) A,B,D are correct

60. Identify the correct statements among the following

I) Cr in first series of d-block has highest oxidation state.

II) Colour of MnO_4^- is due to charge transfer phenomenon.

III) Zn can show variable oxidation state.

IV) Ferromagnetism disappears in the solution of Fe

1) All 2) I & II only 3) II & IV only 4) II & III only

61. What is wrong about the following pair of compounds? $[Cr(H_2O)_6]Cl_3$ and $[Cr(H_2O)_5Cl]Cl_2.H_2O$

1) They are hydration isomers 2) They have different colours

3) Their 0.1M aqueous solutions have same molar conductivity

4) They have different IUPAC name

62. Geometrical Isomerism is observed in

1) Tetrahedral complex 2) Square planar complex

3) Tined complexes 4) planar triangle complexes

63. Which of the following compound shows optical isomerism?

1) $[Cu(NH_3)_4]^{2+}$ 2) $[Zn(Cl)_4]^{2-}$ 3) $[Cr(C_2O_4)_3]^{2-}$ 4) $[Co(CN)_6]^{3-}$

64. Which of the following has least magnetic moment

1) Cu^{+2} 2) Ni^{+2} 3) Co^{+2} 4) Fe^{+2}

65. Which of the following compound is expected to be coloured

1) Ag_2SO_4 2) CuF_2 3) MgF_2 4) CuCl

66. Which of the following has the maximum number of unpaired electron

1) Mg^{+2} 2) Ti^{+3} 3) V^{+3} 4) Fe^{+2}

67. Which has the largest radii

1) Cr^{+3} 2) Mn^{+3} 3) Fe^{+3} 4) Co^{+3}

68. Which of the following elements is alloyed with copper to form brass

1) Pb 2) Bi 3) Zn 4) Sb

69. The oxidation state of Fe in brown ring complex $[Fe(H_2O)_5NO]SO_4$ is

1) +1 2) +2 3) +3 4) +4

70. IUPAC name of $K_3[Fe(CN)_6]$ is

1) potassium hexacyanoferrate (II) 2) Potassium hexacyanoferrate

3) hexacyanoferrate (III) 4) potassium ferricyanide

71. $K_4[Fe(CN)_6]$ is a

1) double salt
2) complex compound
3) neutral molecule
4) none of these

72. The oxidation number of Pt in the complex $[Pt(C_2H_4)Cl_3]^-$ is
1) +1 2) +2 3) +3 4) +4

73. The effective atomic number of Cr (at. no. 24) in $[Cr(NH_3)_6]Cl_3$ is
1) 35 2) 27 3) 33 4) 36

WORK SHEET - III

1. The pair in which both species have iron is :
1) nitrogenase, cytochromes
2) carboxypeptidase, haemoglobin
3) haemoglobin, nitrogenase
4) haemoglobin, cytochromes

2. The complex used as an anticancer agent is :
1) mer – $[Co(NH_3)_3Cl_3]$
2) Cis – $[PtCl_2(NH_3)_2]$
3) Cis – $K_2[PtCl_2Br_2]$
4) $Na_2[CoCl_4]$

3. Identify the complexes which are expected to be coloured.
1) $[Ti(NO_3)_4]$
2) $[Cu(NCCH_3)_4]^+ BF_4^-$
3) $[Cr(NH_3)_6]^{3+} 3Cl^-$
4) $K_3[VF_6]$

4. The complex, $[Co(NH_3)_4Cl_2]^+$ is known to exist in two different coloured forms. This is due to :
1) ionisation isomerism
2) optical isomerism
3) geometrical isomerism
4) linkage isomerism

5. Theoretically, the number of geometrical isomers expected for octhedral complex, [Mabcdef] is ;
1) 0 2) 15 3) 12 4) 30

6. The following complexes which can form same no.of geometrical isomers are
1) $[CoCl_2Br_2]^{2-}$ 2) $[Rh(en)_3]^{3+}$ 3) $[Cr(en)_2Br_2]^+$ 4) $[Pt(en)Cl_2]$

7. The ligands in anticancer drug 'cis – platin' are :
1) NH_3, Cl 2) NH_3, H_2O 3) Cl, H_2O 4) NO, Cl

8. In $Fe(CO)_5$, the Fe-C bond possesses :
1) π character only
2) σ character only
3) ionic character only
4) both π and σ characters

9. The coordination number and oxidation number of X in the following compound $[x(NH_3)_5(SO_4)]Cl$ will be :
1) 10 and 3 2) 2 and 6 3) 6 and 3 4) 6 and 4

10. The ligand called π-acid is :
1) Co 2) NH_3 3) $C_2O_4^{2-}$ 4) ethylene diamine

11. the donor sites of EDTA lgand are :
1) O atoms only
2) N atoms only
3) Two N atoms and four O atoms
4) Three N atoms of EDTA ion is :

12. which of the following is a chelate ?

1) Cis-platin - a drug used in the treatment of cancer

2) Haemglobin - a protein present in blood

3) chlorophyll - a green plant pigment which acts as a photosensitiser in the synthesis of carbohydrates

4) vitamin B_{12} - It is a cobalt (I) complex.

13. Which of the following statements are correct about stability of chelates ?
 1) As the number of rings in complex increases, stability of chelate also increases
 2) A chelate having five membered ring is more stable if it contains double bonds.
 3) A chelate having six membered ring is more stable if it does not contain double bonds.
 4) chelating ligands are atleast bidentate ligands.

14. According to valence bond theory, the following complexes will have same geometry.
 1) $[Ni(CN)_4]^{2-}$ 2) $[Fe(CN)_{64}]^{3-}$ 3) $[FeF_6]^{3-}$ 4) $[Cr(NH_3)_6]^{3+}$

15. the tetrahedral crystal field spliting is only_____of the octahedral splitting.
 1) 1/9 2) 2/9 3) 4/9 4) 5/9

16. Which of the following metal ions cannot form both high spin & low spin octahydral complexes ?
 1) Ti^{+3} 2) CO^{2+} 3) Fe^{+2} 4) Cu^{2+}

EXERCISE - I / ANSWER

WORK SHEET - I

1) 2	2) 1	3) 3	4) 3	5) 1	6) 1	7) 1	8) 2	9) 3	10) 3
11) 4	12) 1	13) 1	14) 3	15) 1	16) 2	17) 1	18) 1	19) 3	20) 4
21) 4	22) 1	23) 1	24) 2	25) 3	26) 2	27) 3	28) 2	29) 1	30) 2
31) 4	32) 1	33) 2	34) 1	35) 3	36) 2	37) 1	38) 2	39) 4	40) 2
41) 2	42) 1	43) 4	44) 2	45) 1	46) 4	47) 3	48) 4	49) 3	50) 3
51) 4	52) 2	53) 2	54) 4	55) 3					

WORK SHEET - II

1) 1	2) 4	3) 4	4) 4	5) 3	6) 1	7) 3	8) 2	9) 1	10) 2
11) 2	12) 3	13) 2	14) 2	15) 1	16) 2	17) 2	18) 2	19) 3	20) 2
21) 1	22) 1	23) 2	24) 4	25) 2	26) 2	27) 3	28) 4	29) 4	30) 3
31) 3	32) 4	33) 2	34) 4	35) 2	36) 1	37) 4	38) 3	39) 2	40) 3
41) 2	42) 2	43) 1	44) 2	45) 4	46) 2	47) 4	48) 1	49) 1	50) 2
51) 1	52) 1	53) 1	54) 3	55) 3	56) 4	57) 3	58) 4	59) 1	60) 3
61) 3	62) 2	63) 3	64) 1	65) 2	66) 4	67) 1	68) 3	69) 1	70) 2
71) 2	72) 2	73) 3							

WORK SHEET - III

1) 4 2) 2 3) 34 4) 3 5) 2 6) 124 7) 1 8) 4 9) 3 10) 1 11) 3
12) 234 13) 14 14) 234 15) 3 16) 14

EXERCISE-II

1. Match Column-I (Compounds) with Column - II (Oxidation states of Co) and select the correct answer using the codes given below the Columns :

Column- I	**Column - II**
1) $[Co(NCS)(NH_3)_5](SO_3)$	p) -1
2) $Na[Co(CO)_4]$	q) 0
3) $Na_4[Co(S_2O_3)_3]$	r) +3
4) $Co_2(CO)_8$	s) +2

2.

Column - I	**Column- II**
1) EDTA	p) diamagnetic
2) $Ni(CO)_4$	q) Bidentate
3) low spin complex	r) Hexa dentate
4) Glycine	s) $K_4[Fe(CN)_6]$

3. Match Column-I (Complex ions) withColumn - II (Number of unpaired electrons) and select the correct answer using the codes given below the Columns :

Column - I (Complex ions)	**Column - II (number of unpaired electrons)**
1) $[CrF_6]^{4-}$	p) One
2) $[MnF_6]^{4-}$	q) Two
3) $[Cr(CN)_6]^{4-}$	r) Five
4) $[Mn(CN)_6]^{4-}$	s) Four

4. Match Column - I (Complexes) with Column- II (Hybridization) of central atom and select the correct answer using the codes given below the Columns :

Column - I	**Column - II**
1) $Ni(CO)_4$	p) sp^3
2) $[Ni(CN)_4]^{2-}$	q) dsp^2
3) $[Fe(CN)_6]^{4-}$	r) sp^3d^2
4) $[MnF_6]^{4-}$	s) d^2sp^3

5. Match Column I with Column II and select the correct answer using the codes given below the Columns.

Column- I (Complex)	**Column- II (Geometry)**
1) $[Ni(CN)_4]^{2-}$	p) Tetrahedral
2) $[ZnCl_4]^{2-}$	q) Tetragonal
3) $[Co(en)_3]^{3+}$	r) Square planar
4) $[Cu(NO_2)_6]^{4-}$	s) Octahedral

6. **Column- I** **Column - II**

1) Octahedral — p) $[Cu(NH_3)_4]^{+2}$
2) Square plannar — q) $[As(NH_3)_2]^+$
3) Trigonal bi pyramidal — r) $[Fe(CO)_5]$
4) Linear — s) $[Cr(dien)_2]^{3+}$

7. Match Column-I (Co-ordination compounds) with Column -II (Type of isomerism) and select the correct answer using the codes given below the Columns :

Column- I	Column - II
1) $[Co(NH_3)_4Cl_2]$	p) Optical isomerism
2) Cis-$[Co(en)_3Cl_2]$	q) Ionization isomerism
3) $[Co(en)_2(NO_2)Cl]SCN$	r) Co-ordination isomerism
4) $[Co(NH_3)_6][Cr(CN)_6]$	s) Geometrical isomerism

8. Match the complexes in Column - I with their properties listed inColumn - II. Indicate your answer by darkening the appropriate bubbles of the 4 x 4 matrix given in the ORS.

Column- I	Column - II
1) $[Co(NH_3)_4(H_2O)_2]Cl_2$	p) Geometrical isomers
2) $[Pt(NH_3)_2Cl_2]$	q) Paramagnetic
3) $[Co(H_2O)_5Cl]Cl$	r) Diamagnetic
4) $[Ni(H_2O)_6]Cl_2$	s) Metal ion with +2 oxidation state

9.

Column- I	Column- II
1) $[Fe(CN)_6]^{4-}$	p) Paramagnetic
2) $[Fe(H_2O)_6]^{2+}$	q) Diamagnetic
3) $[Cu(NH_3)_6]^{2+}$	r) Inner orbital complex
4) $[Ni(CN)_6]^{4-}$	s) Outer orbital complex

10.

Column - I	Column- II
1) $[Ni(H_2O)_6]Cl_2$	p) d^2sp^3 hybridisation
2) $[Co(CN)_2(NH_3)_4]OC_2H_5$	q) Ionisation isomerism
3) $[IrCl_6]^{3-}$	r) μ = 2.83 bM
4) $[PtCl_2(NH_3)_4]Br_2$	s) $\Delta_0 < P$

EXERCISE - II / ANSWERS

01) 1 - R ; 2 - P ; 3 - S ; 4 - Q 02) 1 - R; 2 - P ; 3 - S ; 4 - Q

03) 1 - s; 2 - r ; 3 - q ; 4 - p 04) 1 - p ; 2 - q; 3 - s ; 4 - r

05) 1 - r ; 2 - p ; 3 - s ; 4 - q 06) 1 - s; 2 - p ; 3 - r ; 4 - q

07) 1 - s ; 2 - p ; 3 - q ; 4 - r 08) 1 - p,q,s ; 2 - p, r ; 3 - q,s ; 4 - q,s

09) 1 - q,R ; 2 - p,s ; 3 - p,s ; 4 - q,s 10) 1 - r,s ; 2 - p,q ; 3 - p ; 4 - p,q

EXERCISE - I

WORK SHEET - I

1. The general formula of alkyl halides is

   1) $C_nH_{2n}X$ 2) $C_nH_{2n+1}X$ 3) $C_nH_{2n}X_2$ 4) $C_nH_{2n-1}X$

2. The hybridisation of carbon atoms in C_2H_5Cl are

   1) sp^3 and sp^2 2) sp^3 and sp 3) sp^3 and sp^3 4) sp^2 and sp

3. Ethyl chloride is

   1) 1^0 alkyl halide 2) 2^0 alkyl halide 3) 3^0 alkyl halide 4) gem halide

4. The C - Cl bond in Ethyl chloride is formed by .... overlaping

   1) sp^3-s 2) sp^3-p 3) sp^3d-p 4) sp^2-p

5. IUPAC name of $(CH_3)_2CHCH_2CH_2$ Br is

   1) 1-Bromo - 3 -methyl butane 2) 1-Bromo - 3 -methyl propane

   3) 1-Bromo pentane 4) 3-Bromo pentane

6 IUPAC name of $H_3C - HC(Br)_2$ is

   1) Ethylidene bromide 2) Gem - dibromide

   3) 1,1 - dibromo ethane 4) Any of the above

7. n–Butyl chloride and iso butyl chloride are

   1) position isomers 2) Functional group isomers

   3) Chain isomers 4) Metamers

8. With increase in number of halogen atoms & atomic mass of halogen atoms density of the compounds

   1) Decrease 2) Increase 3) Remains same 4) Can't say

9. Among the following Density maximum for

   1) CH_3Cl 2) CH_2Cl_2 3) $CHCl_3$ 4) CCl_4

10. For the same alkyl (or) aryl group boiling point is more for ____

    1) RI 2) RBr 3) RCl 4) RF

11. The following cannot be used for the preparation of ethyl chloride from ethyl alcohol

    1) PCl_3 2) PCl_5 3) SO_2Cl_2 4) $SOCl_2$

12. The best reagent for the preparation of pure C_2H_5Cl from Ethanol is

    1) Lucas reagent 2) PCl_5

    3) Thionyl chloride in Pyridine 4) Red Phosphorous + Chlorine

13. $CH_2 = CH_2 + HCl \xrightarrow{X} CH_3 - CH_2Cl$, What is 'X' ?

    1) Al_2O_3 2) Anhy. $AlCl_3$ 3) NaCl 4) $MgCl_2$

14. $3C_2H_5OH + PCl_3 \rightarrow 3C_2H_5Cl + X$ where 'X' is

    1) H_3PO_2 2) H_3PO_4 3) H_3PO_3 4) $H_4P_2O_7$

15 $C_2H_5OH + SOCl_2 \xrightarrow{\text{Pyridine}} X + Y + Z$ in this reaction X, Y, & Z respectively are

    1) $C_2H_4Cl_2, SO_2, HCl$ 2) C_2H_5Cl, SO_2, HCl

    3) $C_2H_5Cl, SOCl, HCl$ 4) C_2H_4, SO_2, Cl_2

16. What is 'X' in the following reaction

$C_2H_5Cl + X \rightarrow C_2H_5OH + KCl$

1) $KHCO_3$ 2) Alcoholic KOH 3) Aqueous KOH 4) K_2CO_3

17. Metal present in Grignard reagent is

1) Na 2) Mg 3) Al 4) Zn

18. When Ethyl chloride is reacted with alcoholic KOH, ethylene is formed. This is an example of .... reaction

1) Addition 2) Substitution 3) Elimination 4) Rearrangement

19. Ethyl iodide when treated with dry silver oxide gives

1) Ethanol 2) Diethyl ether 3) Ethylene 4) Ethane

20. Alkyl halides are almost insoluble in water because

1) They are covalent compounds 2) They have low polarity

3) They do not form hydrogen bonds with water

4) They have tetrahedral geometry

21. The major product formed when alcoholic $AgNO_2$ reacts with ethyl chloride is

1) Ethyl Nitrite 2) Ethyl Nitrate 3) Nitroethane 4) Ethyl diNitrate

22. $C_2H_5Cl + KNO_2 \xrightarrow{\text{Solvent 'x'}} C_2H_5NO_2 + KCl$

solvent 'x' used in the reaction is

1) Dimethyl formamide 2) Dimethyl ester 3) Chloroform 4) Diethyl ether

23. Chloroethane reacts with "X" to form diethyl ether. What is X.

1) NaOH 2) H_2SO_4 3) C_2H_5ONa 4) $Na_2S_2O_3$

24. The reaction

$C_6H_6 + CH_3Cl \xrightarrow[\text{(anhydrous)}]{AlCl_3} + HCl + C_6H_5CH_3$ is

1) Friedel - Craft's alkylation 2) Addition reaction

3) Friedel - Craft's acylation 4) Friedel Craft's benzoylation

25. The solvent used in the preparation of Grignard's reagent is

1) dry ether 2) dry acetone 3) dry alcohol 4) dry chloroform

26. Ethyl chloride does not react with

1) Sodium in dry ether 2) $AgNO_3$ solution

3) Magnesium in dry ether 4) KCN

27. Ethyl chloride reacts with sodium metal in presence of dry ether and forms

1) Isobutane 2) n-butane 3) Neopentane 4) Tertiary butyl chloride

28. In the reaction sequence, $C_2H_5Cl + KCN \xrightarrow{C_2H_5OH} X \xrightarrow{H_3O^{\oplus}} Y + NH_3$ What is the molecular formula of 'Y' ?

1) $C_3H_6O_2$ 2) C_3H_5N 3) $C_2H_4O_2$ 4) C_2H_6O

29. Ethyl chloride is not used in

1) preparation of T.E.L. 2) local anaesthesia

3) general anaesthesia 4) Ethylating agent

HALOKANES & HALORENES

30. The IUPAC name of $CHCl_3$ is

1) Chloroform 2) Trichloromethane 3) Chloromethane 4) Dichloromethane

31. The hybridisation of carbon in $CHCl_3$ is

1) sp^3 2) sp^2 3) sp 4) sp^3d

32. The shape of chloroform molecule is

1) Tetrahedral 2) Pyramidal 3) Planar trigonal 4) Distorted tetrahedral

33. Pure chloroform is prepared from

1) CCl_4 2) CH_3CHO 3) $CCl_3CH(OH)_2$ 4) CH_3 - CO - CH_3

34. Chloral hydrate is dissolved in NaOH solution and distilled. What are the compounds obtained ? 1) CH_3Cl, NaCl 2) CH_3Cl, CH_3COONa 3) $CHCl_3, HCOONa, H_2O$ 4) C_2H_5Cl, CH_3COONa

35. Number of moles of nascent hydrogen atoms required in the reduction of one mole of $CHCl_3$ to CH_4 with Zn + H_2O are

1) 2 2) 4 3) 6 4) 3

36. In storing chloroform, the substance added

1) 1% ethyl alchohol 2) 50% ethyl alchohol 3) 1% acetaldehyde 4) 1% acetone

37. Which of the following poisonous gass is formed when chloroform is exposed to sunlight and moist air

1) Mustard gas 2) Phosgene 3) Chlorine 4) Carbon monoxide

38. The gas liberated when $CHCl_3$ reacts with Ag powder is

1) CH_4 2) C_2H_4 3) C_2H_2 4) HCl

39. Hydrolysis of tricholoromethane with aqueous KOH gives

1) methanol 2) chloral 3) acetylene 4) potassium formate

40.

List - 1	List - 2
1) CCl_4	1) CH_3CHCl_2
2) $CHCl_3$	2) Solvent
3) Gemdihalide	3) CH_2ClCH_2Cl
4) Vicinaldihalide	4) Anaesthetic
	5) Toluene

The correct match is

	A	B	C	D		A	B	C	D
1)	5	3	1	2	2)	1	4	3	2
3)	5	3	2	1	4)	2	4	1	3

41.

List - 1	List - 2
1) C_2H_5Cl	1) Williamson synthesis
2) C_2H_5MgBr	2) Wurtz reaction
3) $C_2H_5Cl + C_2H_5ONa$	3) Local Anaesthetic
4) Na + dry ether	4) Antiseptic
	5) Grignard reagnet

The correct match is

	A	B	C	D		A	B	C	D

1)	3	5	1	2	2)	5	3	1	2
3)	3	4	1	2	4)	3	5	1	4

42. Match the following

Reactants	**Products**
1) C_2H_5Cl, Moist Ag_2O	i) CH_3CH_2ONO
2) C_2H_5Cl, aqueous Ethanolic AgCN	ii) C_2H_4
3) C_2H_5Cl, aqueous Ethanolic $AgNO_2$	iii) C_2H_5OH
4) C_2H_5Cl, aqueous Ethanolic KOH	iv) CH_3CH_2NC
	v) C_2H_6

The Correct match is

	A	B	C	D		A	B	C	D
1)	v	iii	iv	i	2)	i	ii	iii	iv
3)	iii	iv	i	ii	4)	iv	i	ii	iv

43.

List - 1	**List - 2**
1) Chloroform, phenol & alkali	1) Carbylamine reaction
2) Ethyl alcohol, bleaching powder	2) Reimer - Tiemann reaction
3) Chloroform, aniline & alkali	3) Iodoform test
4) Acetone, iodine & caustic soda	4) Chloroform
	5) Williamson synthesis

The correct match is

	A	B	C	D		A	B	C	D
1)	2	4	3	1	2)	2	4	1	3
3)	4	3	1	2	4)	1	4	2	3

44.

List - 1	**List - 2**
1) Dehydrohalogenation	1) Na + C_2H_5OH
2) Dehalogenation	2) conc. H_2SO_4
3) Dehydration	3) aq. KOH
4) Hydrolysis	4) alc. KOH
	5) Ethanolic zinc.

The correct match is

	A	B	C	D		A	B	C	D
1)	2	5	1	3	2)	4	5	2	3
3)	1	5	2	3	4)	3	5	4	2

45. Amongst the following the most reactive alkyl halide is

1) C_2H_5F 2) C_2H_5Cl 3) C_2H_5Br 4) C_2H_5I

46. SN^1 reactions occur through the intermediate formation of

1) Carbocations 2) Carbanions 3) Free radicals 4) None of these

47. The reaction $(CH_3)_3C-Br \xrightarrow{H_2O} (CH_3)_3C-OH$ is -------- reaction.

1) elimination 2) substitution 3) free radical 4) displacement

48. An optically active halide when allowed to react with CN^- gives a racemic mixture. The halide is most likely to be

1) 1^o 2) 2^o 3) 3^o 4) 4^o

49. A dextrorotatory optically active alkyl halide undergoes hydrolysis by SN^2 mechanism. The resulting alcohol is

1) Dextrorotatory 2) Laveorotatory

3) Optically inactive due to racemisation 4) may be dextro (or) laevorotatory

50. Aryl halides are less reactive towards nucleophilic substitution reaction as compared to alkyl halides due to

1) The formation of less stable carbanion 2) Resonance stabilization of aryl halides

3) Longer – carbon halogen bond 4) Inductive effect

51. Chlorobenzene is ?

1) More reactive than ethyl bromide 2) More reactive than isopropyl chloride

3) As reactive as methyl chloride 4) Less reactive than benzyl chloride

52. The conditions that are necessary in the preparation of Aryl halides ?

1) Low temperature 2) Absence of sunlight

3) Presence of halogen carrier 4) all of the above

53. Aryl halides can be prepared by

1) Sand mayer's method 2) Friedel - craft reaction

3) Gattermann's reaction 4) 1 and 3

54. Flouro benzene can not be prepared by direct flourination since.

1) F_2 is highly reactive 2) F_2 is inert

3) Reaction with F_2 reversible 4) F_2 reacts slowly

55. In Gattermann reaction, a diazonium group is replaced by X using Y. X, Y are :

	X	Y
1)	$Cl^{\ominus}$	Cu/HCl
2)	$Cl^{\oplus}$	$CuCl_2$/HCl
3)	$Cl^{\ominus}$	$CuCl_2$/HCl
4)	Cl_2	Cu_2O/HCl

56. $C_6H_5NH_2 \xrightarrow[0-5^0C]{NaNO_2+HCl} A \xrightarrow{KI} B + C\uparrow$

Here B and C are

1) C_6H_5I, N_2 2) C_6H_5I, O_2 3) C_6H_6, I_2 4) $C_6H_5CH_2I, N_2$

57. Chlorobenzene on fusing with solid NaOH follwed by acidification gives

1) Benzene 2) Benzoic acid 3) Phenol 4) Benzene Chloride

WORK SHEET - II

1. Tertiary alkyl halide among the following is
1) 2 - chlorobutane　2) Secondary butyl chloride
3) Isobutyl chloride　4) 3 - chloro - 3 - methyl pentane

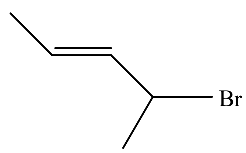
2. Number of possible isomers with the molecular formula C_4H_9Cl are
1) 3　2) 4　3) 5　4) 6

3. In chloro ethane, the Carbon bearing halogen is bonded to ------ hydrogen(s). It is called ---- alkyl halide (2002)
1) Two, primary　2) Three, primary　3) Two, secondary　4) One, Tertiary

4. Which of the following is a primary alkyl halide ?
1) Isobutyl bromide　2) Neo - Pentyl chloride
3) Isopentyl bromide　4) All are primary halides

5. Incorrect statement among the following
1) n-propylchloride and isopropyl chloride are position isomers
2) n-butyl chloride and iso butyl chloride are chain isomers
3) sec butyl chloride and ter-butyl chloride are chain isomers
4) isobutyl chloride and ter-butyl chloride are chain isomers

6. Among the following perhaloalkane is
1) SCl_4　2) $CHCl_3$　3) C_2Cl_6　4) $CF_3CHClBr$

7. 

IUPAC name is
1) 4 - bromo pent - 3- ene　2) 4 - bromo pent - 2- ene
3) 2 - bromo pent - 3- ene　4) 3 - bromo bute - 2- ene

8. The halogen atom is on the sp^3 hybridesed carbon which it self is attached to an aromatic ring, is called as -
1) Allylic halide　2) Benzyl hlaide　3) Perhalo alkane　4) Aryl halide

9. Which of the following has the highest boiling point ?
1) 1 - Chloropentane　2) isopentyl chloride
3) ter-pentyl chloride　4) All have equal boiling point

10. C - X bond is strongest in
1) CH_3Cl　2) CH_3Br　3) CH_3F　4) CH_3I

11. Which of the following alkyl halides has the maximum density ?
1) C_3H_7I　2) C_2H_5I　3) CH_3Br　4) CH_3I

12. $C_2H_5Cl + Na \xrightarrow[\text{-NaCl}]{\text{dry ether}} A$
A on monochlorination give how many isomers
1) 1　2) 2　3) 3　4) 4

13. $C_2H_5OH + HCl \xrightarrow[200°C]{ZnCl_2} C_2H_5Cl + H_2O$ in this reaction anhydrous $ZnCl_2$ acts as
1) dehydrating agent　2) dehydrogenating agent

3) dehalogenating agent
4) dehydrohalogenating agent

14. Hydrogen chloride and SO_2 are the by products in the reaction of ethanol with thionyl chloride. Which of the following is the main product in this reaction ?

1) $C_2H_5OC_2H_5$
2) C_2H_6
3) CH_3Cl
4) C_2H_5Cl

15. The hybridization state of carbon atoms in the product formed by the reaction of ethyl chloride with aqueous KOH is

1) Sp
2) Sp^2
3) Sp^3
4) Sp^3d

16. $C_2H_5C\ell \xrightarrow{\text{alc.KOH}} x \xrightarrow{C\ell_2/CC\ell_4} y$. About 'y' the correct statement is

1) It is an example of gem dihalide
2) It is an example of vic dihalide
3) Hybridisation of carbon in 'y' is SP^2
4) It is an unsaturated compound

17. Ethyl chloride on heating with Silver cyanide forms a compound 'X'. The functional isomer of 'X' is

1) C_2H_5NC
2) C_2H_5CN
3) $CH_3 - NH - CH_3$
4) $(CH_3)_3N$

18. For the preparation of ethyl propionate from ethyl bromide, the other reactant required is

1) Silver acetate
2) Propionic anhydride
3) Propanoyl chloride
4) Silver propionate

19. $C_2H_6 \xrightarrow{450°C} A \xrightarrow{+HCl/AlCl_3} B$

$$B \xrightarrow{\text{aqueous ethanolic KCN}} C$$

$$B \xrightarrow{\text{aqueous ethanolic AgCN}} D$$

Covalence of 'Carbon' in the functional group of C and D are

1) 3, 3
2) 4, 4
3) 4, 3
4) 3, 4

20. $C_2H_5Cl + KNO_2 \xrightarrow{\text{DMF}} A_{\text{(Major)}}$

The bond absent in 'A' is

1) C–N
2) C–O
3) C–H
4) C–C

21. $C_2H_5Cl_{\text{excess}} \xrightarrow{NH_3\text{alc.}} A_{\text{(final)}}$

Covalenc of 'N' in 'A' is

1) 4
2) 3
3) 2
4) 1

22. Which one of the following reaction is not possible

1) $C_2H_5Cl + KF \rightarrow C_2H_5F + KCl$
2) $C_2H_5Cl + NaBr \rightarrow C_2H_5Br + NaCl$
3) $C_2H_5Cl + KI \rightarrow C_2H_5I + KCl$
4) $C_2H_5Cl + KBr \rightarrow C_2H_5Br + KCl$

23. $C_6H_6 + C_2H_5Cl \xrightarrow{'X'} 'Y'$

Wrong statement among the following is

1) 'X' is Lewis acid
2) In 'Y' all carbons undergo Sp^2 hybridization
3) For 'Y' four aromatic isomers are possible
4) Its homologue is toluene

24. $CH_3COOAg + C_2H_5Cl \rightarrow A\text{(org.)}$

Wrong statement about 'A' is

1) A is an ester
2) IUPAC name of 'A' is ethylethanoate
3) Functional group isomers of 'A' is butyric acid

4) All carbons in 'A' are Sp^2 hybridised

25. $C_2H_5Cl + Mg \xrightarrow{\text{dryether}} X \xrightarrow{D_2O} Y$
Here 'Y' is
1) C_2H_6 2) $C_2H_4D_2$ 3) CH_3D 4) C_2H_5D

26. Ethyl chloride can be converted into Ethane by reacting with
1) Zn + HCl 2) $LiAlH_4$ 3) H_2/Ni 4) All the above

27. $C_2H_5Cl \xrightarrow{X} C_2H_6$ $BCl_3 + X \rightarrow B_2H_6$
IUPAC name of 'X' is
1) Lithiumaluminium hydride 2) Lithium tetrahydridoaluminium (III)
3) Lithium tetrahydridoaluminate (III) 4) Tetrahydridoaluminium (III) lithium

28. Butanenitrile is formed by reaction of KCN with
1) Propyl alcohol 2) Butyl chloride 3) Butyl alcohol 4) Propyl chloride

29. What are the reagent and reaction conditions used for converting ethyl chloride to ethyl nitrite
(as the major product)
1) KNO_2, C_2H_5OH, H_20, Δ 2) $NaNO_2$, HCl, O^0C
3) KCN, H_2O, Δ 4) $AgNO_2$, C_2H_5OH, H_20, Δ

30. Which of the following reagents when heated with ethyl chloride, form ethylene ?
1) Aqueous KOH 2) Zn/HCl 3) Alcoholic KOH 4) HI

31. $C_2H_5Cl \xrightarrow[Ag_2O]{\text{dry}} A \xrightarrow[360^0 c]{Al_2O_3} B \xrightarrow{S_2Cl_2} C$ In the above sequence of reactions, identify 'C'
1) Chloretone 2) Chloropicrin 3) Mustard gas 4) Lewisite gas

32. Chloroform is prepared on large scale by the reduction of CCl_4 with
1) Zn + HCl alc 2) Fe fillings and water
3) $LiAlH_4$ 4) HI + Red P

33. Chloroform can be prepared by the reaction of C_2H_5OH with bleaching powder. In the above method, the reaction taking place
1) Chlorination 2) Hydrolysis 3) Oxidation 4) All the above

34. The number of moles of bleaching powder required to get one mole of $CHCl_3$ from C_2H_5OH is
1) 1 2) 2 3) 3 4) 4

35. $CH_3-\overset{O}{\overset{\|}{C}}-CCl_3 \xrightarrow{Ca(OH)_2} CHCl_3 + X.$ What is 'X' ?
1) $(CH_3COO)_2Ca$ 2) $(HCOO)_2Ca$ 3) CH_3COOH 4) $CaCl_2$

36. $CCl_3-\overset{O}{\overset{\|}{C}}-H \xrightarrow{Ca(OH)_2} CHCl_3 + X.$ What is 'X' ?
1) $(CH_3COO)_2Ca$ 2) $(HCOO)_2Ca$ 3) CH_3COOH 4) $CaCl_2$

37. What is the product obtained when chlorine reacts with ethyl alcohol in KOH?
1) $CHCl_3$ 2) CCl_3CHO 3) CH_3Cl 4) none

HALOKANES & HALORENES

38. Among the following which is stable

1) $CH_3CH(OH)_2$ 2) $CCl_3CH(OH)_2$ 3) $CH_3C(OH)_2CH_3$ 4) $CH(OH)_3$

39. When 1% C_2H_5OH is added to chloroform, the phosgene present in chloroform is converted into.

1) $CH_3COOC_2H_5$ 2) $CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-CH_3$ 3) $(CH_3CH_2O)_2CO$ 4) CH_3COOH

40. $CHCl_3 + \frac{1}{2}O_2 \xrightarrow[-HCl]{h\vartheta} A \xrightarrow{C_2H_5OH} B$

Correct statement among the following is

1) In 'A' hybridization of 'carbon' is Sp^3

2) 'B' is harmfull

3) 'A' gives white precipitate with aq-$AgNO_3$

4) In the presence of 1% C_2H_5OH, formation of A is retarded

41. The number of moles of Ag metal to be reacted with $CHCl_3$ to get 1 mole of C_2H_2 is

1) 1 2) 2 3) 4 4) 6

42. $CHCl_3 + C_6H_5OH \xrightarrow{NaOH} x + NaCl + H_2O$ the principal functional group in the compound 'x' is

1) -OH 2) - CHO 3) -COOH 4) - Cl

43. $C_6H_5NH_2 + CHCl_3 + KOH_{(alc.)} \xrightarrow{\Delta} A_{(org)}$

Covalence of C and N in the functional group of 'A' is

1) 4, 3 2) 3, 4 3) 4, 4 4) 3, 3

44. Chloroform reacts with 'X' and forms a compound having offensive smell in the presence of base, 'X' is

1) 1^0 amine 2) 2^0 amine 3) 3^0 amine 4) 4^0 amine

45. Isocyanide test is used to identify

1) Aromatic secondary amines 2) Aromatic tertiary amines

3) Aromatic and aliphatic primary amines 4) Quaternary ammonium compound

46. Which of the following does not participate in the carbylamine reaction ?

1) aniline 2) chlorofor 3) ethanal 4) $KOH_{(alc)}$

47. Reagent used for detecting $CHCl_3$ is

1) aq. $AgNO_3$ 2) 1°-amine 3) 1°-amine + $KOH_{(alc.)}$ 4) 1% C_2H_5OH

48. Reagent used for testing the purity of $CHCl_3$ is

1) aq.$AgNO_3$ 2) 1°-amine 3) 1°-amine+KOH(aq) 4) 1% C_2H_5OH

49. Iodoform test is not answered by

1) CH_3CHO 2) 3-pentanone 3) CH_3COCH_3 4) $CH_3CHOHCH_2C_6H_5$

50. The following are some statements about ethyl chloride

i) it is used as refrigerant

ii) it is used to prepare diethyl ether

iii) it is used to prepare Tetra Ethyl Lead(TEL)

1) all are correct 2) only i and ii are correct

3) only ii is correct 4) only ii and iii are correct

1) Both (1) and (R) are true and (R) is the correct explanation of (A)

2) Both (1) and (R) are true and (R) is not the correct explanation of (A)

3) (1) is true but (R) is false
4) (1) is false but (R) is true

51. (1) : Ethyl chloride with aq.ethanolic AgCN gives ethyl cyanide as major product.
(R) : In ethyl cyanide ethyl carbon is linked to $\overline{CN}$ group.

52. (1) : Chloroform vapours burn with green flame.
(R) : chloroform is green coloured liquid.

53. (1) : Pure chloroform doesnot give precipitate with $AgNO_3$ solution.
(R) : $CHCl_3$ is covalent compound.

54. Which of the following is formed when the product of oxidation of chloroform is treated with ethyl alcohol ?
1) Ethyl chloride 2) Ethyl carbonate 3) Chloral hydrate 4) Chloral

55. In the chemical reaction, $CH_3CH_2NH_2 + CHCl_3 + 3KOH \rightarrow (A) + (B) + 3H_2O$
(1) & (2) are respectively
1) C_2H_5NC & 3KCl 2) C_2H_5CN & 3KCl
3) $CH_3CH_2CONH_2$ & 3KCl 4) C_2H_5NC & K_2CO_3

56. The characteristic reactions of alkyl halides are
1) electrophilic substitution reactions 2) electrophilic addition reactions
3) nucleophilic addition reactions 4) nucleophilic substitution reactions

57. Which of the following is an example of SN^2 rection ?
1) $CH_3Br + OH^- \longrightarrow CH_3OH + Br^-$
2) $CH_3-\underset{\displaystyle Br}{\underset{|}{CH}}-CH_3 + OH^- \longrightarrow CH_3-\underset{\displaystyle OH}{\underset{|}{CH}}-CH_3 + Br^-$
3) $CH_3CH_2OH \xrightarrow{H_2O} CH_2=CH_2$ 4) $(CH_3)_3C\text{-}Br + OH^- \longrightarrow (CH_3)_3COH + Br^-$

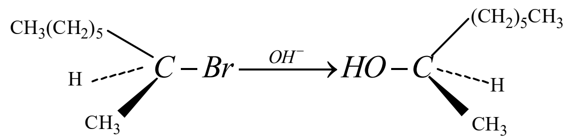
58. Most reactive halide towards S_{N^1} reaction is
1) n - Butyl chloride 2) sec - Butyl chloride 3) tert - Butyl chloride 4) Allyl Chloride

59. Which of the following alkyl halides is hydrolysed by SN^1 mechanism ?
1) CH_3–Br 2) CH_3CH_2–Br 3) $CH_3CH_2CH_2$–Br 4) $(CH_3)_3C$–Br

60. Which of the following alkyl halides is hydrolysed by SN^2 mechanism ?
1) $C_6H_5CH_2Br$ 2) CH_3Br 3) $CH_2 = CHCH_2Br$ 4) $(CH_3)_3CBr$

61. In S_N1 reactions rate of reaction depends on
a) concentration of alkyl halide b) concentration of nucleophile
c) Nature of alkyl halide
1) All 2) 'a' and 'c' only 3) 'a', 'b' only 4) 'c' only

62. The reaction described is



1) S_{E^2} 2) S_{N^1} 3) S_{N^2} 4) S_{N^0}

63. In SN[1] (substitution, nucleophilic uni molecular) reaction, the racemization takes place. It is due to

1) inversion of configuration
2) retention of configuration
3) conversion of configuration
4) both 1 and 2

64. The organic chloro compound, whcih shows complete stereo chemcial inversion during S_N2 reaction is

1) $(CH_3)_3CCl$ 2) $(CH_3)_2$ CHCl 3) CH_3Cl 4) $(C_2H_5)_2CHCl$

65. $C_6H_5N_2Cl \xrightarrow{CuCl/HCl} C_6H_5Cl + N_2$ is called

1) Etard reaction
2) Sandmeyer reaction
3) Wurtz-Fittig's reaction
4) Perkin's reaction

66. The reaction of an alkyl halide with RCOOAg produces

1) ester 2) ether 3) aldehyde 4) ketone

67. Which of the following statements are not correct?

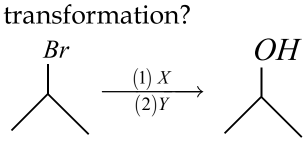
1) Chlorobenzene is more reactive than benzene towards electrophilic substitution reactions
2) C - Cl bond in chlorobenzene is less polar than in CH_3Cl
3) Chlorobenzene is less reactive than CH_3Cl towards nucleophilic substitution reactions
4) In chlorobenzene further substitution take place at ortho and para position

WORK SHEET - III

01. Which of the following statements is incorrect?

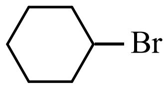
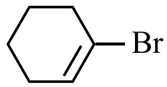
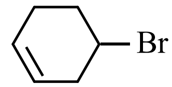
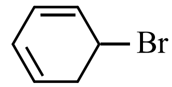
1) Alkyl halides are more reactive than aryl halides towards nucleophilic substitution reaction.
2) Alkyl halides are less reactive than aryl halides towards nucleophilic substitution reactions.
3) The presence of an electron-releasing substituent at ortho and/or para position decreases the reactivity of nucleophilic substitution of chlorine in the substituted chlorobenzene
4) The replacement of chlorine in chlorobenzene by strong bases proceeds via elimination-addition reaction

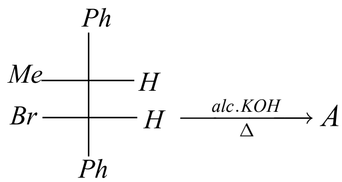
02. Which of the following reagents shown below would accomplish the following transformation?

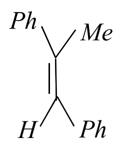
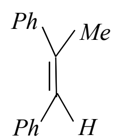
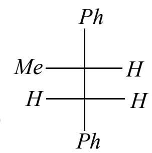
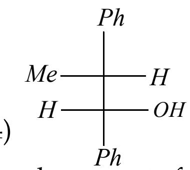


1) H_3O^+; $BH_3 - THF, H_2O_2 / NaOH$
2) $NaOH$; $BH_3 - THF, H_2O_2 / NaOH$
3) $HBr / ether$; $Hg(OAC)_2 / H_2O, NaBH_4$
4) $NaNH_2$ $Hg(OAC)_2 / H_2O, NaBH_4$

03. Which of the following undergoes dehydrobromination at a fastest rate ?

1)  2)  3)  4) 

04.  . 'A' can be

1)  2)  3)  4) 

05. A Compound 'X' have molecular formula $C_3H_6Br_2$ reacts with NaI and acetone to form a substance which turns starch solution blue. 'X' is

a) $CH_3CH(Br)CH_2Br$ 2) $CH_3CH_2CHBr_2$

3) $CH_3C(Br)_2CH_3$ 4) $BrCH_2CH_2CH_2Br$

06. An unknown alkylhalide (1) reacts with alcoholic KOH to produce C_4H_8 which on ozonolysis gives one mole of propanone and one mole of formaldehyde. The structure of 'A' is

1) $(CH_3)_3CBr$ 2) $CH_3CH(Br)CH(Br)CH_3$

3) $CH_3CH_2CH(Br)CH_3$ 4) $BrCH_2CH_2CH_2Br$

07. Consider the following compounds.

I. DDT II. Gammexane III. Carbon tetrachloride IV. Chlorobenzene

The correct sequence of these compounds in the increasing order of percentage of chlorine in them is

1) III, II, I, IV 2) IV, II, I, III 3) III, I, II, IV 4) IV, I, II, III

08. Which of the following will give yellow precipitate with I_2 / NaOH?

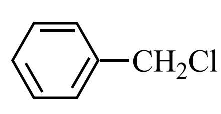
1) $CH_3COOCOCH_3$ 2) $CH_3COOCH_2CH_3$

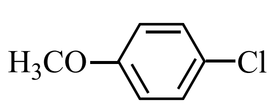
3) CH_3CONH_2 4) $CH_3CH(OH)CH_2CH_3$

09. Among the three possible isomers of dibromo benzenes, the highest melting point is possessed by

1) o-dibromobenzene 2) p-dibromobenzene 3) m-dibromobenzene 4) Both B & C

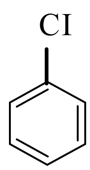
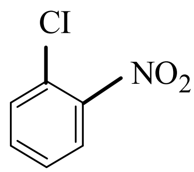
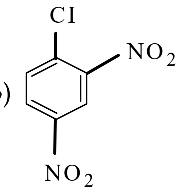
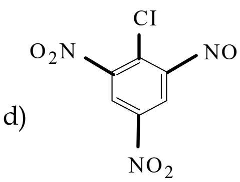
10. Which of the following compounds are more reactive towards NaOH.

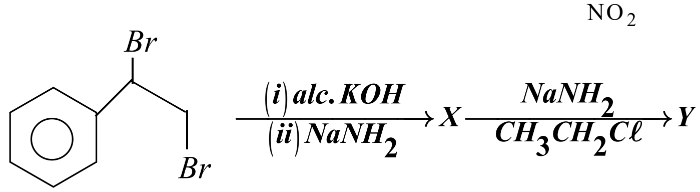
1) CH_3Cl 2) 

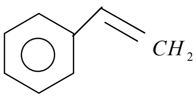
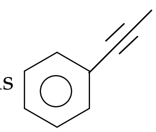
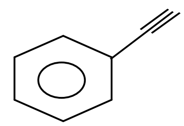
3)  4) $CH_3CH = CHC\ell$

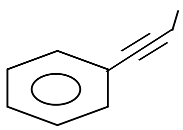
HALOKANES & HALORENES

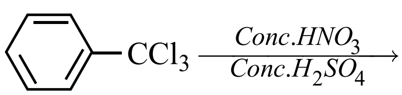
11. Which of the following compounds undergoes replacement of -CI by -OH by merely warming the compound with aqueous NaOH?

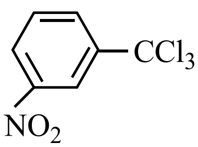
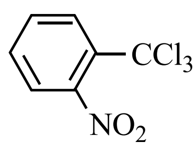
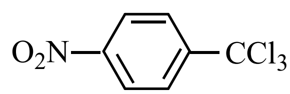
1)  2)  3)  d) 

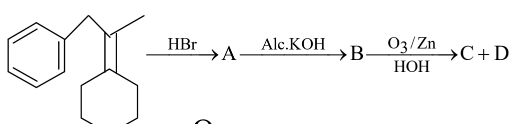
12.  . X and Y are

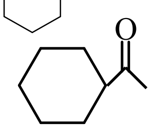
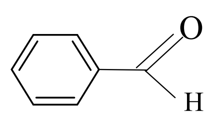
1) X is  2) Y is  3) X is 

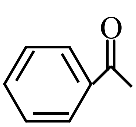
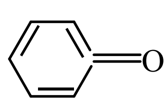
4) Y is 

13.  (X). X is

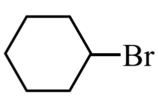
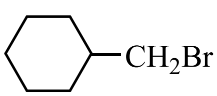
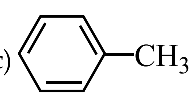
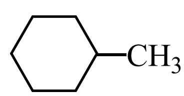
1)  2)  3)  4) Both b and c

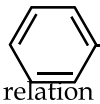
14.  . C & D are

1) C is  2) D is 

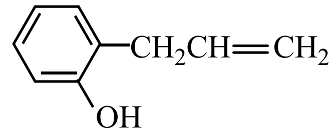
3) D is  4) C is 

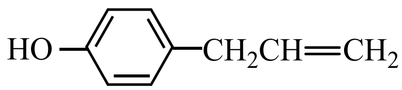
15. The product obtained by reduction of Benzyl bromide with $LiAlH_4$ is

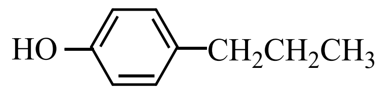
1)  2)  c)  4) 

16.  $-ONa + CH_2 = CHCH_2Cl \xrightarrow[200°C]{Heat} [X] \xrightarrow{\Delta} [Y] + [Z]$ then the correct relation is

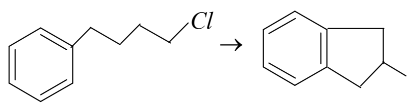
1) X is 

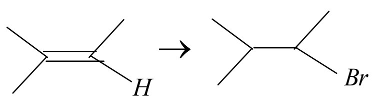
2) Y is 

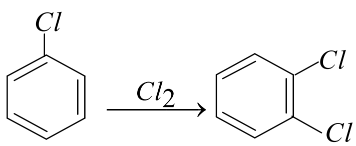
3) Z is 

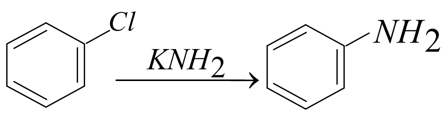
4) X is 

17. **Column - I** | **Column - II**

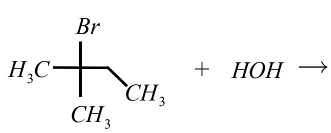
(1)  (P) Benzyne mechanism

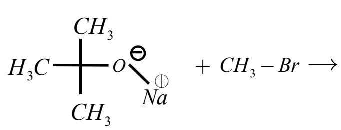
(2)  (Q) Carbocation reaction

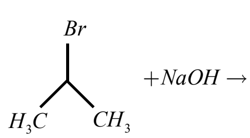
(3)  (R) Anhydrous $AlCl_3$

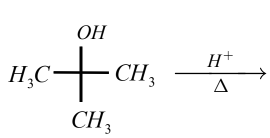
(4)  (S) Electrophilic aromatic substitution

18. **Column - I** | **Column - II**

1)  P) Ethers

2)  Q) 2^0 Alcohol

3)  R) 3^0 Alcohol

4)  S) Alkene

EXERCISE - I / ANSWERS

WORK SHEET - I

1) 2	2) 3	3) 1	4) 2	5) 1	6) 3	7) 3	8) 2	9) 4	10) 1
11) 3	12) 3	13) 2	14) 3	15) 2	16) 3	17) 2	18) 3	19) 2	20) 3
21) 1	22) 1	23) 3	24) 1	25) 1	26) 2	27) 2	28) 1	29) 3	30) 2
31) 1	32) 4	33) 3	34) 3	35) 3	36) 1	37) 2	38) 3	39) 4	40) 4
41) 1	42) 3	43) 2	44) 2	45) 4	46) 1	47) 2	48) 3	49) 4	50) 2
51) 4	52) 4	53) 4	54) 1	55) 1	56) 1	57) 4			

WORK SHEET - II

1) 4	2) 3	3) 1	4) 4	5) 4	6) 3	7) 2	8) 2	9) 1	10) 3
11) 1	12) 2	13) 1	14) 4	15) 3	16) 2	17) 2	18) 4	19) 3	20) 2
21) 1	22) 1	23) 2	24) 4	25) 4	26) 4	27) 3	28) 4	29) 4	30) 3
31) 3	32) 2	33) 4	34) 4	35) 1	36) 2	37) 1	38) 2	39) 3	40) 4
41) 4	42) 2	43) 2	44) 1	45) 3	46) 3	47) 3	48) 1	49) 2	50) 1
51) 4	52) 3	53) 1	54) 2	55) 1	56) 4	57) 1	58) 4	59) 4	60) 2
61) 2	62) 3	63) 4	64) 3	65) 2	66) 1	67) 1			

WORK SHEET - III

1) 2	2) 4	3) 4	4) 1	5) 1	6) 1	7) 4	8) 4	9) 2	10) 2

11) 34 12) 34 13) 1 14) 12 15) 3 16) 123 17) 1– QR; 2 – Q; 3 – RS; 4 - P

18) 1– R; 2 – P; 3 – Q; 4 - S

EXERCISE - I

WORK SHEET - I

1. The number of 1^0, 2^0 and 3^0 alcoholic groups in Mannitol or Sorbitol are
   1) 2, 4 and 0 2) 1, 4 and 0 3) 2, 2 and 0 4) 2, 1 and 1
2. The common name of 2-methyl-1-propanol
   1) 2-methyl-2-propanol 2) Sec.butyl alcohol
   3) Isobutyl alcohol 4) Tertiary butyl alcohol
3. An isomer of ethanol is
   1) Methanol 2) Dimethyl ether 3) Diethyl ether 4) Ethylene glycol
4. Which one of the following is a secondary alcohol ?
   1) 2 - Methyl - 1 - propanol 2) 2 - Methyl - 2 - propanol
   3) 2 - Butanol 4) 1 - Butanol
5. If the boiling point of ethanol (molecular weight = 46) is 78°C, what is the boiling point of diethyl ether (molecular weight = 74)
   1) 100°C 2) 78°C 3) 86°C 4) 34°C
6. Which of the following alcohols has the lowest solubility in water ?
   1) Methanol 2) Ethanol 3) 1-Propanol 4) 1-Butanol
7. The enzyme that is not associated in the preparation of C_2H_5OH from starch is
   1) maltase 2) diastase 3) invertase 4) zymase
8. Glucose is converted into ethyl alcohol by
   1) maltase 2) zymase 3) invertase 4) diastase
9. The percentage of C_2H_5OH in wash is
   1) 95% 2) 10% 3) 50% 4) 75%
10. Rectified spirit can be converted into Absolute alcohol by distilling with
    1) Na_2CO_3 2) Na 3) conc. H_2SO_4 4) CaO
11. The solution of starch formed by passing steam is called as
    1) malt 2) mash 3) wash 4) absolute alcohol
12. The enzyme produced by Malt is
    1) maltase 2) diastase 3) invertase 4) zymase
13. The enzyme Maltase converts maltose into
    1) Glucose and Fructose 2) Fructose only
    3) Glucose only 4) Glucose and C_2H_5OH
14. Rectified spirit is made unsuitable for drinking by adding
    1) CH_3OH 2) 1-propanol 3) Water 4) 2-propanol
15. (1) : Alcoholic fermentation involves conversion of sugar into ethanol by the action of yeast.
    (R) : Fermentation involves the liberation of CO_2 gas.
    The correct answer is
    1) Both (1) and (R) are true and (R) is the correct explanation of (A)
    2) Both (1) and (R) are true and (R) is not the correct explanation of (A)
    3) (1) is true but (R) is false 4) (1) is false but (R) is true

16. Which of the following alkenes when passed through conc. H_2SO_4 followed by hydrolysis with boiling water would give tert-butyl alcohol ?
1) Ethylene 2) Isobutylene 3) Propylene 4) 1-Butene.

17. When equal weights of methyl alcohol and ethyl alcohol react with excess of sodium metal the volume of H_2 liberated is more in the case of
1) C_2H_5OH 2) CH_3OH 3) Equal in both 4) H_2 do not liberated

18. The reaction of ethylmagnesium iodide with acetaldehyde gives after acidification
1) 2-Butanol 2) 1-Butanol 3) 2-Methyl-2-propanol 4) 2-Methylpropanol.

19. To prepare 2-propanol from methylmagnesium bromide,the other chemical required is
1) HCHO 2) CH_3CHO 3) C_2H_5OH 4) CH_3COCH_3

20. Slow decomposition of complex organic compounds into simpler ones by enzymes is known as
1) Condensation 2) Fermentation 3) Dehydration 4) Polymerization

21. In the conversion of starch to ethyl alcohol,the following enzymes are used
1) Invertase, Zymase, Emulsin 2) Maltase, Zymase, Emulsin
3) Diastase, Maltase, Zymase 4) Invertase, Diastase, Zymase.

22. Which one of the following gases is liberated when ethyl alcohol is heated with methyl magnesium iodide ?
1) Methane 2) Ethane 3) Carbondioxide 4) Propane

23. Identify A and B in the following reaction $C_2H_5Cl \xrightarrow{A} C_2H_5OH \xleftarrow{B} C_2H_5Cl$
1) A = aqueous KOH ' B = AgOH 2) A = alcoholic KOH / ; B = aqueous NaOH
3) A = aqueous NaOH ; B = $AgNO_2$ 4) A = $AgNO_2$; B = KNO_2

24. The reaction $2ROH+2\,Na \longrightarrow 2RONa+H_2$
Suggests that alcohols are
1)Acidic 2) Basic 3)Amphoteric 4)Neutral in character

25. 23 g of sodium will react with methanol to give
1) One mole of oxygen 2) 1/2 mole of hydrogen
3) One mole of hydrogen 4) 1/4 mole of oxygen.

26. Which of the following alcohols is the strongest acid ?
1) CH_3OH 2) CH_3CH_2OH 3) $(CH_3)_2CHCH_2OH$ 4) $(CH_3)_3COH$.

27. The correct order of decreasing basicity of the following species is : $H_2O, OH^-, CH_3OH, CH_3O^-$
1) $CH_3OH < H_2O < OH^- < CH_3O^-$ 2) $CH_3O^- > OH^- > CH_3OH > H_2O$
3) $H_2O < CH_3OH < CH_3O^- < OH^-$ 4) $OH^- > CH_3O^- > CH_3OH > H_2O$

28. Which of the following alcohols is expected to have the lowest pK_a value ?
1) Ethanol 2) 2-fluoro ethanol 3) 2,2,2-Trifluoroethanol 4) 2-Chloroethanol

29. When 2-butanol is heated with an excess of concentrated sulphuric acid, the main product is
1) 1-Butene 2) 2-Butene 3) 2-Methyl propene 4) 2-Methyl-2-butene.

30. The structural formula of alcohol that on dehydration would give 2-methylpropene as the

major product is

1) $CH_3CH_2CH_2CH_2OH$ 2) $(CH_3)_2CH–CH_2OH$
3) $CH_3–CHOH–CH_2CH_3$ 4) $CH_3CHOHCH_3$

31. $CH_3COOH + C_2H_5OH \xrightarrow[heat]{conc.H_2SO_4} CH_3COOC_2H_5 + H_2O.$

The above reaction is known as

1) Hydrolysis 2) Esterification 3) Sopanification 4) Dehydration

32. C_2H_5OH can be converted in to C_2H_5Cl by reacting with

1) PCl_3 2) PCl_5 3) $SOCl_2$ + Pyridine 4) All the above

33. A mixture of anhydrous $ZnCl_2$+conc.HCl is known as

1) Fehling's reagent 2) Lucas reagent 3) Tollen's reagent 4) Benedict's reagent

34. When C_2H_5OH reacts with Conc. HNO_3 the product formed is

1) Nitroethane 2) Ethyl Nitrite 3) Ethyl Nitrate 4) Nitrosoethane

35. Action of bleaching powder on ethyl alcohol gives

1) Chloroform 2) Dichloro methane 3) Trichloro ethane 4) Ethylene chloride

36. Which is formed when ethanol reacts with acetic acid

1) $CH_3COOC_2H_5$ 2) $C_2H_5OC_2H_5$ 3) CH_3OCH_3 4) CH_3CH_2CHO

Assertion (1) & Reason (R) type Questions :

1) Both (1) and (R) are true and (R) is the correct explanation of (A)
2) Both (1) and (R) are true and (R) is not the correct explanation of (A)
3) (1) is true but (R) is false
4) (1) is false but (R) is true

37. Assertion : Ethanol is miscible in all proportions with water.
Reason : Hydrogen bonds are formed between water and alcohol molecules.

38. Assertion : $CaCl_2$ can't be used for drying ethyl alcohol
Reason : Ethyl alcohol forms addition compound with $CaCl_2$

39. Assertion : Ethyl alcohol is soluble in organic solvents
Reason : Ethyl alcohol is having non polar ethyl group.

40. Assertion : The boiling point of C_2H_5OH is less than that of H_2O, though the molecular weight of C_2H_5OH is more than that of water.
Reason : C_2H_5OH molecules are not highly associated through hydrogen bonding as in water.

41. Assertion : Addition of C_2H_5OH to CH_3MgI gives methane.
Reason : C_2H_5OH is more acidic than CH_4.

42. Assertion : Dehydration of alcohols can be carried out with Conc H_2SO_4 but not with conc. HCl
Reason : H_2SO_4 is dibasic while HCl is monobasic.

ALCOHOLS, PHENOLS AND ETHERS

43. Assertion : Alcohols on dehydration can produce ether as well as alkene under different conditions

Reason : Dehydration of alcohol takes place with conc.H_2SO_4 or Al_2O_3.

44. In the reaction, $\underset{\text{(Vapour)}}{C_2H_5OH} \xrightarrow[300^0 C]{Cu} \underline{X}$. The molecular formula of $\underline{X}$ is (EAMCET-ENG-2005)

1) C_4H_6O 2) $C_4H_{10}O$ 3) C_2H_4O 4) C_2H_6

45. $C_2H_5OH + SOCl_2 \xrightarrow{\text{pyridine}} X + Y + Z$ .In this reaction X, Y and Z respectively are

1) $C_2H_4Cl_2$, SO_2, HCl 2) C_2H_5Cl, SO_2, HCl 3) C_2H_4Cl, $SOCl_2$, HCl 4) C_2H_4, SO_2, Cl_2

46. The compound that reacts with CH_3MgBr to yield methane as one of the products is

1) CH_3CHO 2) CH_3COCH_3 3) CH_3COOCH_3 4) CH_3CH_2OH

47. The correct order of reactivity of hydrogen halides with ethyl alcohol is

1) HF > HCl > HBr > HI 2) HCl > HBr > HF > HI

3) HBr > HCl > HI > HF 4) HI > HBr > HCl > HF

48. What is the hybridisation state(s) of the atoms in X formed in the following reaction?

$$\underset{\text{(Vapours)}}{C_2H_5OH} \xrightarrow[260^0 C]{Al_2O_3} \underline{X}$$

1) sp^3 only 2) sp^2 and sp^3 3) sp^2 only 4) sp only

49. Phenol can be prepared from

1) Benzene diazonium chloride 2) Chlorobenzene

3) Sodium benzene sulfonate 4) All

50. Benzene diazonium chloride on boiling with dilute H_2SO_4 gives

1) Cresol 2) Xylene 3) Phenol 4) Toulene

51. Sodium salt of benzene sulphonic acid on fusion with caustic soda followed by acidification gives

1) Benzene 2) Phenol

3) Thiophenol 4) Benzenesulfonic acid

52. On heating with soda-lime, salicylic acid gives

1) Phenol 2) Benzoic acid 3) Sodium salicylate 4) Benzene.

53. The reaction, $C_6H_5ONa+CO_2+H_2O \rightarrow C_6H_5OH+NaHCO_3$ suggests that

1) Phenol is a stronger acid than carbonic acid

2) Carbonic acid a stronger acid than phenol

3) Water is a stronger acid than phenol

4) None of the above

54. Phenol can be prepared by the reaction between

1) Aniline and HNO_3at 373 K

2) C_6H_5MgBr and CO_2followed by hydrolysis

3) C_6H_5Cl and NaOH at 373 K

4) $C_6H_5SO_3Na$ and NaOH at 573–623K followed by acidification.

55. Phenol is prepared commercially from

1) Ethylbenzene 2) Isopropylbenzene 3) n- Propylbenzene 4) Toluene.

56. Phenol is commercially isolated from the following fraction of coal-tar distillation

1) Light oil 2) Middle oil 3) Cresotic oil 4) Antheracene oil

57. The acidic character of phenol is due to

1) Greater resonance stabilization of phenoxide ion over phenol

2) Greater resonance stabilization of phenol over phenoxide ion

3) Because of tautomerism occurring in phenol

4) Because oxygen is more electronegative than hydrogen

58. The correct order of relative acidic strength of phenol, ethyl alcohol and water is

1) Phenol > Water > Ethyl alcohol 2) Ethyl alcohol > Water > Phenol

3) Ethyl alcohol > Phenol > Water 4) Water > Phenol > Ethyl alcohol

59. Which of the following compounds will react with sodium hydroxide?

1) CH_3OH 2) CH_3CH_2OH 3) C_6H_5OH 4) $C_6H_5CH_2OH$

60. Which of the following compounds when dissolved in water, gives a solution with pH less than seven?

1) CH_3COCH_3 2) C_6H_5OH 3) $C_6H_5NH_2$ 4) C_2H_5OH

61. The general formula of ethers is

1) $C_nH_{2n}O$ 2) $C_nH_{2n+1}O$ 3) $C_nH_{2n+2}O$ 4) $C_nH_{2n}OC_nH_{2n}$

62. The IUPAC name of an unsymmetrical ether with the molecular formula $C_4H_{10}O$

1) Ethoxy propane 2) Methoxy ethane

3) Ethoxy ethane 4) Methoxy propane

63. Hybridisation of Oxygen in Diethylether is

1) SP 2) SP^2 3) SP^3 4) SP^3d

64. The reaction , $RX + R\text{-}ONa \rightarrow R\text{-}O\text{-}R + NaX$ is called

1) Wurtz reaction 2)Williamson's synthesis

3) Kolbe's reaction 4) Hofmann bromamide reaction

65. Williamson's synthesis in an example of :

1) Nucleophillic addition 2) Electrophillic addition

3) Electrophillic substitution 4) Nucleophillic substitution reaction

66. When vapours of ethyl alcohol are passed over Al_2O_3 at 523 K, it forms

1) 1,2-Ethanediol 2) Etene 3) Ethoxyethane 4) Ethanal.

67. Ethyl chloride reacts with sodium ethoxide to form a compound A. Which of the following reactions also yields A ?

1) $C_2H_5Cl, KOH(alc), \Delta$ 2) $2C_2H_5OH, conc.H_2SO_4, 140^0C$

3) C_2H_5Cl, Mg (dry ether) 4) C_2H_2, dil. H_2SO_4,$HgSO_4$

68. Consider the following reaction $C_2H_5I \xrightarrow[X]{\Delta}$ (Pleasant smelling liqluid), X is (

1) Sodium 2) Dry silver oxide 3) Ethyl chloride 4) Dry silver powder

69. The IUPAC name of $C_2H_5 - O - CH(CH_3)_2$

1) Ethoxy propane 2) 1,1-dimethyl ether

3) 2-Ethoxy isopropane 4) 2-Ethoxy propane

70. Which of the following is the strongest Lewis base ?
1) H_2O 2) CH_3OH 3) CH_3OCH_3 4) C_6H_5OH

71. Grignard reagents are prepared in
1) Benzene 2) Chloroform 3) Alcohols 4) Ethers

72. A mixture of Ether and .... gives temperatures as low as 163K
1) NaCl 2) Ice 3) Solid CO_2 4) C_2H_5OH

73. Sometimes explosion occurs while distilling ethers. It is due to the presence of
1) Oxides 2) Ketones 3) Aldehydes 4) Peroxides

74. When diethyl ether is heated with dil.H_2SO_4 under pressure , it forms
1) Propanoic acid 2) Acetic acid
3) Ethyl alcohol 4) Ethyl hydrogen sulphate.

75. An unknown compound dissolves in conc.Sulphuric acid, but does not declourise bromine water and does not react with sodium. Which of the following classes of molecules would behave in this manner ?
1) Alkene 2) Alcohol 3) Ether 4) Phenol

Assertion (1) and Reason (R) type Questions :

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2) Both (1) and (R) are true and (R) is not the correct explanation of (A)
3) (1) is true but (R) is false
4) (1) is false but (R) is true

76. (A):Diethyl ether when heated with dil.mineral acid gives C_2H_5OH.
(R):Diethyl ether undergoes dehydration when heated with mineral acid.

77. (A): Ethers behave as bases in the presence of mineral acids.
(R): Oxygen atom in ether is having lone pair electrons.

78. (1) : Ethers are relatively inert when compared to C_2H_5OH.
(R) :In ethyl alcohol both carbon and oxygen undergo SP^3 hybridisation.

79. In the reaction $C_2H_5OC_2H_5 + CO \xrightarrow[150^0 C]{BF_{3,}\ 500atms} X$
What is X?
1) Diethyl carbonate 2) Ethyl carbonate 3) Diethyl peroxide 4) Ethyl propionate

80. Halothane is
1) CF_3 CHCl Br 2) CCl_3 CHFCl 3) C_2H_5Cl 4) $CHCl_3$

81. $C_2H_5–O–C_2H_5 + HI \xrightarrow{\Delta} X+Y$, here X and Y are (hot)
1) C_2H_5I and C_2H_5OH 2) C_2H_5I and H_2O 3) $C_2H_5OH + H_2O$ 4) $C_2H_4 + H_2O$

82. The gas liberated by treating diethyl ether with PCl_5 is
1) C_2H_4 2) CH_4 3) C_2H_5Cl 4) C_2H_5COCl

83. $C_2H_5–O–C_2H_5 + PCl_5 \rightarrow C_2H_5Cl + X$, here 'X' is

1) PCl_3 2) H_3PO_3 3) PO_3Cl 4) $POCl_3$

84. Diethyl ether when treated with acetyl chloride in presence of $AlCl_3$, gives

1) C_2H_5Cl, CH_3COOCH_3 2) C_2H_5Cl, CH_3COOH

3) CH_3CHO, CH_3COCH_3 4) C_2H_5Cl, $CH_3COOC_2H_5$

WORK SHEET - II

1. Most favourable condition for alcohol fermentation of sugar is

1) High concentration of sugar solution, low temperature, plenty of air

2) Low concentration of sugar solution, high temperature, plenty of air

3) Low concentraion of sugar solution, low temperature, absence of air

4) None of the above

2. Consider the following sequence of reactions:

$$A \xrightarrow{C_2H_5MgI} X \xrightarrow{H^+/H_2O} \text{tert}-\text{amyl alcohol}$$

The compound A in the above sequence of reactions is:

1) 2- Butanone 2) Acetaldehyde 3) Acetone 4) Propanal

3. Which of the following alcohols cannot be prepared by the action of a suitable Grignard reagent on an aldehyde or a ketone followed by acid hydrolysis ?

1) Ethyl alcohol 2) n- Propyl alcohol 3) Isopropyl alcohol 4) Methyl alcohol

4. Wood spirit is the common name of

1) Methly alcohol 2) Ethyl alcohol 3) Amyl alcohol 4) Benzyl alcohol

5. Basic hydrolysis of ethyl acetate gives acetate ion and ....

1) Ethyl alcohol 2) Ethoxide ion 3) Acetaldehyde 4) Acetone

6. $$X \xrightarrow[AlCl_3]{HCl} Y \xrightarrow{KOH(aq)} C_2H_5OH.$$

In the above reaction 'X' is

1) C_2H_5Cl 2) C_2H_2 3) C_2H_4 4) C_2H_5Br

7. $$CH_2 = CH_2 + H_2SO_4 \xrightarrow{75-80°C} A \xrightarrow[warm]{H_2O} B$$

A and B in the above reaction are

1) C_2H_5OH ; $C_2H_5HSO_4$ 2) $(C_2H_5)_2SO_4$; C_2H_5OH

3) $C_2H_5HSO_4$; C_2H_5OH 4) C_2H_5OH ; $(C_2H_5)_2SO_4$

8. $A + CH_3MgI \longrightarrow$ Addition product $\xrightarrow{H-OH} \rightleftarrows CH_3CH_2OH$. What is 'A' ?

1) CH_3 - CHO 2) HCHO 3) CH_3-CH_2-CHO 4) CH_3-CO-CH_3

9. $$C_2H_5OH \xrightarrow{K_2Cr_2O_7/H_2SO_4} A \xrightarrow{K_2Cr_2O_7/H_2SO_4} B$$

A and B in the above reaction are

1) acetone and acetaldehyde 2) acetaldehyde and acetone

3) acetic acid and acetaldehyde 4) acetaldehyde and acetic acid

ALCOHOLS, PHENOLS AND ETHERS

10. Glycerol does not contain ...... alcoholic group

1) 1^0 2) 2^0 3) 3^0 4) 1^0 and 3^0

11. Which of the following is more volatile

1) CH_3-CH_2-CH_2OH 2) CH_2OH–CH_2–CH_2OH 3) Glycerol 4) CH_3OH

12. Which is a more volatile liquid

1) C_2H_5OH 2) CH_3COOH 3) $C_2H_5OC_2H_5$ 4) C_6H_6

13. $C_2H_5Cl + AgOH \rightarrow A + AgCl$

$A + CH_3COCl \rightarrow C + HCl$. Here "C" is

1) Ethyl acetate 2) Methyl acetate 3) Butanone 4) Propanone

14. In which of the following reactions, chlorine acts as an oxidizing agent ?

I : $CH_3CH_2OH + Cl_2 \rightarrow CH_3CHO + 2HCl$ II: $CH_3CHO + Cl_2 \rightarrow CCl_3CHO + HCl$

III: $CH_4 + Cl_2 \xrightarrow{h\upsilon} CH_3Cl + HCl$

The correct answer is :

1) only I 2) only II 3) I and II 4) I, II and III

15. $C_2H_5OH + HONO_2 \rightarrow A + H_2O$. "A" is

1) Ester 2) Ether 3) Alcohol 4) Alkane

16. Ethyl alcohol forms $CaCl_2$. XC_2H_5OH ; $MgCl_2$. YC_2H_5OH and $CuSO_4$. ZC_2H_5OH when C_2H_5OH reacts with respective anhydrous salts. Then

1) X = 3, Y = 3, Z = 6 2) X = 3, Y = 6, Z = 3 3) X = 3, Y = 7, Z = 4 4) X = 4, Y = 4, Z = 4

17. $CH_3CHO + 2[H] \xrightarrow{Ni : \Delta} B$. A dibasic acid is formed when "B" reacts with

1) $SOCl_2$ 2) HCl 3) PCl_3 4) PCl_5

18. $2C_2H_5OH \xrightarrow{X} B \xrightarrow{Y} C_2H_4 + H_2O$ then X and Y are respectively

1) $X = Al_2O_3$; 260^0C ; $Y = AlCl_3$ 2) X = Conc. H_2SO_4 ; 170°C ; Y = Conc. H_2SO_4 ; 140°C

3) X = Al_2O_3 ; 360^0C ; Y = Conc. H_2SO_4 ; 140^0C 4) X = Al_2O_3 ; 260^0C, ; Y = Al_2O_3, 360^0C

19. Haloform reaction is not given by

1) CH_3COCH_3 2) $CH_3COC_2H_5$ 3) $C_6H_5COC_2H_5$ 4) $CH_3CHOHCH_3$

20. What is the final product obtained when chlorine reacts with ethyl alcohol in KOH?

1) $CHCl_3$ 2) CCl_3CHO 3) CH_3Cl 4) none

21. Which of the following is a tertiary alcohol

1) CH_3-$CH(CH_3)$-CH_2OH 2) CH_3-CH_2-CH_2-CH_2-OH

3) CH_3-CH_2-$CH(CH_3)$-OH 4) CH_3-$C(CH_3)_2$-OH

22. 3 moles of ethanol reacts with one mole of phosphorous tribromide to form 3 moles of bromo ethane and one mole of X. Which of the following is "X"

1) H_3PO_4 2) H_3PO_2 3) HPO_3 4) H_3PO_3

23. What are X and Y respectively in the following reaction $X \xrightarrow{PBr_3} C_2H_5Br \xrightarrow{AgOH(Aq)} Y$

1) $CH_3.OH$; C_2H_6 2) C_2H_5OH ; C_2H_5Br
3) CH_3COOH ; $CH_3.CH_2OH$ 4) C_2H_5OH ; C_2H_5OH

24. In the following reaction X and Y respectively are

$$C_2H_5OH \xrightarrow{KMnO_4/H^{\oplus}} X \xrightarrow[H_2SO_4]{Y} CH_3COOC_2H_5$$

1) CH_3OH ; C_2H_5OH 2) CH_3CHO ; CH_3OH 3) $CH_2=CH_2$; CH_3COOH 4) CH_3COOH ; C_2H_5OH

25. Which of the following is most suitable method for removing the traces of water from ethanol
1) Heating with Na metal 2) Passing dry HCl through it
3) Distilling it with CaO 4) Reacting with Mg

26. Hydrolysis of an ester gives acid "A" and alcohol "B". "A" reduces fehling's solution and oxidation of B gives A. The ester is
1) Methyl formate 2) Ethyl formate 3) Methyl acetate 4) Ethyl acetate

27. $R–OH + HX \rightarrow R–X + H_2O$ in this reaction the reactivity of alcohols is
1) Tertiary > Secondary > Primary 2) Tertiary < Secondary < Primary
3) Tertiary > Priamry > Secondary 4) Secondary > Primary > Tertiary

28. Which statement is not correct about alcohol
1) Ethyl alcohol is heavier than water
2) Ethyl alcohol evaporates more quickly than water
3) Alcohol with less number of carbon atoms are more soluble in water
4) Alcohol produces H_2 by reaction with sodium metal

29. Which of the following compound gives ethylmethyl ketone on oxidation
1) Propan–2–ol 2) Butan–1–ol 3) Butan–2–ol 4) 2–Methyl butan–2–ol

30. In CH_3CH_2OH, the bond that undergoes heterolytic change most readily in reaction with 'Na' is
1) C--C 2) O--H 3) C--H 4) C--O

31. Match the following :

Set - I	Set - II
1) $C_2H_5OH \xrightarrow[170^0C]{Conc.H_2SO_4}$	1) Methane
2) $CHI_3 \xrightarrow[Ag(powedr)]{\Delta}$	2) Ethylene
3) $CH_3COONa_{(aq)} \xrightarrow{electrolysis}$	3) Benzene
4) $CH_3COONa \xrightarrow[CaO]{NaOH}$	4) Acetylene
	5) Ethane

1) A - 2 , B - 4, C - 5, D - 1 2) A - 2, B - 4, C - 5, D - 3

3) A - 4, B - 2, C - 5, D - 1 4) A - 4, B - 2, C - 5, D - 3

32. $CH_3CH_2OH \xrightarrow[\text{step}-1]{Cl_2} CH_3CHO \xrightarrow[\text{step}-2]{3Cl_2} Cl_3CCHO$

In the above reaction the role of Cl_2 in step - 1 & step - 2 respectively is :

1) Oxidation, chlorination 2) Reduction, Chlorination

3) Oxidation, addition 4) Reduction, substitution

33. $CaO\ Cl_2 + H_2O \rightarrow Ca(OH)_2 + \underline{X}$

$\underline{X} + CH_3CHO \rightarrow \underline{Y}$

$\underline{Y} + Ca(OH)_2 \rightarrow CHCl_3$

What is 'Y' ?

1) $CH_3CH(OH)_2$ 2) CH_2Cl_2 3) CCl_3CHO 4) CCl_3COCH_3

34. Match the following lists

List - I	**List - II**
1) Ethylene	1) Natalite
2) Acety lene	2) Preservative
3) Ethanol	3) Hawker's lamp
4) Diethyl ether	4) Drug
5) Polyethylene	

Answer is :

	A	B	C	D		A	B	C	D
1)	3	2	1	5	2)	5	1	2	3
3)	5	3	2	1	4)	5	1	4	2

35. What are X and Y in the reaction

$C_2H_4 + H_2SO_4 \xrightarrow{80^0 C} X \xrightarrow{H_2O/\Delta} Y$

1) C_2H_6, C_2H_5OH 2) C_2H_2, C_2H_5SH 3) $C_2H_5OSO_3H, C_2H_5OH$ 4) $C_2H_2CH_3CHO$

36. $(CH_3)_2CHOH \xrightarrow{\text{mild oxidation}} x \xrightarrow[H_2O]{(i)CH_3MgBr} y$

Here 'Y' is

1) Iso butyl alcohol 2) Iso butylene 3) Secbutyl alcohol 4) Terbutyl alcohol

37. Increasing pK_a values of o,m and p-cresols is

1) o < p < m 2) m < p = o 3) m < o < p 4) p < o < m

38. Which of the following compounds would not evolve CO_2 when treated with aq. $NaHCO_3$ solution?

1) Phenol 2) Benzoic acid 3) 2,4- Dinitrophenol 4) 2,4,6-Trinitrophenol

39. Phenol is converted into Salicylaldehyde by

1) Kolbe's reaction
2) Cannizaro reaction
3) Reimer – Tiemann reaction
4) Kolbe Schmidt reaction

40. Rate of electrophilic substitution reaction in phenol is
1) Equal to that to benzene
2) Faster than that of benzene
3) Slower than that of benzene
4) Very slower than that Nitrobenzene

41. m-Dihydroxybenzene is called as
1) Resorcinol 2) Catechol 3) Quinol 4) Cresol

42. 2 – Methyl phenol is
1) m – cresol 2) o – cresol 3) m – xylene 4) o – xylene

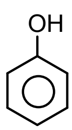
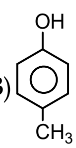
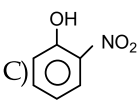
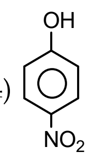
43. Identify the product Z in the following sequence of reactions

$$\text{phenol} \xrightarrow{\text{NaOH}} X \xrightarrow[\text{4–7 atm, 410 K}]{CO_2} Y \xrightarrow{H_3O^+} Z$$

1) Aspirin 2) Salicylaldehyde 3) Benzoic acid 4) Salicilic acid

44. Phenol on heating with aq. KOH and chloroform undergoes
1) Kolbe reaction
2) Rosenmund reaction
3) Reimer Tiemann reaction
4) Cannizzaro reaction

45. Which of the following has the least value of pKa ?

A) 
B) 
C) 
4) 

1) A 2) B 3) C 4) D

46. Electrophilic substitution in phenol takes place at
1) ortho and para-positions
2) meta-position
3) ortho-position
4) para-position

47. Regarding diethyl ether, the wrong statement is
1) It is slightly soluble in water
2) In cold condition, ether does not react with alkali and dilute acids
3) Ethers have active hydrogen
4) Ethers do not react with Na metal

48. (1) :Diethyl ether is used as general anaesthetia.
(R): Diethyl ether produces unconsciousness
The correct answer is

49. Alcohols can be distinguished from Ethers by
1) Sodium metal 2) Ester formation 3) Iodoform test 4) All the above

50. Which of the following can not form Oxonium salts with diethyl ether
1) HCl 2) HBr 3) H_2SO_4 4) HCN

51. '<u>A</u>' reacts with C_2H_5I giving '<u>B</u>' and NaI. Here '<u>A</u>' and '<u>B</u>' respectively are
1) CH_3COONa, CH_3OCH_3
2) $C_2H_5OC_2H_5, C_2H_5COOC_2H_5$
3) $C_2H_5ONa, C_2H_5OC_2H_5$
4) $C_2H_5OH, C_2H_5OC_2H_5$

ALCOHOLS, PHENOLS AND ETHERS

WORK SHEET - III

Following questions consists of an assertion (1) and reason (R). use the following the key to select the correct answer.

1) If both (1) and (R) are correct and (R) is correct explanation of (1)

2) If both (1) and (R) correct but (R) is not the correct explanation of (1)

3) If (1) is correct but (R) is incorrect   4) If (1) is incorrect but (R) is correct

Alcohols :

1.	Assertion	:	Alcoholic fermentation involves conversion of sugar into ethyl alcohol by yeast.
	Reason	:	Fermentation involves the slow decomposition of complex organic compounds into simpler substances through the agency of complex nitrogenous compounds called enzymes.
2.	Assertion	:	All ketones on reaction wtih Grignard reagent gives 3° alcohols
	Reason	:	$R^-$is nucleophile in Grignard reagent.
3.	Assertion	:	The solubility of the alcohols in water follow the order t-butyl-alcohol > s-butyl alcohol > n-butyl alcohol.
	Reason	:	Alcohols are soluble in water due to hydrogen bonding.
4.	Assertion	:	The solubility of alcohols increase with increase in branching.
	Reason	:	Ethanol and methanol are immsicible in water
5.	Assertion	:	The boiling point of alcohols is higher than those of hydrocarbons of comparable molecular masses.
	Reason	:	Alcohols show intramolecular hydrogen bonding.
6.	Assertion	:	Secondary alcohol reacts faster with sodium than primary alcohol.
	Reason	:	Primary alcohol is more acidic than secondary alcohol.
7.	Assertion	:	$CH_2= CH - OH$ is more acidic than $CH_3 - CH_2- OH$
	Reason	:	Enolate ion is stabilised by resonance
8.	Assertion	:	Methyl alcohol is most reactive for acetylation reaction.
	Reason	:	The O-H bond is the weakest in methyl alcohol.
9.	Assertion	:	Tertiary alcohol is most reactive for nucleophilic substitution reactions.
	Reason	:	The C-O bond is the weakest in tertiary alcohol.
10.	Assertion	:	Acid catalysed dehydration of t- butanol is slower than n-butanol.
	Reason	:	Dehydration involves formation of the protonated alcohol, ROH_2^+
11.	Assertion	:	Phenol decomposes $NaHCO_3$ solution to evolve CO_2 gas
	Reason	:	picric acid is 2,4,6-trinitrophenol.
12.	Assertion	:	The order of acidic strength is $CH_3COOH > H_2CO_3 >$ Phenol $> H_2O > C_2H_5OH$
	Reason	:	As acid strength increases, pK_a increases
13.	Assertion	:	Picric acid doesnot contain carboxylic group.

Reason : Presence of three - NO_2 groups makes the phenol more acidic.

14. Assertion : Phenol is more reactive than benzene towards electrophilic substitution reaction

Reason : OH group of phenol is elecron donating group due to resonance effect.

15. Assertion : Ortho nitrophenol and para nitrophenol can be separated by steam distillation

Reason : Intramolecular hydrogen bonding is present in ortho nitrophenol.

16. Assertion : Dichloro carbene is active intermediate in Reimer-Tiemann reaction.

Reason : Dichloro carbene is an electrophile because its octet is not complete

17. Assertion : Sodium phenoxide exists in water whereas sodium ethoxide exists in gaseous state.

Reason : Phenol is stonger acid than alcohol because phenoxide ion is stabilised by resonance.

18. Assertion : Reaction between sodium-tert butoxide and ethyl iodide does not produce an ether.

Reason : Sodium-tert butoxide is very strong base but it is not a nucleophile.

19. Assertion : Di-tert-butyl ether cannot be prepared by Williamson method.

Reason : t-Butyl bromide gives alkene with $R-O^-$.

20. Assertion : Ethers are stronger bases than alcohols.

Reason : Alcohols are soluble in water.

EXERCISE - I / ANSWER

WORK SHEET - I

01) 1	02) 3	03) 2	04) 3	05) 4	06) 4	07) 3	08) 2	09) 2	10) 4
11) 2	12) 2	13) 3	14) 1	15) 2	16) 2	17) 2	18) 1	19) 2	20) 2
21) 3	22) 1	23) 1	24) 1	25) 2	26) 1	27) 2	28) 3	29) 2	30) 2
31) 2	32) 4	33) 2	34) 3	35) 1	36) 1	37) 1	38) 1	39) 1	40) 1
41) 1	42) 2	43) 2	44) 3	45) 2	46) 4	47) 4	48) 1	49) 4	50) 3
51) 2	52) 1	53) 2	54) 4	55) 2	56) 2	57) 1	58) 1	59) 3	60) 2
61) 3	62) 4	63) 3	64) 2	65) 4	66) 3	67) 2	68) 2	69) 4	70) 3
71) 4	72) 3	73) 4	74) 3	75) 3	76) 3	77) 1	78) 2	79) 4	80) 1
81) 2	82) 3	83) 4	84) 4						

WORK SHEET - II

01) 3	02) 3	03) 4	04) 1	05) 1	06) 3	07) 3	08) 2	09) 4	10) 3
11) 4	12) 3	13) 1	14) 4	15) 1	16) 2	17) 3	18) 4	19) 3	20) 1
21) 4	22) 4	23) 4	24) 4	25) 3	26) 1	27) 1	28) 1	29) 3	30) 2

EXERCISE - I

WORK SHEET - I

Aldehydes and Ketones:

1. General molecular formula of carbonyl compounds
   1) $C_nH_{2n}O_2$ 2) $C_nH_{2n+2}O_2$ 3) $C_nH_{2n}O$ 4) $C_nH_{2n+2}O$

2. The hybridisation of carbon in the carbonyl group is
   1) sp^3 2) sp^2 3) sp 4) sp^3d

3. The IUPAC name of methyl isopropyl ketone
   1) 3-methyl-2-pentanone 2) 3-methyl butan-2-one
   3) 2-pentanone 4) 2-methyl pentanone

4. Controlled oxidation of primary alcohols give
   1) aldehydes 2) ketones 3) carboxylic acids 4) ethers

5. On the dry distillation of calcium acetate, a compound 'X' is formed, the functional isomer of 'X' is :
   1) Acetone 2) Acetaldehyde 3) Propionaldehyde 4) Butanone

6. Dehydrogenation of isopropyl alcohol gives
   1) Methanol 2) Methanal 3) Ethanal 4) Propanone

7. $C_2H_5OH \xrightarrow[300^0 C]{Cu} CH_3CHO$
   The above process is
   1) Reduction 2) Oxidation 3) Dehydrogenation 4) Both 2 and 3

8. Ketones cannot be prepared in one step from
   1) Alcohols 2) Alkenes 3) Alkynes 4) Acid halides

9. The first oxidation product of isopropyl alcohol is
   1) ethanal 2) propanone 3) ethanoic acid 4) methyl isopropyl ketone

10. Which carboxylic acid(s) gives acetaldehyde on strong heating in presence of catalyst
    1) Only formic acid 2) Only acetic acid
    3) Both formic acid and acetic acid 4) Calcium formate

11. Ketones can not be prepared by
    1) Rosenmund's reaction 2) The hydrolysis of terminal gem dihalides
    3) The oxidation of primary alcohols 4) All of these

12. Alkenes can be converted into aldehydes and ketones by an acidified aqueous solution of $PdCl_2$ and $CuCl_2$. This process is known as
    1) Wacker process 2) Pyrolysis
    3) Williamson's synthesis 4) Clemmenson's reduction

13. Ethylidene chloride when heated with aqueous KOH gives
    1) CH_3COOH 2) CH_3CHO 3) CH_3COCH_3 4) C_2H_5OH

14. What are X and Y in the following reaction sequence :
    $C_2H_5OH \xrightarrow{Cl_2} X \xrightarrow{Cl_2} Y$
    1) C_2H_5Cl, CH_3CHO 2) CH_3CHO, CH_3CO_2H 3) CH_3CHO, CCl_3CHO

4) C_2H_5Cl, CCl_3CHO

15. Which of the following on heating with aqueous KOH, produces acetaldehyde ?
1) CH_3CH_2Cl 2) CH_2ClCH_2Cl 3) $CH_3\ CHCl_2$ 4) CH_3COCl

16. Ozonolysis of the following gives only acetaldehyde
1) 2-butene 2) 1-Butene 3) Isobutylene 4) Ethylene

17. Aldehydes and ketones give addition reactions with
1) HCN 2) $NaHSO_3$ 3) CH_3MgX 4) All of these

18. The formation of cyanohydrin with acetone is an example for
1) nucleophilic addition 2) nucleophilic substitution
3) electrophilic addition 4) electrophilic substitution

19. Molecular formula of acetone semicarbazone

1) $\underset{\substack{| \\ H}}{CH_3} - C = N - OH$ 2) $CH_3 - \underset{\substack{| \\ H}}{C} = N - OH$

3) $CH_3 - \underset{\substack{| \\ H}}{C} = N - NH - CO - NH_2$ 4) $CH_3 - \underset{\substack{| \\ CH_3}}{C} = N - NH - C_6H_3(NO_2)_2$

20. Acetone adds up the following without the elimination of water molecule
1) $NH_2 - OH$ 2) 2, 4 - DNP 3) $H_2N - NH_2$ 4) HCN

21. Which of the following gives oximes with acetaldehyde?
1) H_2NNH_2 2) 2, 4 - DNP 3) H_2NOH 4) $H_2NNHCONH_2$

22. The following is more reactive towards nucleophilic addition reactions
1) CH_3COCH_3 2) HCHO 3) CH_3CHO 4) C_2H_5CHO

23. The following does not undergo aldol condensation in the presence of alkali
1) CH_3CHO 2) CH_3COCH_3 3) CH_3CH_2CHO 4) CCl_3CHO

24. Fehling's solution is
1) Alkaline $CuSO_4$ + Rochelle salt (Sod. pot. tartarate)
2) Alkaline $CuSO_4$ complexed with citrate ions
3) Ammonical $AgNO_3$ solution
4) Magenta solution in H_2SO_3

25. (A) : Acetaldehyde participate in aldol condensation reaction
(R) : Acetaldehyde contains α - hydrogen atom.
1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false
4) (A) is false but (R) is true

26. Aldehydes can be oxidised by
1) Benedicts solution 2) Tollen's reagent 3) Fehling's solution 4) All of these

27. An example of hydro carbon

1) Phorone 2) Mesitylene 3) Metaldehyde 4) Chloretone

28. Acetaldehyde and acetone cannot be distinguished by
1) Tollen's test 2) Benedicts test 3) Iodoform test 4) Schiff's test

29. IUPAC name of Isobutyraldehyde is
1) Butanal 2) Methyl propanal 3) Ethyl ethanal 4) Methyl Butanal

30. The medium in which Ehtanol is oxidised to ethanal using PCC or PDC is
1) any alcohol 2) Nitrobenzene 3) Methylene dichloride 4) Ether

31. PCC is
1) $C_6H_5N^+CrO_2Cl^-$ 2) $[C_5H_5N \rightarrow H]^+CrO_3Cl^-$
3) $C_6H_5NH^+Cl^-$ 4) $C_6H_5N^+CrO_3Cl^-$

32. Ethanol and Ethanal are isolated from their mixture using the reagent
1) HCN 2) $NaHSO_3$ 3) $C_6H_5NHNH_2$ 4) All

33. The reagents used in the wolf - kishner reduction are
1) Zn - Hg and conc HCl 2) Anhydrous $ZnCl_2$ and conc HCl
3) Hydrazine, Glycerol and alkali 4) Zn and CH_3COOH

34. $\text{Isopropyl alcohol} \xrightarrow{H^+/K_2Cr_2O_7} \text{final Product}$
1) Propene 2) Propanol 3) Ethanal 4) Ethanoic acid

35. Which one of the following reagents reacts with both acetaldehyde and acetone?
1) Fehling's solution 2) Grignard reagent 3) Schiff's reagent 4) Tollen's reagent

36. The interaction of acetone with methyl magnesium chloride in the presence of water gives
1) Isobutyl alcohol 2) Tertiary butyl alcohol 3) n-butyl alcohol
4) Sec-butyl alcohol

37. Acetone and Acetaldehyde can be distinguished using
1) Grignard reagent 2) $NaHSO_3$ 3) Ammonical $AgNO_3$ 4) PCl_5

38. Haloform reaction is not given by
1) CH_3COCH_3 2) $CH_3COC_2H_5$ 3) $C_6H_5COC_2H_5$ 4) $CH_3CHOHCH_3$

39. Which of the following does not respond to iodoform test
1) Ethanol 2) Methanol 3) Acetaldehyde 4) Acetone

40. Acetaldehyde and acetone can be identified by
1) Schiff's test 2) Tollen's reagent 3) Lucas test 4) 2, 4 - DNP

41. Acetone on reaction with chlorine gives normally
1) Monochloro acetone 2) Dichloroacetone 3) Trichloroacetone 4) Hexachloro acetone

42. Acetaldehyde cannot give
1) Iodoform test 2) Lucas test 3) Benedict test 4) Tollens test

43. C_2H_5CHO and CH_3COCH_3 can be distinguished from one another by testing with
1) phenyl hydrazine 2) 2, 4 dinitrophenyl hydrazine

3) Fehling solution   4) sodium bisulphite

44. An alkaline solution of .... and citrate ions is called ....
1) Silver nitrate ; Fehling's solution   2) Cupric sulphate ; Schiff's reagents
3) Silver chloride ; Tollen's reagent   4) Cupric sulphate ; Benedict's solution

45. Ethylene is converted to X on passing through a mixture of an acidified aqueous solution of palladium chloride and cupric chloride. Which of the follwoing reagents readily take part in addition reaction with X ?
1) Br_2 2) HBr   3) HCl   4) HCN

46. The product obtained when acetaldehyde is treated with dilute NaOH is
1) CH_3CH_2OH 2) CH_3COOH 3) $CH_3-\underset{\displaystyle OH}{\underset{|}{CH}}-CH_2CHO$ 4) CH_3-CH_3

47. When acetaldehyde is heated with Fehling solution, a red precipitate is formed. Which of the following is that ?
1) Cu_2O 2) Cu   3) CuO   4) $CuSO_4$

48. What reagent is used in the Rosenmund reduction ?
1) $H_2 \mid Pd - BaSO_4$ 2) $LiA\ell H_4$
3) NH_2NH_2 / KOH/Ethylene Glycol   4) $Zn - Hg \mid HCl$

49. An organic compound 'X' on treatment with pyridium dichromate in dichloromethane gives compound 'Y'. Compound 'Y' reacts with I_2 and alkali to form Tri iodomethane the compound 'X' is
1) C_2H_5OH 2) CH_3CHO 3) CH_3COCH_3 4) CH_3COOH

WORK SHEET - II

1. $CH_3CHO + NH_2OH \longrightarrow X \xrightarrow[-H_2O]{} Y$
The number of σ bonds, π bonds and lone pairs of electrons in the compound 'Y' are respectively
1) 9, 1 and 4   2) 11, 1, 5   3) 9, 2, 2   4) 8, 1, 3

2. 2 - pentanone and 3 - pentanone are predominantly
1) Positional isomers   2) Functional isomers   3) Metamers   4) Ring chain isomers

3. IUPAC name of α,α' di chloro diethyl ketone is
1) 2, 5 - dichloro - 3 - pentanone   2) 2, 4 - dichloro - 3 - pentanone
3) 1, 4 - dichloro - 2- pentanone   4) 2, 5 - dichloro - 3- Hexanone

4. The IUPAC name of β-methyl valeraldehyde is
1) 2-methyl pentanal   2) 3-methyl pentanal   3) 2-methyl butanal   4) 2-methyl butanal

5. Iso propyl alcohol is obtained by the reaction of the following

1) Acetone with Clemmenson's reducing agent 2) Acetone with H_2 in presence of Ni
3) Acetaldehyde with H_2 in presence of Ni 4) Acetone with chloroform

6. Which one of the following undergoes aldol condensation and gives iodoform test
1) Actaldehyde 2) Ethyl alcohol 3) Acetic acid 4) formaldehyde

7. CH_3COCH_3 + NaOH + Na_2 [$Fe(CN)_5NO$] + H_2O gives a wine colour. This changes to yellow colour on standing. This test is called
1) Legal test 2) Indigo test 3) Iodoform test 4) 2, 4 - DNP test

8. 2, 2-dichloro propane treated with aq. KOH gives an unstable product. It is
1) CH_3COCH_3 2) $CH_3CH(OH)CH_3$ 3) $CH_3C(OH)_2CH_3$ 4) $CH_3CH(OH)CH_2CHO$

9. An alkene on ozonolysis gives acetalde hyde and acetone. The alkene in question is
1) $CH_3-CH=\overset{\overset{\displaystyle CH_3}{|}}{C}-CH_3$ 2) CH_3 - CH = CH - CH_2 - CH_3
3) CH_2 = CH - CH_3 4) $(CH_3)_2C = C(CH_3)_2$

10. The first oxidation product of the following alcohol is a ketone with the same number of carbon atoms
1) $CH_3CH_2CH_2OH$ 2) $(CH_3)_2CHCH_2OH$ 3) $CH_3CH(OH)CH_3$ 4) $(CH_3)_3C$ - OH

11. HCHO; CH_3CHO; CCl_3CHO; CH_3COCH_3; CCl_3COCH_3; C_6H_5CHO
(I) (II) (III) (IV) (V) (VI)
Which of the above compounds undergo aldol condensation
1) Only II, III, IV and VI 2) Only II, IV and V
3) Only II and III 4) All except I

12. Tollens reagent can be obtained by mixing aqueous $AgNO_3$ with aqueous NH_3 solution. The reagent mainly contains
1) $[Ag(NH_3)_2]^+$ 2) AgOH 3) Ag 4) CH_3CHO

13. $\text{Acetaldehyde} \xrightarrow[\text{room temerature}]{\text{conc}H_2SO_4} (A)$ 'A' is
1) Acetaldehyde 2) Metaldehyde 3) Mesitylene 4) Paraldehyde

14. In aldehydes –CHO may be attached to
1) Alkyl group 2) H atom 3) Aryl group 4) Alkyl /aryl/ H atom

15. (A) : Acetone gets oxidised by strong oxidising agents like Ag^+, Cu^{+2} etc
(R) : Oxidation of acetone involved carbon - carbon bond cleavage
1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false
4) (A) is false but (R) is true

16. Alkaline sodium nitroprusside is used to confirm the presence of
1) Aldehyde 2) Ketone having α - hydrogen atom
3) All Ketones 4) Secondary and tertiary alcohols

17. Consider the following statements
A) On reaction with grignard reagent followed by hydrolysis Acetone gives tertiary alcohol

B) Mesitylene is a polymer of Acetone

C) Chloroform gives chloretone with acetone

D) Acetone ammonia is an addition product of acetone with NH_3

The correct statements are

1) All are correct 2) A is correct 3) A, B and C are correct 4) A and D are correct

18. The catalyst in Wacker process is

1) $CuCl_{2\backslash}$ 2) $PdCl_2$ 3) Cu_2Cl_2 4) Pd

19. Statement - I : Aldehydes restore the megenta colour of schiff's reagent

Statement - II : Schiff's reagent is a colourless p - rosaniline hydrochloride

1) I is true II is wrong 2) I is wrong II is true

3) Both statements are correct 4) Both statements are incorrect

20. (A) :Acetaldehyde reduces Fehling's solution but Acetone does not

(R): Acetaldehyde is stronger reducing agent than acetone.

The correct answer is

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false

4) (A) is false but (R) is true

21. (A):Acetaldehyde undergoes aldol condensation with dil. NaOH

(R):Acetaldehyde does not contain a - hydrogen

1) Both (A) and (R) are true and (R) is the correct explanation of (A)

2) Both (A) and (R) are true and (R) is not the correct explanation of (A)

3) (A) is true but (R) is false

4) (A) is false but (R) is true

22.

List- 1	**List - 2**
I) $CH_3CHO \rightarrow$ Aldol	A) $LiAlH_4$
II) $CH_3COOH \rightarrow CH_3CH_2OH$	B) Zn - Hg; Con. HCl
III) $CH_3COCH_3 \rightarrow CH_3CH_2CH_3$	C) Con. H_2SO_4; Δ
IV) $CH_3CHO \rightarrow (CH_3CHO)_3$	D) NaOH
	E) $KMnO_4$, H^+

The correct match is

	I	II	III	IV		I	II	III	IV
1)	E	B	A	C	2)	D	A	B	C
3)	B	E	A	D	4)	D	B	E	D

23. Acetylene on reaction with hypochlorous acid gives

1) Acetone 2) Chloro acetone

3) Dichloro acetaldehyde 4) Dichloro methane

24. The reagent that gives an orange coloured precipitate with acetaldehyde is

1) NH_2OH 2) $NaHSO_3$ 3) Iodine 4) 2, 4 - DNP

25. The No.of p bonds in the product formed by passing acetylene through dil.H_2SO_4 containing

mercuric sulphate is

1) zero 2) one 3) two 4) three

26. Which of the following can be detected by silver mirror test

1) CH_3COCH_3 2) CH_3COOH 3) C_2H_6 4) CH_3CHO

27. What is X in the following reaction $2CH_3CHO \xrightarrow{\text{dil.NaOH}} X$

1) CH_3-CH(OH)-CHO 2) CH_3-CO-CH_2CHO
3) CH_3-CH(OH)-CH_2-CHO 4) CH_3-CH_2-CH(OH)-CHO

28. Which of the following converts acetone to acetone oxime

1) H_2N - NH_2 2) 2, 4 - DNP 3) $C_6H_5NHNH_2$ 4) NH_2OH

29. Para rosaniline hydrochloride solution is decolourised by SO_2 is called

1) Bendict's solution 2) Fehling's solution 3) Schiff's reagent 4) Tollen's reagent

30. Acetone on distillation with bleaching powder and water gives chloroform and X. Ethyl alcohol on distillation with bleaching powder and water gives $CHCl_3$ and Y. X and Y together on distillation gives

1) CH_3CHO 2) CH_3COCH_3 3) CH_2 = CHOH 4) $CH_3COC_2H_5$

31. Match the following

List - I	List - II
A) $CH_3COCH_3 \xrightarrow[\text{conc HCl}]{\text{Zn-Hg}}$	1) Phorone
B) $CH_3CHO \xrightarrow{H_2,Ni}$	2) CH_3CHO
C) $CH_3-CH=CH_2+PdCl_2+H_2O \xrightarrow[H^+]{CuCl_2}$	3) CH_3COCH_3
D) $CH_3COCH_3 \xrightarrow[H_2SO_4]{\text{Conc}}$	4) CH_3CH_3
	5. $CH_3CH_2CH_3$
	6. CH_3CH_2OH
	7. $C_6H_3(CH_3)_3$

The correct match is

	A	B	C	D		A	B	C	D
1)	5	6	3	1	2)	5	6	3	7
3)	5	6	4	3	4)	5	6	4	2

32. When Acetaldehyde is treated with $LiAlH_4$, What is the product formed

1) CH_3COOH 2) CH_3–CH_2–OH 3) CH_3–OH 4) HCOOH

33. Ethanal is reacted with acidified $K_2Cr_2O_7$. What is the product formed?

1) C_2H_5OH 2) CH_3COOH 3) C_2H_6 4) CCl_3 CHO

34. During reduction of aldehyde with $\dfrac{H_2N-NH_2}{OH^-/\text{glycol}}$, the first intermediate compound formed as

1) RCN 2) $RCONH_2$ 3) R-CH=NH 4) R –CH = NNH_2

35. Acetaldehyde is reduced with hydrogen in the presence of Nickel. What is the compound formed.

1) Ethanol 2) n–propanol 3) Methanol 4) Isopropanol

36. What is the "X" in the following reaction

$2CH_3COCH_3 \xrightarrow{Ba(OH)_2} X$

1) $\begin{array}{ccccccccc} & & OH & & & & & & \\ & & | & & & & & & \\ CH_3 & - & C & - & CH_2 & - & C & - & CH_3 \\ & & | & & & & \| & & \\ & & CH_3 & & & & O & & \end{array}$

2) $\begin{array}{ccccccccc} & & OH & & & & & & \\ & & | & & & & & & \\ CH_3 & - & C & - & CH_2 & - & CH_2 & - & CHO \\ & & | & & & & & & \\ & & CH_3 & & & & & & \end{array}$

3) $CH_3-CH(CH_3)-CH_2-CO-CH_3$

4) $\begin{array}{ccccccccc} CH_3 & - & CH & - & CH & - & C & - & CH_3 \\ & & | & & | & & \| & & \\ & & CH_3 & & OH & & O & & \end{array}$

37. An organic compound X gives a red precipitate on heating with Fehling's solution. Which one of following reactions yields X as major product ?

1) HCHO $\xrightarrow[(ii)H_2O]{(i)CH_3MgI}$

2) $C_2H_5Br + AgOH \xrightarrow{\Delta}$

3) $2C_2H_5Br + Ag_2O \xrightarrow{\Delta}$

4) $C_2H_2 + H_2O \xrightarrow[1\%\ HgSO_4;60^0 C]{40\%\ H_2SO_4}$

38. Which one of the following compounds reacts with Saturated solution of Sodium bisulphite to give colourless crystalline products?

1) C_2H_5OH 2) C_2H_6 3) CH_3 CHO 4) $CHCl_3$

39. Identify acetaldoxime (EAMCET-ENG- 2004)

1) $CH_3CH = N - NH_2$ 2) $CH_3CH = N - OH$ 3) $(CH_3)_2C = N - OH$ 4) $CH_2 = N - OH$

40. Which of the following reagents can form a hydrazone with alkanone ?

1) NH_2OH 2) $PhNHNH_2$ 3) $NH_2NHCONH_2$ 4) HCN

41. 3 - Hydroxy butanal is formed when (X) reacts with (Y) in dilute (Z) solution. What are(X),(Y) and(Z)?

	X	**Y**	**Z**
1)	CH_3CHO	$(CH_3)_2CO$	NaOH
2)	CH_3CHO	CH_3CHO	NaCl
3)	$(CH_3)_2CO$	$(CH_3)_2CO$	HCl
4)	CH_3CHO	CH_3CHO	NaOH

42. Which of the following reagents converts both acetaldehyde and acetone to alkanes ?

1) Ni / H_2 2) LiAl H_4 3) I_2 / NaOH 4) Zn - Hg / Conc. HCl

EXERCISE - I / ANSWER

WORK SHEET - I

01) 3	02) 2	03) 2	04) 1	05) 3	06) 4	07) 4	08) 4	09) 2	10) 3
11) 4	12) 1	13) 2	14) 3	15) 3	16) 1	17) 4	18) 1	19) 2	20) 4
21) 3	22) 2	23) 4	24) 1	25) 1	26) 4	27) 2	28) 3	29) 2	30) 3
31) 2	32) 2	33) 3	34) 4	35) 2	36) 2	37) 3	38) 3	39) 2	40) 4
41) 3	42) 2	43) 3	44) 4	45) 4	46) 3	47) 1	48) 1	49) 1	

WORK SHEET - II

1) 4	2) 3	3) 2	4) 2	5) 2	6) 1	7) 1	8) 3	9) 1	10) 3
11) 2	12) 1	13) 4	14) 4	15) 4	16) 3	17) 3	18) 1	19) 3	20) 1
21) 3	22) 2	23) 3	24) 4	25) 2	26) 4	27) 3	28) 4	29) 3	30) 1
31) 2	32) 2	33) 2	34) 4	35) 1	36) 1	37) 4	38) 3	39) 2	40) 2
41) 4	42) 4								

EXERCISE - I

WORK SHEET - I

Carboxylic Acids & Derivatives:

1. Saturated mono carboxylic acids are also called
   1) Paraffins 2) Olefins
   3) Fatty Acids 4) Mineral Acids

2. The general formula of carboxylic acids is
   1) $C_nH_{2n}O_2$ 2) $C_nH_{2n+1}O_2$ 3) $C_nH_{2n+2}O_2$ 4) $C_nH_{2n-2}O_2$

3. The acid obtained by the distillation of ants is called as
   1) Formalin 2) Formic acid 3) ethanoic acid 4) Both 2 & 3

4. The chief constituent of vinegar is
   1) Acetal 2) Acetic acid 3) Ethanoic acid 4) Both 2 and 3

5. Root of valerian plant contains
   1) C_3H_7COOH 2) C_2H_5COOH 3) C_4H_9COOH 4) HCOOH

6. IUPAC name of valeric acid
   1) Propionic acid 2) Burtyic acid
   3) Pentanoic acid 4) 2-methyl butanoic acid

7. Propionic acid can also be named as
   1) Methyl methanoic acid 2) Methyl acetic acid
   3) Methyl ethanoic acid 4) ethyl acetic acid

8. Which of the following is a pair of functional isomers ?
   1) CH_3COCH_3, CH_3CHO 2) $C_2H_5CO_2H$, $CH_3CO_2CH_3$
   3) $C_2H_5CO_2H$, $CH_3CO_2C_2H_5$ 4) CH_3CO_2H, CH_3CHO

9. In the reaction sequence, $C_2H_5Cl + KCN \xrightarrow{C_2H_5OH} \times \xrightarrow[\Delta]{H_3O^{\oplus}} Y$.
   What is the molecular formuls of Y?
   1) $C_3H_6O_2$ 2) C_3H_5N 3) $C_2H_4O_2$ 4) C_2H_6O

10. Oxidation of primary Alcohols finally gives
    1) Aldehydes 2) Ketones 3) Carboxylic acids 4) Esters

11. Which one of the following when reacts with CH_3MgBr followed by hydrolysis gives acetic acid?
    1) CO 2) CH_3CHO 3) C_2H_5OH 4) CO_2

12. Acetonitrile when boiled with alkali (or) acid gives
    1) CH_3COOH only 2) $CH_3COOH+C_2H_5OH$
    3) $CH_3COOH + NH_3$ 4) $CH_3COOH + H_2$

13. $CH_3OH + CO \xrightarrow[\Delta,\ \text{pressure}]{X} CH_3COOH$ Here X is

1) Cu 2) Co 3) Rb 4) Ni

14. Which one of the following functional group undergoes hydrolysis with alkali to yield an acid group

1) –CN 2) –CHO 3) $-COCH_3$ 4) –Br

15. Ethyl Benzene $\xrightarrow[(ii)H^+/H_2O]{(i)KMnO_4/OH^-}$ X

Predict X in above reaction

1) $C_6H_5CH_2COOH$ 2) $C_6H_5CH_2CHO$

3) Benzoic acid 4) Benzaldehyde

16. $C_6H_5MgBr \xrightarrow[(2)H_3O^+]{(1)CO_2} P$ In the above reaction, product P is

1) Phenol 2) Benzoic acid 3) Benzaldehyde 4) Benzophenone

17. Lower carboxylic acids are soluble in water due to

1) Low molecular weight 2) Hydrogen bonding

3) Dissociation into ions 4) Easy Hydrolysis

18. Which of the following possess higher boiling point ?

1) C_2H_5Cl 2) CH_3CHO 3) C_2H_5OH 4) CH_3COOH

19. Which of the following exists as dimer in benzene ?

1) CH_3CHO 2) CH_3COCH_3 3) CH_3CH_2OH 4) CH_3COOH

20. Acetic acid liberates CO_2 gas with

1) Na 2) Zn 3) $NaHCO_3$ 4) NaOH

21. Acetic acid can be used

1) For curing meat and fish 2) As vinegar in cooking

3) In the preparation of perfumes 4) All

22. Which of the following is not a fatty acid

1) Propionic acid 2) Oxalic acid 3) Valeric acid 4) Stearic acid

23. The reagent used for converting ethanoic acid to ethanol is

1) $LiAlH_4$ 2) BH_3 3) PCl_3 4) $K_2Cr_2O_7$

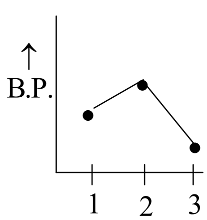
24. Acetic acid gives acetic anhydride when treated with

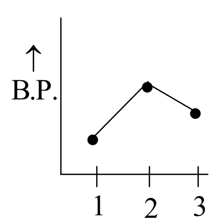
1) PCl_5 2) P_2O_5 3) Cl_2/P 4) Na

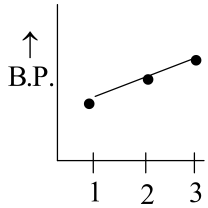
25. Which of the following compounds is formed when ethanol reacts with acetic acid in the presence of concentrated H_2SO_4

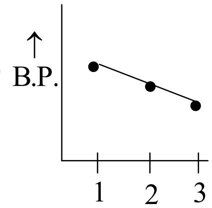
1) $CH_3COOC_2H_5$ 2) $C_2H_5OC_2H_5$ 3) CH_3OCH_3 4) CH_3CH_2CHO

26. Which one of the following graphs represents the correct order of boiling points (B.P) of ethane (1), ethyl alcohol (2) and acetic acid (3) ?

1) 

2) 

3) 

4) 

27. Which of the following is the strongest acid

1) CF_3COOH 2) CBr_3COOH 3) CH_3COOH 4) CCl_3COOH

28. Which of the following is the weakest acid

1) Phenol 2) CH_3COOH 3) HCOOH 4) Benzoic acid

WORK SHEET - II

1. $C_2H_5OH \xrightarrow{K_2Cr_2O_7/H^+} (X) \xrightarrow{(O)} (Y)$;

What is 'Y' ?

1) CH_3CHO 2) CH_3COOH 3) $CH_3COOC_2H_5$ 4) CH_3COCH_3

2. The catalyst used in the manufacture of acetic acid from acetaldehyde by the atmospheric oxygen is

1) $(CH_3COO)_2Mn$ 2) $(CH_3COO)_2Zn$ 3) CH_3COOK 4) CH_3COONa

3. The reagent used for the detection of a carboxyl group in an organic compound is

1) PCl_5 2) $SOCl_2$ 3) Na 4) $NaHCO_3$

4. Which of the following does not participate in HVZ reaction.

1) CH_3COOH 2) CH_3CH_2COOH 3) $CH_3CHClCOOH$ 4) $(CH_3)_3CCOOH$

5. During the electrolysis of Potassium acetate solution the anode products are

1) C_2H_6, CO_2 2) C_2H_6, H_2 3) C_4H_{10}, CO_2 4) CH_4, C_2H_6

6. $CH_3COOH \xrightarrow{X} CH_3COCl$. Here the reagent X can not be

1) PCl_5 2) PCl_3 3) $SOCl_2$ 4) NaCl

7. $C_2H_5OH + CH_3COOH \underset{}{\overset{H_2SO_4}{\rightleftharpoons}} CH_3COOC_2H_5 + H_2O$.

Here H_2SO_4 acts as

1) Oxidising agent 2) Reducing agent 3) Dehydrating agent 4) negative catalyst

8. The intermediate compound formed during the hydrolysis of CH_3CN is

1) CH_3COOH 2) CH_3COONH_4 3) CH_3CONH_2 4) $CH_3CH_2NH_2$

9. Hydrolysis of an ester gives a carboxylic acid which on kolbe's electrolysis yields ethane. The ester is

1) methyl ethanoate 2) methylmethanoate 3) ethyl methanoate 4) methyl propanoate

10. Compound A reacts with PCl_5 to give B which on treatment with KCN followed by hydrolysis gave propionic acid. What are A & B respectively ?

1) C_3H_8 & C_3H_7Cl 2) C_2H_6 & C_2H_5Cl

3) C_2H_5OH & $C_2H_4Cl_2$ 4) C_2H_5OH & C_2H_5Cl

11. An organic compound reacts with metallic sodium to liberate hydrogen and with Na_2CO_3 solution to liberate CO_2. The compound is

1) Alcohol 2) Carboxylic acid 3) Ether 4) An ester

12. Acetic acid is treated with metallic Sodium to form Hydrogen and X. When X is treated with Sodalime, Y and Sodium Carbonate are formed 'Y' is

1) C_2H_6 2) CH_4 3) CH_sCOONa 4) CH_3CONH_2

13. What is the reagent used in the preparation of chloro-acetic acid from acetic acid

1) PCl_5 2) Cl_2 / Red P 3) PCl_3 4) $SOCl_2$

14. In the following reaction X and Y respectively are.

$$X \xrightarrow{\text{Aq.NaOH}} CH_3COOH \xrightarrow{Y} (CH_3CO)_2O$$

1) $CH_3.CHO$; PCl_5 2) CH_3CN ; P_2O_5

3) CH_3CH_2OH ; NaOAC 4) CH_3COCH_3 ; H_2SO_4

15. In the following reaction X and Y are respectively

$$CH_3COOH + NH_3 \rightarrow X \xrightarrow[\Delta]{} Y + H_2O$$

1) CH_3CONH_2 ; CH_4 2) CH_3COONH_4 ; CH_3CONH_2

3) CH_3CONH_2 ; CH_3COOH 4) CH_3NH_2 ; CH_3CONH_2

16. In the following reaction X and Y respectively are

$$C_2H_5OH \xrightarrow{KMnO_4/H^{\oplus}} X \xrightarrow[H_2SO_4]{Y} CH_3COOC_2H_5$$

1) CH_3OH ; C_2H_5OH 2) CH_3CHO ; CH_3OH

3) $CH_2 = CH_2$; CH_3COOH 4) CH_3COOH ; C_2H_5OH

17. Aqueous 10% $NaHCO_3$ solution is used as a reagent for identifying 'X'. Which one of the following compounds yields 'X' on hydrolysis?

1) $CH_3CO_2C_2H_5$ 2) $C_2H_5 - O - C_2H_5$ 3) CH_3CHO 4) $CH_3 - CH_2 - OH$

18. Acid hydrolysis of X yields two different organic compounds. Which one of the following is X?

1) CH_3COOH 2) CH_3CONH_2 3) $CH_3COOC_2H_5$ 4) $(CH_3CO)_2O$

19. When compound X is oxidised by acidified potassium dichromate, compound Y is formed. Compound Y on reduction with $LiA\ell H_4$ gives X .X and Y respectively are :

1) C_2H_5OH, CH_3COOH 2) CH_3COCH_3, CH_3COOH

3) C_2H_5OH, CH_3COCH_3 4) CH_3CHO, CH_3COOH_3

20. $CH_3COOH \xrightarrow{LiAlH_4} \underline{A}$,

$$\underline{A} + CH_3COOH \xrightarrow{H_3O^+} \underline{B} + H_2O$$

In the above reactions 'A' and 'B' respectively are

1) $CH_3COOC_2H_5, C_2H_5OH$ 2) CH_3CHO, C_2H_5OH
3) C_2H_5OH, CH_3CHO 4) $C_2H_5OH, CH_3COOC_2H_5$

21. Identify X and Y in the following sequence of reactions.

$$CH_3CHO \xrightarrow{HNO_3} X \xrightarrow[\Delta]{P_4O_{10}} Y$$

X	Y	X	Y
1) C_2H_5OH,	C_2H_4	2) CH_3CO_2H,	$(CH_3CO)_2O$
3) CH_3CO_2H,	$CH_3CO_2CH_3$	4) C_2H_5OH,	CH_3CO_2H

22. In which of the following reactions hydrogen gas is liberated ?

1) $CH_3COOH + Na$ 2) $CH_3COOH + NaHCO_3$
3) $CH_3COOH + NaOH$ 4) $CH_3COOH + H_2O$

23. Methyl alcohol when reacted with carbon monoxide using cobalt or Rhodium as catalyst, compound 'A' is formed, 'A' on heating with HI in the presence of red phosphorous as catalyst 'B' is formed. Inentify 'B'

1) CH_3COOH 2) CH_3CHO 3) CH_3CH_2I 4) CH_3CH_3

24. Reaction of CH_3COOH with excess of CH_3CH_2MgBr finally yields

1) an alkene 2) an ester 3) an alkane 4) a tertiary alcohol

25. $CH_3CH_2COOH \xrightarrow[Red'p']{Br_2} X \xrightarrow[alcohol]{NH_3} Y$ Y in the reaction is

1) Lactic acid 2) Ethylanine 3) Propylamine 4) Alanine

26. $CH_3COOH \xrightarrow{1mole\ Cl_2/Red\,P} A \xrightarrow{KCN} B \xrightarrow{H^+/H_2O} C$. Hence 'C' is

1) Oxalic acid 2) Maleic acid
3) Fumaric acid 4) Malonic acid

27. $CH_3CH_2COOH \xrightarrow{Cl_2/Red\,P} A \xrightarrow{aq.KOH} B$. Here 'B' is

1) Succinic acid 2) Lactic acid 3) Picric acid 4) Malonic acid

28. Benzoic acid gives benzene on being heated with X and phenol gives benzene on being heated with Y therefore X and Y are respectively

1) Sodalime and copper 2) Zincdust and sodium hydroxide
3) Zinc dust and Sodalime 4) Sodalime and Zinc dust

29. On vigorous oxidation by permanganate solution $(CH_3)_2C=CH-CH_2CH_3$ gives

1) $\begin{array}{c} \quad\ OH\ \ OH \\ \quad\ \ |\quad\ \ | \\ CH_3-C-CH-CH_2CH_3 \\ | \quad\quad\quad\quad \\ CH_3 \quad\quad\quad \end{array}$ (A.I.E.E.E. 2002) 2) $\begin{array}{l} CH_3 \diagdown \\ \quad\quad\ CHCO_2H + CH_3CH_2COOH \\ CH_3 \diagup \end{array}$

3) $(CH_3)_2CHOH + CH_3CH_2CH_2OH$ 4) $(CH_3)_2C=O + CH_3CH_2COOH$

30. Identify C in the following reaction :

$$C_2H_2 \xrightarrow{\text{Chromic acid}} A \xrightarrow{NH_3} B \xrightarrow[-H_2O]{\Delta} C$$

1) $CH_3CH_2NH_2$ 2) CH_3CN 3) $CH_3CH_2NHCH_3$ 4) $CH_3-\overset{\overset{O}{||}}{C}-NH_2$

31. $CH_3CN + H_2O \xrightarrow{H^+} A \xrightarrow[\text{Red P}]{\text{Excess } Cl_2} B$. In the above reaction A and B are respectively

1) CH_3COOH, CCl_3COOH 2) CH_3CH_2OH, CH_3CH_2Cl
3) CH_3CHO, CCl_3CHO 4) CH_3COCH_3, CCl_3COCH_3

32. Identify A and B in the following reaction, $CH_3CH_3 \xleftarrow{B} CH_3COOH \xrightarrow{A} CH_3CH_2OH$

A	B	A	B
1) HI + Red P	$LiAlH_4$	2) Ni/ Δ	$LiAlH_4$
3) $LiAlH_4$	HI + Red P	4) Pd-$BaSO_4$	Zn + HCl

33. In the anion $HCOO^-$ the two carbon-oxygen bonds are found to be of equal length. What is the reason for it 1) The anion $HCOO^-$ has two equivalent resonating structures
2) The anion is obtained by removal of a proton from the acid molecule
3) Electronic orbitals of carbon atom are hybridised
4) The C=O bond is weaker than the C-O bond

34. Among the following acids which has the lowest pK_a value

1) CH_3COOH 2) HCOOH 3) $(CH_3)_2CH-COOH$ 4) CH_3CH_2COOH

35. Which of the following has highest tendency to ionise in aqueous solution.

1) HCOOH 2) CH_3COOH 3) FCH_2COOH 4) $BrCH_2COOH$

36. Which acid has lowest value of pK_a?
1) p - Methoxybenzoic acid 2) p - Chlorobenzoic acid
3) p - Aminobenzoic acid 4) p - Toluic acid

37. Which of following anion is a strongest base?
1) $C_6H_5COO^-$ 2) $HCOO^-$ 3) CH_3COO^- 4) $(CH_3)_2CHCOO^-$

38. Which of the following statements are correct ?
1) the two carbon-oxygen bond lengths in molecular formic acid are different
2) the two carbon-oxygen bond length in sodium formate are equal
3) very partial resonance is there in formic acid
4) all of the above

39. Among acetic acid, phenol and n-hexanol, which of the compounds will react with $NaHCO_3$ solution to give sodium salt and CO_2

1) acetic acid 2) phenol 3) n-hexanol 4) acetic acid and phenol

40. CH_3COOH is less acidic than HCOOH. It is due to which effect

1) + I of Methyl group 2) + M of Methyl group

3) - I of Methyl group 4) None

41. What is the main reason for the fact that carboxylic acids can undergo ionisation.

1) Absence of α – hydrogen

2) Resonance stabilisation of the carboxylate ion

3) High reactivity of α – Hydrogen 4) Hydrogen bonding

42. The reagent that can be used to distinguish between phenol and ethanoic acid is

1) Ammoniacal silver nitrate solution 2) Fehling solution

3) Sodium carbonate solution 4) Phenolphthalein

WORK SHEET - III

01. $(CH_3)_2C = CH\text{-}CH_2\text{-}CH_3$ on oxidation with permanganate solution gives

1) $(CH_3)_2CHOH+CH_3CH_2CH_2OH$ 2) $(CH_3)_2C{=}O+CH_3CH_2COOH$

3) $(CH_3)_2CHCO_2H+CH_3CH_2COOH$ 4) $(CH_3)_2C(OH)CH(OH)CH_2CH_3$

02. The calcium salt of which of the following acids on dry distillation produces 2,4 - dimethyl pentane - 3 - one ?

1) isobutyric acid 2) adipic acid 3) butyric acid 4) propionic acid

03. Acetaldehyde $\xrightarrow{HCN} X \xrightarrow[H_2O/H^+]{} Y \xrightarrow{Heat} Z$:

In the above sequence, the end product Z is

1) but-2-enoic acid 2) prop - 2 - en oic acid

3) tartaric acid 4) lactic acid

04. The compound obtained by the reaction of CO + NaOH and H_2SO_4 will be

1) HCOONa 2) $C_2H_2O_4$ 3) HCOOH 4) CH_3COOH

05. Which of the following has highest solubility in water ?

1) acetic acid 2) isobutyric acid 3) n-butyric acid 4) propionic acid

06. $CH_3OH \xrightarrow{PCl_5} (A) \xrightarrow{KCN} (B) \xrightarrow{H_3O^+} (C)$ the end product (3) will be ?

1) CH_3CONH_2 2) $CH_3\text{-}CH_2OH$ 3) HCOOH 4) CH_3COOH

07. The end product (3) in the following sequence of reactions,

$CH_3Cl \xrightarrow{KCN} (A) \xrightarrow{H^+/H_2O} (B) \xrightarrow[\Delta]{P_4O_{10}}$ C. The compound 'C' is

1) $(CH_3CO)_2O$ 2) CH_3COOCH_2 3) CH_3COOH 4) CH_3COCH_3

08. Which of the following is optically active ?

1) Lactic acid 2) Pyruvic acid 3) Glycolic acid 4) Both (2) & (c)

09. In the series of reactions $CH_3COOH \xrightarrow{NH_3} A \xrightarrow{\Delta} B \xrightarrow{P_2O_5} C$ the product C is :

1) ammonium acetate 2) methane 3) acetonitrile 4) methanol

10. Which of these can not show resonance stabilisation ?

1) $CH_2 = CH\text{-}CH_2\overline{O}$ 2) $C_6H_5\overline{O}$ 3) $C_6H_5CO\overline{O}$ 4) All of these

11. Acetic anhydride is prepared industrially by heating sodium acetate with :

1) CH_3Cl 2) PCl_3 3) $POCl_3$ 4) SO_2Cl_2

12. Which of the following will be able to produce acetyl chloride by its reaction with acetic acid ?

1) PCl_3 2) PCI_5 3) Cl_2 4) $SOCl_2$/Py

13. Acetyl chloride is reduced to acetaldehyde by :

1) $LiAlH_4$ 2) H_2/Pd-$BaSO_4$ 3) H_2/Ni 4) Na-C_2H_5OH

14. Which of the following compounds will give ethyl alcohol on reduction with $LiAlH_4$?

1) $(CH_3CO)_2O$ 2) CH_3COCl 3) CH_3CONH_2 4) $CH_3COOC_2H_5$

15. –OH group of acid can be replaced with

1) $SOCl_2$ 2) $COCl_2$ 3) PCl_5 4) PCl_3

16. Aceto Phenone is oxidised by peroxyacetic acid followed by acid catalysed hydrolysis to give two products (1) and (B). Identify the products (1) and (B)

1) (1) is benzoic acid 2) (2) is phenol

3) (1) is acetic acid 4) (2) is methanol

17. The intermediate(s) formed during the reaction,

$$C_6H_5CH_2COOAg + Br_2 \xrightarrow{CCL_4} C_6H_5CH_2Br + AgBr$$ is / are

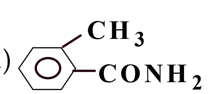
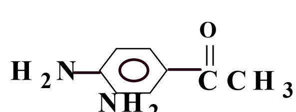
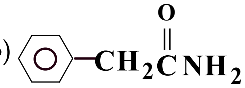
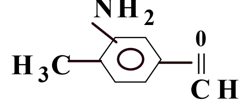
1) $C_6H_5-CH_2-\overset{\overset{O}{\|}}{C}-OBr$ 2) $C_6H_5-CH_2-\overset{\overset{O}{\|}}{C}-O\bullet$

3) $C_6H_5-\dot{C}H_2$ 4) $Br\bullet$

Passage - I

An orga nic compound (1) of molecular weight 135 on boiling with NaOH evolves a gas which gines white dense fumes on bringing a rod dipped in HCl near it. The alkaline solution thus, obtained on acidification gives the precipitate of a compound (2) having molecular weight 136. Treatment of (1) with HNO_2 also yeilds (B), whereas its treatment with Br_2/KOH gives (C). compound (3) reacts with cold HNO_2 to give(D), which gives red colour with ceric ammonium nitrate. On the other hand(E) an isomer of (1) on boiling with dil HCl gives an acid (F), having molecular weight 136. On oxidation followed by heating, (F) gives an anhydride (G) which condenses with benzene in presence of $AlCl_3$ to give anthraquinone.

18. Structural formula of compound (1) is

1) 
2) 
3) 
4) 

19. IUPAC name of compound (2) is

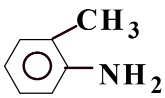
1) p-methylbenzoic acid 2) 2-phenylethanoic acid

3) methyl benzoate　　　　4) none of these

20. Structural formula of compound (3) is

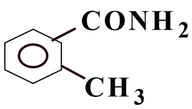
1) 

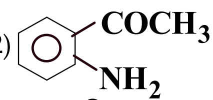
2) 

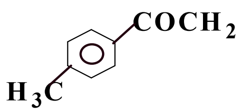
3) 

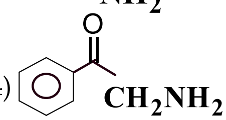
4) $C_6H_5CH_2NH_2$

21. Compound (E) is

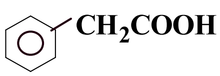
1) 

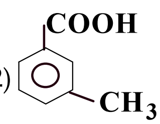
2) 

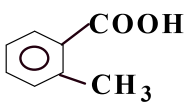
3) 

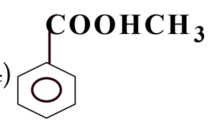
4) 

22. Compound (F) is

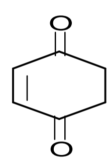
1) 

2) 

3) 

4) 

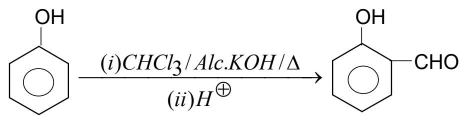
23. Match List-I with List - II and select the correct answer using the codes given below the lists.

Column - I (compound)	**Column - II** (used as)
(1) 1,4 addition	(P) $Ph-CH_2-\overset{O}{\overset{\|}{C}}-CH=CH_2$
(2) Tautomerism	(Q) PCC
(3) Allylic bromination	(R) 
(4) Preparation of Ketone from 2° alcohol	(S) NBS

24. Match list - I with list - II and select the correct answer using the codes give below the lists

Column - I	**Column - II**
(1) $C_6H_5CHO+HCHO \xrightarrow{OH^{\ominus}} C_6H_5CH_2OH+HCOO^{\ominus}$	(P) Cannizzaro reaction
(2) $C_6H_5-H+CH_3COCl \xrightarrow{Anhy.AlCl_3} C_6H_5-CO-CH_3$	(Q) Friedel Crafts reaction

(3) $C_6H_6 + CO + HCl \xrightarrow[Cu_2Cl_2]{Anhy.ZnCl_2} C_6H_5-CHO$ (R) Reimer-Tiemann reaction

(4) 

(S) Gattermann-Koch aldehyde synthesis

25. Number of compounds with the formula $C_4H_8O_2$ is ---------------------

26. How many lone pair of eletrons are in oxalic acid ?

27. The number of acids which have greater K_a value than acetic acid is

Formic acid, Benzoic acid, $CH_2 = CHCOOH$, CH_3OCH_2COOH, $HOCH_2COOH$, $CH_2=CHCH_2COOH$.

EXERCISE - I / ANSWERS

WORK SHEET - I

1) 3	2) 1	3) 2	4) 4	5) 3	6) 3	7) 2	8) 2	9) 1	10) 3
11) 4	12) 3	13) 2	14) 1	15) 3	16) 2	17) 2	18) 4	19) 4	20) 3
21) 4	22) 2	23) 1	24) 2	25) 1	26) 3	27) 1	28) 1		

WORK SHEET - II

1) 2	2) 1	3) 4	4) 4	5) 1	6) 4	7) 3	8) 3	9) 1	10) 4
11) 2	12) 2	13) 2	14) 2	15) 2	16) 4	17) 1	18) 3	19) 1	20) 4
21) 2	22) 1	23) 4	24) 3	25) 4	26) 4	27) 2	28) 4	29) 4	30) 4
31) 1	32) 3	33) 1	34) 2	35) 3	36) 2	37) 4	38) 4	39) 1	40) 1
41) 2	42) 3								

WORK SHEET - III

1) 2 2) 1 3) 2 4) 2 5) 1 6) 4 7) 1 8) 3 9) 1 10) 1

11) 234 12) 124 13) 2 14) 124 15) 134 16) 34 17) 1234 18) 3 19) 2 20) 4
21) 1 22) 3 23) 1 – PR; 2 – P; 3 – S; 4 – QS 24) 1 –P; 2 – Q; 3 – S; 4 – R

25) 6 26) 8 27) 6

EXERCISE - II

WORK SHEET - IA

25. **Column -I** (Ester) — **Column -II** (Flavour)

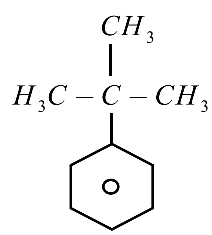
Column -I (Ester)	Column -II (Flavour)
(1) ethyl butanoate	(P) orange
(2) octyl ethanoate	(Q) jasmine
(3) n-pentyl ethanoate	(R) pineapple
(4)benzyl ethanoate	(S) banana

26.

Column -I	Column -II
(1) R-$CONH_2$	(P) most reactive towards aryl substitution
(2) R - COOR′	(Q) reduces $HgCl_2$
(3) HCOOH	(R) high boiling point
(4) RCOCl	(S) fruit flavour

WORK SHEET - IIB

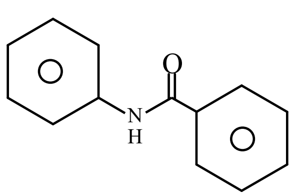
27. No of positional isomers possible for terephthalicacid are

28.  $\xrightarrow[KMnO_4]{\text{acidified}} [A] \xrightarrow{SOCl_2} [B] \xrightarrow{CH_2N_2} [C] \xrightarrow{H_2O/Ag_2O} [D]$

number of carboxylic groups present in compound [D]

29. Fructose is oxidised by periodic acid [HIO_4]. The number of moles of HCOOH formed from each mole of fructose are

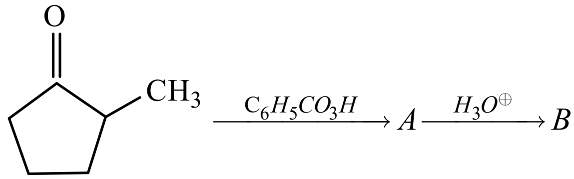
30. The number of isomeric carboxylic acids possible for the formula $C_4H_8O_2$ are respectively

31.  $\xrightarrow[conc.H_2SO_4]{\text{conc. } HNO_3}$

In the above reaction how many nitrated products are possible?

32. The number of hydroxyl groups present in tartaricacid are

33. During the reaction between formic acid & $KMnO_4$. The equivalent weight of $KMnO_4$ obtained by dividing it's molecular weight by a ______________ factor

34. 

No. of sp^2 hybridised carbons in compound (B)

35. Benzoic acid $\xrightarrow[2) KOH + Br_2/\text{heat}]{1) NH_3/\text{heat}}$ product

No. of sp^2 hybridised atoms in product

36. Acid chlorides are converted in to 3^0 alcohols with Gariguard reagent. During this convertion number of moles of Gariguard reagent are used

EXERCISE - II / ANSWERS

WORK SHEET - IA

25) 1 – R; 2 – P; 3 – S; 4 – Q

26) 1 – R; 2 – S; 3 – Q; 4 – P

WORK SHEET - IIB

27) 3 28) 1 29) 4 30) 2 31) 1 32) 2 33) 5 34) 1 35) 7
36) 2

EXERCISE - I

WORK SHEET - I

1. Oil of mirbane is
   1) Nitrobenzene 2) m-dinitrobenzene
   3) Aniline 4) Benzene sulphonamide
2. Nitroalkanes are the derivatives of
   1) Nitric Acid 2) Nitrous acid 3) Hyponitrous acid 4) Pernitric acid
3. Steam distillation method is useful for the purification of
   1) Nitrobenzene 2) Benzene
   3) Aniline 4) Both Nitrobenzene and Aniline
4. NitroBenzene is reduced with $LiAlH_4$. The product is
   1) AzoBenzene 2) HydrazoBenzene
   3) N-Phenyl hydroxylamine 4) Aniline
5. Nitrobenzene can act as
   1) oxidant 2) reductant 3) bleaching agent 4) antichlor
6. Among the following which is less reactive towards electrophilic substitution reactions
   1) Benzene 2) NitroBenzene 3) Aniline 4) Toluene
7. The following is used in the preparation of floor polishes
   1) Nitrobenzene 2) Aniline
   3) Benzene diazonium chloride 4) Phenyl hydroxyl amine
8. NitroBenzene is used as a solvent in
   1) Wurtz's reaction 2) The Preparation of G.R.
   3) Friedel - Craft's reaction 4) Diazotisation reaction
9. Which is used as a cheap perfume
   1) Aniline 2) Ethyl alcohol 3) Acetone 4) NitroBenzene
10. IUPAC name of $(CH_3)_3C.NH_2$ is
    1) trimethyl amine 2) 2-methyl butanamine-1
    3) 2-methyl propanamine-2 4) 2-methyl propanamine-1
11. Which of the following is not a tertiary amine ?
    1) tri ethyl amine 2) tri methyl amine
    3) 2-methyl propanamine-2 4) N-ethyl-N-methyl propanamine-1
12. Which of the following shows optical activity?
    1) butanamine-1 2) butanamine-2 3) isopropyl amine 4) ethyl methyl amine
13. IUPAC name of $(C_2H_5)_3C–NH_2$ is
    1) 3-ethyl propanamine-1 2) 3-ethyl pentanamine-2
    3) 3-ethyl pentanamine-3 4) 2-ethyl pentanamine-3
14. Number of saturated isomeric primary amines possible for the molecular formula C_3H_5N is
    1) zero 2) 3 3) 2 4) 4
15. Chemical formula of Hinsberg's reagent is
    1) $C_6H_5SO_3H$ 2) $C_6H_5NHSO_2C_6H_5$ 3) $C_6H_5SO_2Cl$ 4) $C_6H_5NHCOC_6H_5$
16. For carbyl amine reaction, we need alcoholic KOH and
    1) any primary amine and chloroform 2) aromatic primary amine and chloroform

3) aliphatic primary amine and chloroform 4) any amine and chloroform

17. Aniline on acetylation gives
1) phenol 2) acetamide 3) acetanilide 4) benzene

18. Treatment of ammonia on excess of alkyl halide yields
1) triethyl amine 2) quaternary ammonium salt
3) diethyl amine 4) ethyl amine

19. Aniline on reaction with con. H_2SO_4 gives X. If X is heated, the product is
1) sulphanilic acid 2) sulphonamide
3) benzene sulphonyl chloride 4) m-amino benzene sulphonic acid

20. In-correct statement among the following is
1) methanamine is more basic than ammonia 2) ammonia forms H-bonds
3) boiling point of ethyl amine is higher than propane
4) dimethyl amine is less basic than aniline

21. A primary amine on reaction with alc.KOH and chloroform yields
1) isocyanide 2) aldehyde 3) cyanide 4) alcohol

22. Primary amines have lower boiling points than
1) corresponding alkanes 2) corresponding 2^0 and 3^0 amines
3) corresponding esters 4) corresponding alcohols

23. (A) : N-methyl ethanamine is more basic than N,N-dimethyl ethanamine
(R) : +I effect is more in former than the later
1) A and R are true and R explains A 2) A and R are true but R does not explain A
3) A is true but R is false 4) A is false but R is true

24. Molecular association is highest in
1) n-propyl amine 2) trimethyl amine 3) ethyl methyl amine 4) equal in all

25. Among isomeric amines possible for molecular formula C_3H_9N, correct order of basic strength is given by
I) propanamine-1 II) N-methyl ethanamine
III) N,N-dimethyl methanamine IV) N-methyl propanamine-1
1) III > I > II 2) IV > III > I > II 3) II > III > I 4) II > III > I > IV

26. Aniline is less basic than
1) NH_3 2) CH_3NH_2 3) N - methyl Aniline 4) All the above

27. Which of the following is a 1° amine
1) Tert. butylamine 2) dimethyl amine 3) N - methylaniline 4) N, N-dimethyl aniline

28. Which functional group responds to carbylamine test
1) $-NH_2$ 2) NH 3) $-CONH_2$ 4) N

29. Among the following which is more basic
1) n - butyl amine 2) isobutylamine 3) Sec. butylamine 4) diethylamine

30. Impure Aniline is purified by
1) distillation 2) steam distillation
3) distillation under reduced pressure 4) fractional crystallisation

31. Towards litmus, Aniline is
1) Acidic 2) Basic 3) Neutral 4) Bleaching agent

32. Which of the following can react with an alkyl halide

1) 1° amine 2) 2° amine 3) 3° amine 4) All the above

33. The substance with nauseating smell is
1) C_6H_5CN 2) $C_6H_5NO_2$ 3) $C_6H_5NH_2$ 4) C_6H_5NC

34. Aniline doesn't react with
1) dil. HCl 2) dil.NaOH 3) $CH_3.CHO$ 4) Br_2water

35. Nitrobenzene on reduction with Hydrogen in presence of Nickel gives
1) Azobenzene 2) Hydrazobenzene 3) Phenyl hydroxyl amine 4) Aniline

36. Schiffs base is used as a
1) Oxidant 2) Reductant 3) Antichlor 4) Antioxidant

37. Aniline is obtained by the destructive distillation of
1) Coal Tar 2) Molasses 3) Indigo 4) Proteins

38. Aniline is soluble in
1) dil.HCl 2) dil.NaOH 3) Water 4) Na_2CO_3 solution

39. Aniline is treated with excess of CH_3I. The final product is
1) $C_6H_5NHCH_3$ 2) $C_6H_5N(CH_3)_2$ 3) $C_6H_5N(CH_3)_3I$ 4) C_6H_5I

40. The reagent which gets attached to the nucleus when added to aniline
1) CH_3I 2) C_6H_5COCl 3) CH_3COCl 4) Br_2

41. Which of the following is not a property of aniline
1) It is basic in nature 2) It gives carbylamine test
3) It can react with 3 moles of alkylhalide 4) It turns blue litmus red

42. Which of the following is a mixed 2° amine
1) Toludine 2) N - Methylaniline 3) Dimethylamine 4) Methyldiethyl amine

43. The general formula of amines is
1) $C_nH_{2n+1}N$ 2) $C_nH_{2n+2}N$ 3) $C_nH_{2n+3}N$ 4) $C_nH_{2n}N$

44. The general formula of quaternary ammoniam salt is
1) RNH_2 2) R_2NH 3) R_3N 4) R_4NX

45. Which of the following contains imino group $\left[>NH\right]$
1) Aniline 2) O - Toludine 3) Benzylamine 4) N - methyl aniline

46. The number of moles of hydrogen atoms required to convert 1 mole of nitrobenzene to hydrazobenzene is
1) 5 2) 10 3) 4 4) 8

47. Freshly prepared aniline is ?
1) Colourless 2) Brown 3) Yellow 4) Pale Yellow

48. Which of the following is true
1) aniline forms salts with aqueous alkali
2) aniline is more basic than ammonia
3) aniline forms benzene diazonium chloride with nitric acid
4) aniline is less basic than ammonia

49. Bromination of Aniline with bromine water mainly gives
1) Red precipitate of 2, 4, 6 – tribromo aniline 2) Ortho and Para bromo anilines
3) 2, 4 – Dibromo aniline

4) White precipitate of 2, 4, 6 – Tribromo aniline

50. Aniline forms anilinium salt when it reacts with
1) An alkyl halide' 2) Acetyl chloride 3) Sulphuric acid 4) Benzoyl chloride

51. The amine that does not form hydrogen bonds is
1) Isopropyl amine 2) Neopentyl amine
3) Tertiary butyl amine 4) N, N – Dimethyl amino ethane

52. The number of primary, secondary and tertiary amine isomers possible for the compound with formula $C_4H_{11}N$ are
1) 4, 3, 1 2) 4, 3, 2 3) 3, 2, 1 4) 4, 2, 1

53. In the diazotisation of Aniline, the reagent or reagents used
1) HNO_3, HCl 2) $NaNO_2$,HCl at0–5°C
3) $NaNO_2$, HNO_2at 0–5°C 4) HNO_2 only

54. In benzene diazonium chloride, the functional group is
1) –N=N=Cl 2) $–N=N^+–Cl^–$ 3) $–N^+=N–Cl^–$ 4) none

55. Diazonium salts are formed by
1) aliphatic primary amines 2) aromatic primary amines
3) alicyclic primary amines 4) heterocycli aromatic nitrogen compounds

56. Diazotisation means the conversion of
1) any primary amine into diazonium salt using $NaNO_3$+HCl at ice cold temperature
2) aromatic primary amine into diazonium salt using $NaNO_2$+HCl at 60-70^{0}C
3) aromatic primary amine into diazonium salt using $NaNO_2$+HCl at ice cold temperature
4) any primary amine into diazonium salt using $NaNO_3$+HCl at ice cold temperature

57. Aniline can be converted into Benzene by
1) diazotization
2) diazotization followed by treating with H_3PO_2
3) treating with H_3PO_2
4) diazotization followed by treating with steam

58. Which of the following does not give diazonium salt with nitrous acid at 273K?
1) Benzenamine 2) Benzyl amine 3) p-hydroxy aniline 4) o-hydroxy aniline

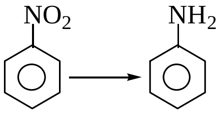
59. Which diazonium salt is stable at room temperature
1) Benzene diazonium chloride 2) Benzene diazonium fluoroborate
3) Benzene diazonium nitrate 4) Benzene diazonium bromide

60. Replacement of $-N_2^+X^-$ group by -Cl or -Br or -CN is called
1) Diazo coupling 2) Hoffmann reaction 3) Sandmayer reaction 4) Perkin reaction

61. Action of HCl on Benzene diazonium chloride in the presence of copper powder gives
1) p-chloro benzene diazonium chloride 2) o-chloro benzene diazonium chloride
3) Chloro benzene 4) o-dichloro benzene

WORK SHEET - II

1. NitroBenzene $\longrightarrow$ HydrazoBenzene.
Here the reagent is
1) Sn + HCl 2) Zn + NH_4Cl 3) Zn + NaOH 4) $LiAlH_4$

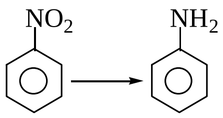
2. In the reaction 

The equivalent weight of NitroBenzene is

1) M 2) $\frac{M}{2}$ 3) $\frac{M}{4}$ 4) $\frac{M}{6}$

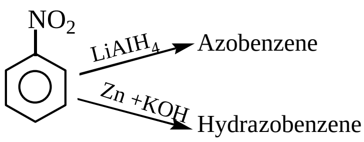
3. $R-\overset{\overset{\displaystyle O}{\|}}{N}\rightarrow O$ and R–O–N = O are a pair of

1) Chain Isomers 2) Metamers 3) Functional Isomers 4) Tautomers

4. 

Here the reagent is

1) Zn + NH_4Cl 2) Zn + NaOH 3) Sn + HCl 4) $LiAlH_4$

5. 

The ratio of the number of moles of Hydrogen atoms required to get 1 mole of azobenzene and 1 mole of hydrazobenzene

1) 4 : 5 2) 5 : 4 3) 1 : 1 4) 2 : 3

6.  + $HNO_3 \xrightarrow[100^0C]{H_2SO_4\ conc.}$ the main product of the reaction

1) Nitrobenzene 2) O – dinitrobenzene 3) m – dinitrobenzene 4) P – dinitrobenzene

7. Which of the following statements is wrong?

I) amines possess pyramidal shape II) amines act as Bronsted bases

III) 1^0 amines show metamerism IV) 2^0 amines show metamerism

1) I, II and III 2) II, III and IV 3) III only 4) I, II and IV

8. N,N-dimethyl butanamine-2 contains

1) six sp^3 hybridised carbon atoms 2) seven sp^3 hybridised atoms

3) two sp^3 hybridised nitrogen atoms 4) 1 and 2 are correct

9. Primary amino group is absent in

1) p-amino phenol 2) o-amino phenol 3) N-methyl ethanamine 4) phenyl amine

10. A) : n-propyl amine is 1^0 but isopropyl amine is 2^0 amine

R) : n-propyl amine and isopropyl amine are position isomers

1) A and R are true and R explains A 2) A and R are true but R does not explain A

3) A is true but R is false 4) A is false and R is true

11. N,N-dimethyl butanamine-2 is the functional isomer of

1) N–butanamine–2 2) N-methyl-2-ethyl butanamine-2

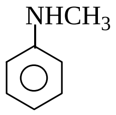
3) trimethyl amine 4) triethyl amine

12. n-butyl amine and isobutyl amine are --- isomers

1) optical 2) functional 3) chain 4) position

13. How many primary amine structural isomers with the molecular formula $C_4H_{11}N$.

1) 1 2) 2 3) 3 4) 4

14.  can react with a maximum of .... moles of CH_3I

1) 4 2) 3 3) 2 4) 1

15. In the nitration of aniline the amino group is protected by conversion into

1) Tribromo derivative 2) Isocyanide 3) Diazonium salt 4) Acetyl derivative

16. The following turns brown on exposure to air and light

1) Nitrobenzene 2) m-dinitrobenzene 3) Aniline 4) Benzene diazonium chloride

17. In the preparation of N-phenyl benzene sulphonamide from aniline, the reagent used is

1) H_2SO_4 2) $SOCl_2$ 3) C_6H_5Cl 4) $C_6H_5SO_2Cl$

18. Which of the following is correct with respect to the order of basic natures of different amines given below ?

1) $C_6H_5NH_2 > NH_3 > CH_3NH_2 > (CH_3)_2NH$

2) $(CH_3)_2NH > CH_3NH_2 > C_6H_5NH_2 > NH_3$

3) $CH_3NH_2 > (CH_3)_2NH > C_6H_5NH_2 > NH_3$

4) $(CH_3)_2NH > CH_3NH_2 > NH_3 > C_6H_5NH_2$

19. Which of the following methods is used to prepare Aniline on large scale ?

A) $C_6H_5NO_2 + 6(H) \xrightarrow{Fe/H_3O^+} C_6H_5NH_2 + 2H_2O$

B) $C_6H_5NO_2 + 6(H) \xrightarrow{Sn/HCl} C_6H_5NH_2 + 2H_2O$

C) $C_6H_5OH_2 + NH_3 \xrightarrow[300^0C]{ZnCl_2} C_6H_5NH_2 + H_2O$

D) $C_6H_5Cl + 2NH_3 \xrightarrow{Cu_2O,\ 200^0C} C_6H_5NH_2 + NH_4Cl$

1) A only 2) B or C 3) C only 4) A or D

EXERCISE - I / ANSWERS

WORK SHEET - I

1) 1	2) 2	3) 4	4) 1	5) 1	6) 2	7) 1	8) 3	9) 4	10) 3
11) 3	12) 2	13) 3	14) 1	15) 3	16) 1	17) 3	18) 2	19) 1	20) 4
21) 1	22) 4	23) 3	24) 1	25) 3	26) 4	27) 1	28) 1	29) 4	30) 2
31) 3	32) 4	33) 4	34) 2	35) 4	36) 4	37) 3	38) 1	39) 3	40) 4
41) 4	42) 2	43) 3	44) 4	45) 4	46) 1	47) 1	48) 4	49) 4	50) 3
51) 4	52) 1	53) 2	54) 4	55) 2	56) 3	57) 2	58) 2	59) 2	60) 3
61) 3									

WORK SHEET - II

1) 3	2) 4	3) 3	4) 3	5) 1	6) 3	7) 3	8) 4	9) 3	10) 4
11) 4	12) 3	13) 4	14) 3	15) 4	16) 3	17) 4	18) 4	19) 1	

EXERCISE - II

WORKSHEET-IA

1.

Column - I	Column - II
1) $C_6H_5-NO_2 \rightarrow C_6H_5-NH_2$	(P) Alkaline medium
2) $C_6H_5-NO_2 \rightarrow C_6H_5-N=N-C_6H_5$	(Q) Glucose in NaOH
3) $C_6H_5-NO_2 \rightarrow C_6H_5-NH-NH-C_6H_5$	(R) Sn / HCl in acidic medium
4) $C_6H_5-NO_2 \rightarrow C_6H_5-NON-C_6H_5$	(S) Alkaline sodium stannite in basic medium

2.

Column - I	Column - II
1) Hofmann's reagent	(P) Primary amines
2) Hinsberg's reagent	(Q) Carbondisulphide
3) Mustard oil smell	(R) Oxayl chloride
4) Thiourea	(S) Separation of 1^0, 2^0 and 3^0 amines

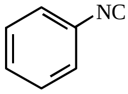
3.

Column - I	Column - II
1) The compound gives violet colour with NaOH and few drops of $CuSO_4$	(P) Urea
2) A compound gives white ppt with oxalic acid	(Q) Carbamic acid
3) A compound produced by the reaction of primary amine & carboxylic acid	(R) Amide linkage
4) A compound gives diazo coupling in strong alkaline medium	(S) Phenol

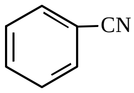
4. Column I — Column II

1) CH_3CH_2CN — (P) Undergoes electrophilic substitution

2) CH_3CH_2NC — (Q) Hydrolysis give primary amine

3) 

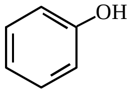
— (R) Reduction give a primary amine

4) 

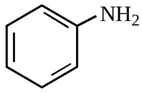
— (S) Hydrolysis give formic acid

(T) Reduction give a secondary amine

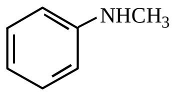
5. Column I — Column II

1) 

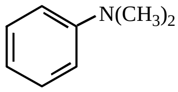
— (P) Reacts with nitrous acid

2) 

— (Q) Undergoes azo conpline reaction with diazoniam salts

3) 

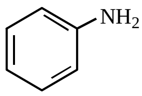
— (R) Undergoes electrophilic substitution

4) 

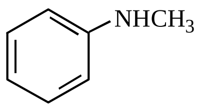
— (S) Reacts with hydrochloric acid to form salt

6. Column I — Column II

1) $CH_3CH_2CH_2NH_2$ — (P) Exhibits isomerism

2) 

— (Q) Reacts with HNO_2 to give yellow only liquid compounds

3) 

— (R) Reacts with Hinsbeng reasent to give compound soluble in NaOH

4) $CH_3CH_2NHCH_3$ — (S) Least basic of all the compounds

(T) Reach with CH_3I to give quaternary salt as the final product

EXERCISE - II / ANSWERS

WORKSHEET-IA

1) 1-QR; 2-QSQS; 3-Q; 4-P

2) 1-R; 2-S; 3-P; 4-PQ

3) 1-RS; 2-S; 3-PQ; 4-PQ

4) 1-PR; 2-PR; 3-PQR; 4-S

5) 1-R; 2-Q,S,T; 3-P,Q,S,T; 4-P,R

6) 1-Q,R; 2-P,Q,R,S,T; 3-P,Q,R,S ; 4-P,Q,R,S

EXERCISE - I

WORK SHEET - I

Biomolecules Carbohydrates:

1. The smallest units in living organism is
   1) Organelle 2) Tissue 2) Organ 4) Biomolecule

2. Oxygen balance in the atmosphere is maintained by a process called
   1) Photosynthesis 2) Protein synthesis 3) Respiration 4) Fat synthesis

3. The materials required for photosynthesis are
   1) CO_2 and H_2O 2) Chlorophyll only
   3) CO_2, H_2O and sunlight 4) CO_2, H_2O, sunlight and cholrophyll

4. Biological reactions associated with positive ΔG are called
   1) Exergonic 2) Endergonic 3) Exothermic 4) Endothermic

5. Which one of the following is a pentose sugar?
   1) Ribose 2) Arabinose 3) Lyxose 4) All the three

6. Monosaccharides contain
   1) Six carbon atoms only 2) Five carbon atoms only
   3) Four carbon atoms only 4) May contain 3 to 7 carbon atoms.

7. Raffinose on hydrolysis gives
   1) glucose, fructose and lactose 2) glucose, fructose and galactose
   3) fructose, glucose and erithrose 4) glucose, fructose and mannose

8. Which of the following is not an oligosaccharide
   1) Xylose 2) Maltose 3) Raffinose 4) Sucrose

9. A Laevorotatory sugar present in fruits is
   1) Glucose 2) Fructose 3) Sucrose 4) Lactose

10. Glucose is not
    1) a hexose 2) a carbohydrate 3) an oligosaccharide 4) an aldose

11. On heating glucose with Fehling solution, we get a precipitate whose colour is
    1) Orange 2) Red 3) Black 4) White

12. Glucose gives silver mirror test with Tollen's reagent. It shows the presence of
    1) Carboxylic group 2) Alcoholic group 3) Ketonic group 4) Aldehydic group

13. The reagent which forms crystalline osazone derivatives with glucose is
    1) Fehling solution 2) Phenyl hydrazine 3) Benedict's solution 4) Hydroxylamine

14. When glucose is heated with nitric acid the product is
    1) Lactic acid 2) Saccharic acid 3) Glycollic acid 4) oxalic acid

15. Glucose when heated with CH_3OH in presence of dry HCl gas gives α and β methyl glycosides because it contains.
    1) a $-CHO$ group 2) a $-CH_2OH$ group 3) a ring structure 4) Five $-OH$ groups

16. When hemiacetal reacts with alcohol the product is
    1) dihemiacetal 2) alcohol 3) acetal 4) Peptide

17. Freshly prepared α–D–glucose solution has specific rotation +111°and after sometime it becomes

1) +52° 2) +99° 3) –92° 4) None

18. Which does not show mutarotation?
1) Glucose 2) Fructose 3) Maltose 4) Sucrose

19. Ring structure of glucose is due to formation of hemiacetal and ring formation is in between
1) C_1 and C_5 2) C_1 and C_4 3) C_1 and C_3 4) C_2 and C_4

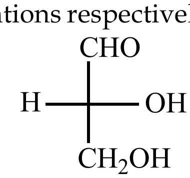
20. The wrong statement about glucose is
1) It has one 1°- alcoholic group 2) It has four 2° - alcoholic group
3) It has one aldehydic group 4) It has one 3° - alcoholic groups

21. Fructose contains
1) 3 secondary alcoholic groups 2) One ketonic group
3) 2 primary alcoholic groups 4) All the above

22. Glucose and mannose are
1) Mirror images 2) Anomers 3) Functional isomers 4) Isomers

23. Anomers have different
1) Physical Properties 2) Melting points 3) Specific rotation 4) All of these

24 The fischer projection of glyceraldehyde represents correct configuration in terms of D & L, R & S and d & l designations respectively



1) D, R, d
2) D, R, l
3) D, S, d
4) D, S, l

25. Which of the following is called as Laevulose ?
1) Glucose 2) Fructose 3) Lactose 4) Maltose

26. The sweetest sugar among the following is
1) Fructose 2) Glucose 3) Sucrose 4) Galactose

27. For naturally occuring fructose, the configuration and sign of specific rotation respectively
1) D , – 2) D , + 3) L , – 4) L , +

28. Glyceraldehyde and trihydroxy acetone are a pair of
1) Anomers 2) Enantiomeres 3) Functional isomers 4) Epimers

29. According to CIP rules, the configuration of (+) – glyceraldehyde can be designed as
1) R 2) S 3) D 4) L

30. Accroding to CIP rules, the configuration of chiral carbon atoms in D –(+) – glucose are
1) 2S, 3S, 4R, 5R 2) 2S, 3R, 4S, 5R 3) 2R, 3R, 4S, 5S 4) 2R, 3S, 4R, 5R

31. Glucose and cane sugar can't be distinguished by
1) Fehling's solution 2) Baeyer's reagent 3) Tollen's reagent 4) Benedict's solution

32. In which of the following all are disaccharides ?
1) Maltose, Sucrose, Lactose 2) Maltose, Lactose, Glucose
3) Glycogen, Lactose, Sucrose 4) Starch, Maltose, Lactose

33. A disaccharide on hydrolysis gives
1) Two molecules of the same monosaccharide
2) Two differnt monosaccharides
3) Three molecules of the same monosaccharide

4) Two molecules of the same or different monosaccharides.

34. Change in optical rotation of sucrose solution due to hydrolysis is called
1) Specific rotation 2) Inversion 3) Rotatory motion 4) Mutarotation

35. Inverted sugar is
1) Optically inactive form of sugar 2) Equimolecular mixture of glucose and fructose
3) Mixture of glucose and fructose 4) A variety of cane sugar

36. Which of the following is not a reducing sugar ?
1) Glucose 2) Sucrose 3) Lactose 4) Maltose

37. The glycosidic linkage in carbohydrates is
1) Link between two carbon atoms in a carbohydrate by a covalent bond
2) Link between a carbon atom and an oxygen atom
3) Link between carbon atoms in a carbohydrate through an oxygen atom formed by elemination of water.
4) None of these

38. Identify the one which does not belong to the class to which the other three belong based on hydrolysis
1) Sucrose 2) Fructose 3) Lactose 4) Maltose

39. Which among the following does not give a silver mirror test with Tollen's reagent ?
1) Fructose 2) Glucose 3) Galactose 4) Sucrose

40. Sucrose molecule contains
1) a glucopyranose and a fructopyranose units
2) a glucopyranose and a fructofuranose units
3) a glucopyranose and a fructopyranose units
4) a glucofuranose and a fructofuranose units

41. Maltose consists of
1) Only α -D glucose units 2) α and β - D Glucose units
3) Glucose and fructose 4) Fructose only

42. Which of the following is animal polysaccharide ?
1) Amylopectin 2) Glycogen 3) Amylose 4) Cellulose

43. Amylose consists of
1) Branched chain of α -D-glucose units 2) Unbranched chain of β -D-glucose units
3) Units of sucrose 4) Unbranched chain of α -D-glucose units

44. Amylopectin is a polymer of
1) β -D glucose 2) α -D glucose 3) β -D fructose 4) α - D fructose

45. In Amylopectin the linkage absent is
1) C_1 & C_4 2) C_1 & C_6
3) C_1 & C_2 4) Both C_1 & C_6 and C_1 & C_4

46. Direct conversion of starch into glucose may be carried out by
1) fermentation with diastase 2) fermentation with zymase
3) heating it with dil HCl 4) fermentation with maltase

BIOMOLECULES (CARBOHYDRATES)

47. The intermediate compound in the conversion of starch to glucose is

1) Lactose 2) Maltose 3) Fructose 4) Sucrose

48. Starch is turned to disaccharide in presence of

1) Maltase 2) Zymase 3) Diastase 4) Lactase

49. Which one of the following statements about starch is correct ?

1) It occurs in the cell wall of plants
2) It is a disaccharide
3) It gives a dark blue colour with iodine solution
4) It gives an orange red precipitate on boiling with Fehling's solution

50. Saliva helps in the digestion of

1) Fats 2) Starch 3) Proteins 4) Vitamins

51. Which of the following carbohydrates is the essential constituent of cell wall ?

1) Starch 2) Maltose 3) Cellulose 4) Sucrose

52. Cellulose is the polymer of

1) L- fructose 2) D-fructose 3) D-glucose 4) Amylose

53. Cellulose is rigid due to

1) Hydrogen Bonding 2) β (1,4) glycosidic linkage
3) cell wall material 4) vegetable matter

WORK SHEET - II

1. In majority of the cells, the principle biomolecules undergoing oxidation during respiration are

1) Vitamins 2) Fats 3) Proteins 4) Carbohydrates

2. Which of the following monosaccharides is a pentose

1) Glucose 2) Frutose 3) Ribose 4) Galactose

3. (A) : Dark reaction in photosynthesis is carried by ATP hydrolysis.

(R) : For dark reactions $\Delta G = -Ve$

1) Both (A) and (R) are true and (R) is the correct explanation of (A)
2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
3) (A) is true but (R) is false
4) (A) is false but (R) is true

4. Reactants $\rightarrow$ products ΔG =+63 KJ mole^{-1}. This reaction is made to takes place by coupling with

1) $ATP \xrightarrow{H_2o} ADP$ 2) $ATP \xrightarrow{H_2o} A$ 3) $ATP \xrightarrow{H_2o} AMP$ 4) $ADP \xrightarrow{H_2o} A$

5.

List - I	**List -II**
Chemical property of Glucose	Structure elucidationof Glucose
A) Acetylation	1) Presence of carbonyl group
B) Reaction with HCN	2)Six carbon atoms straight chain.
C) Reaction with HI/P	3)Presence of 1^0-alcohol group
D) Oxidation with HNO_3	4) Presence of 5 - OH group

Correct match is

	A	B	C	D		A	B	C	D
1)	1	2	3	4	2)	4	1	2	3
3)	3	1	2	4	4)	3	2	1	4

6. Which of the following reagents cannot distinguish between glucose and fructose ?
1) Tollen's reagent 2) Fehling's solution 3) Benedict's solution 4) All of these

7. Oxidation of glucose with Ag_2O gives
1) D-Gluconic acid 2) L-Glucaric acid 3) L-Gluconic acid 4) L-Glucaric acid

8. Fructose gives the silver mirror test because it
1) Contains an aldehyde group
2) Contains a keto group
3) Undergoes rearrangement under the alkaline conditions of the reagent to form a mixture of glucose and mannose
4) It has pyranose structure

9. α - D- Glucose and β -D-glucose differ from each other due to difference in one carbon with respect to its ?
1) Size of hemiacetal ring 2) Number of OH groups
3) Configuration 4) Conformation

10. In an aquouse solution of D-Glucose the percentages of α and β anomers at equilibrium condition are respectively
1) 80 and 20 2) 20 and 80 3) 36 and 64 4) 64 and 36

11. Which of the following statement is correct about D - Glucose & D - Galactose compounds ?
1) They are diastereomers 2) Both are components of lactose
3) They are C - 4 epimers 4) All the above are correct

12. D - Glucose shows mutarotation because,
1) it is dextrorotatory
2) it undergoes inter conversion between it's pyranose structure and furanose structure
3) it undergoes interconversion betwee it's α and $\beta(+)$ Glucopyranose structures
4) it undergoes interconversion with D(–) fructose

13. The number of chiral centres in the open-chain structure of Glucose is
1) 3 2) 4 3) 5 4) 6

14. The number of chiral centres in the cyclic hemiacetal form of Glucose is
1) 3 2) 4 3) 5 4) 6

15. The specific rotation of a freshly prepared solution of α – D – Glucose changes from a value of x° to a constant value of y°. The values of x and y are respectively
1) 19°, 52.5° 2) 111°, 52.5° 3) 52.5°, 19° 4) 52.5°, 111°

16. The end product (B) formed in the reaction sequence. Glucose $\xrightarrow[H_3O^+]{HCN} A \xrightarrow[\Delta]{HI, P} B$.
1) hexanoic acid 2) hexane 3) heptane 4) heptanoic acid

17. With how many molecules of acetic anhydride does one molecule of glucose react ?
1) 3 2) 4 3) 5 4) 6

18. Incorrect statements among the following
A) Sucrose is reducing sugar
B) Two α -D- glucose units in maltose are linked by 1,4 - linkage.

C) β - D - glucose and β - D - fructose units are linked by 1,4 - linkage in lactose

D) All polysaccharides are reducing nonsugars

1) Only AB 2) A, B, C, D 3) A, C, D only 4) A, B, C only

19. Which one of the following statements is not true for glucose ?

1) α –D(+)–glucose undergoes mutarotation

2) It has four asymmetric carbons in Fischer projection formula

3) It gives saccharic acid with Tollen's reagent

4) It reacts with hydroxyl amine

20. Regarding lactose some statements are given below

A) On hydrolysis lactose gives β - D - galactose and β - D - glucose

B) In lactose C_1 of β - D - galactose has acetal structure and C_1 of β - D - glucose has hemiacetal structure

C) In lactose molecule β -D - galactose is a nonreducing unit and β - D - glucose is a reducing unit

The correct statements are

1) A, C 2) A, B 3) B, C 4) A, B, C

21.

List - I	List - II
A) α and β - D Glucose	1) Mutarotation
B) (+) and (-) Glucose	2) Enantiomers
C) D and L-notations	3) Anomers
D) α from $\rightleftarrows$ β - form	4) configurational isomers

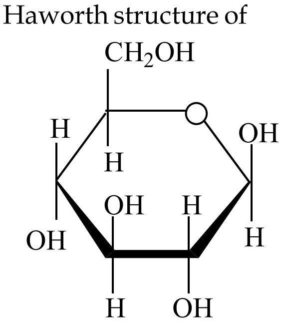
	A	B	C	D		A	B	C	D
1)	2	3	4	1	2)	2	3	1	4
3)	3	2	4	1	4)	3	2	1	4

WORK SHEET - III

1. Which of the following is not a polysaccharide?

1) Cellulose 2) Glycogen 3) Lactose 4) Starch

2. The structure pictured is the Haworth structure of



1) β –D– galactose 2) β–D– glucose

3) α – D–galactose 4) α – D–glucose

3. Which of the following statements is right

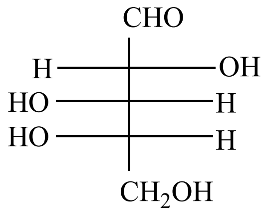
1) Reduction of glucose gives only sorbitol

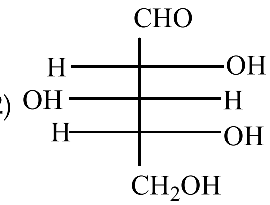
2) Reduction of fructose gives only mannitol

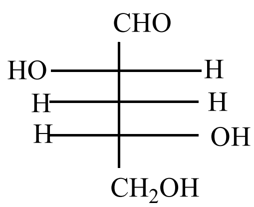
3) Reduction of fructose gives only sorbitol

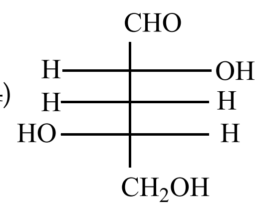
4) Reduction of glucose gives both sorbitol and mannitol

4. Which of the following on oxidation to give a dicarboxylic acid becomes a meso compound.

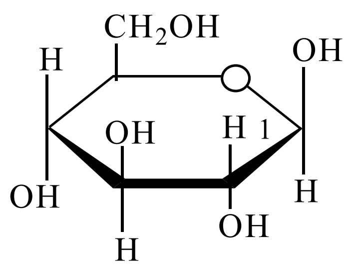
1) 

2) 

3) 

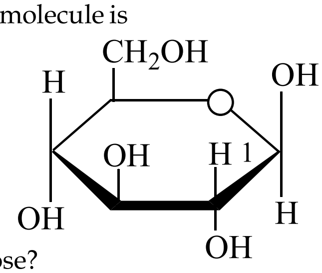
4) 

5. Chiral centres are found in



1) C1, C2, C3, C4, C5 and C6
2) C1 and C4 only
3) C2 and C3 only
4) C1, C2, C3, C4 and C5

6. At room temperature, the lowest energy conformation of this molecule is



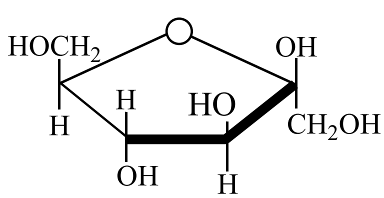
1) In chair form, all bulky groups occupy equitorial positions

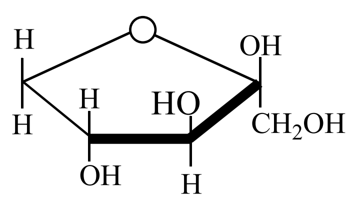
2) In chair form all bulky groups occupy axial positions

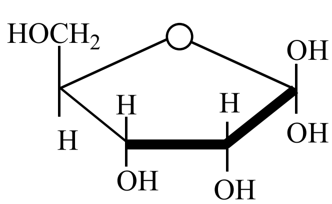
3) In chair form, groups at C1, C3, C5 occupy axial

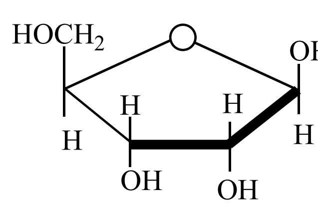
4) In chair form, groups at C1, C4 occupy axial position

7. Which of the following compounds is a β – aldopentofuranose?

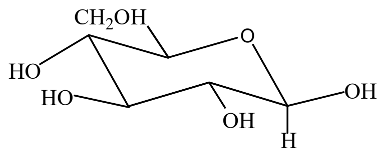
1) 

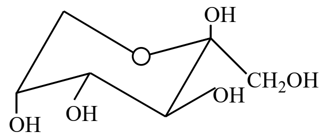
2) 

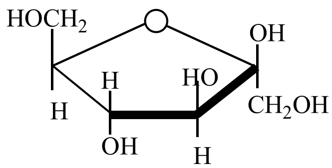
3) 

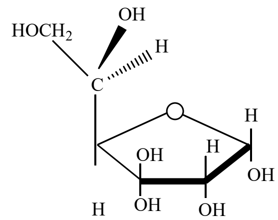
4) 

8. Which of the following compounds is a β–ketohexafuranose?

1) 

2) 

3) 

4) 

9. The optical rotation of the α form of a pyranose is +150.70, that of the β form is +52.80. In solution an equilibrium mixture of the anomers has an optical rotation of +80.20. The percentage of the α form at equilibrium is

1) 28 % 2) 32 % 3) 68 % 4) 72 %

10. A pyranose ring consists of a skeleton of

1) 5 carbon atoms and one oxygen atom
2) 6 carbon atoms
3) 6 carbon atoms and one oxygen atom
4) 4 carbon atoms and one oxygen atom.

EXERCISE - I / ANSWERS

WORK SHEET - I

01) 4	02) 1	03) 4	04) 2	05) 4	06) 4	07) 2	08) 1	09) 2	10) 3
11) 2	12) 4	13) 2	14) 2	15) 3	16) 3	17) 1	18) 4	19) 1	20) 4
21) 4	22) 4	23) 4	24) 1	25) 2	26) 1	27) 1	28) 3	29) 1	30) 4
31) 2	32) 1	33) 4	34) 2	35) 2	36) 2	37) 3	38) 2	39) 4	40) 2
41) 1	42) 2	43) 4	44) 2	45) 3	46) 3	47) 2	48) 3	49) 3	50) 2
51) 3	52) 3	53) 1							

WORK SHEET - II

1) 4	2) 3	3) 3	4) 2	5) 2	6) 4	7) 1	8) 3	9) 3	10) 3
11) 4	12) 3	13) 2	14) 3	15) 2	16) 3	17) 3	18) 3	19) 3	20) 4

WORK SHEET - III

01) 2	02) 2	03) 2	04) 1	05) 3	06) 4	07) 1	08) 2	09) 2	10) 1

EXERCISE - II

WORK SHEET- IA

01. Carbohydrate are :
1) hydrates of carbon
2) polyhydroxy aldehydes or ketones
3) polyhydroxy aldehydes
4) polyhydroxy ketones

02. Which carbohydrate is as important as steel and is employed in manufacture of many articles in daily use as well as most abundent in nature ?
1) Cellulose 2) Glucose 3) Starch 4) Sucrose

03. Carbohydrate contains :
a)- OH group 2) - CHO group 3) $\rangle C=O$ group 4) –COOH group

04. Aqueous solution of carbohydrate with 2 drops of alcoholic solution of α - naphthol and H_2SO_4 gives a ring at the junction. The colour of the ring is :
1) Yellow 2) green 3) violet 4) red

05. Which reagent is used for detection of sugar in urine ?
1) Baeyer's reagent
2) Ozonolysis
3) Fehling's reagent
4) Benedicts solution

06. The carbohydrates are important constituent of our diet ; they function as :
1) bio fuels to provide energy
2) shock absorbing pad
3) heat insulator
4) none of the above

07. Which molecule possess the general formula of carbohydrates, but is not a carbohydrate?
1) Glyceraldehyde
2) Arabinose
3) Acetic acid
4) All of these

08. Which does not contain carbohydrate ?
1) Cellulose 2) Wax 3) Fats 4) Oils

09. Artificial sweetener used in soft drinks is :
1) glucose
2) fructose
3) cellulose
4) asparatame

10. The letter 'D' in carbohydrates represents
1) its direct synthesis
2) its dextrorotation
3) its mutarotation
4) its configuration

11. Glucose reacts with methyl alcohol to give
1) α - methyl glucoside
2) β - methyl glucoside
3) an ester
4) an amide

12. Glucose and fructose posses the following similarities :
1) taste
2) action of heat
3) action of Tollens reagent
4) direction of optical rotation

13. Glucose is Converted by zymase into
1) dicarboxylic acid
2) alcohol
3) amino acids
4) aromatic acids

14. Glucose gives many reactions of aldehyde because :

1) it is hydrolysed to acetaldehyde 2) it is a polyhydroxy ketone
3) it is a cyclic aldehyde
4) it is a hemiacetal in equilibrium with its aldehyde form in solution

15. Osazone formation involves only 2 carbon atoms of glucose because of
1) chelation 2) oxidation
3) reduction 4) hydrolysis

16. Sugars are characterised by the preparation of osazone derivatives. Which sugar have identical osazones?
1) Glucose and lactose **2) Glucose and fructose**
3) Glucose and arabinose 4) Glucose and maltose

17. Glucose reacts with acetyl chloride to form pentacetyl glucose, it indicates presence of
1) five primary alcoholic groups 2) five secondary alcoholic groups
3) aldehydes as well as alcoholic group 4) five - OH groups

18. When glucose reacts with bromine water, the major product is :
1) gluconic acid 2) saccharic acid 3) sorbitol 4) galactose

19. Common table sugar is more formally described as :
1) glucose 2) lactose 3) maltose 4) sucrose

20. The sugar present in fruits is :
1) fructose 2) glucose 3) sucrose 4) galactose

21. The sugar present in honey is :
1) sucrose 2) glucose 3) fructose 4) maltose

22. Which of the following is dextro rotatory ?
1) Glucose 2) Fructose 3) Sucrose 4) None of these

23. A certain compound gives negative test with ninhydrin, but positive test with Benedict's solution. The compound is :
1) protein 2) monosaccharide 3) lipid 4) amino acid

24. Colour of osazone of glucose is
1) red 2) brown 3) yello 4) orange

25. On heating with conc. H_2SO_4 sucrose gives:
1) CO 2) SO_2 3) CO_2 4) none of these

26. Invert sugar is
1) chemically inactive form of sugar 2) equimolecular mixture of glucose and fructose
3) mixture of glucose and sucrose 4) a variety of cane sugar

27. The disaccharide having two glucose units is :
1) lactose 2) maltose 3) sucrose 4) ribose

28. Glycogen is :
1) monosaccharide 2) disaccharide 3) trisaccharide 4) polysaccharide

29. An example of disaccharide made up of two units of the same monosaccharides is
1) maltose 2) sucrose 3) lactose 4) none

30. Cane sugar is made of

1) 5 membered glucose ring and 5 membered fructose ring
2) 6 membered glucose ring and 6 membered fructose ring
3) 6 membered glucose ring and 5 membered fructose ring
4) 6 membered galactose ring and 6 membered fructose ring

31. Raffinose on hydrolysis gives
1) Glucose 2) Mannose 3) Fructose 4) Galactose.

32. Starch can be used as an indicator for the detection of the traces of :
1) glucose in aqueous solution 2) Proteins in blood
3) iodine in aqueous solution 4) urea in blood

33. The ultimate product of the hydrolysis of starch is :
1) glucose 2) fructose 3) sucrose 4) None of these

34. Cellulose is a linear polymer of
1) α –D–glucose 2) β –D–glucose 3) α -fructose 4) None of these

35. Starch is polymer of :
1) fructose 2) glucose 3) lactose 4) None of these

36. Starch is changed into disaccharides in presence of :
1) diastase 2) maltase 3) lactase 4) zymase

37. Which is used for making rayon (artificial silk)?
1) Starch 2) Cellulose 3) terephthalic acid 4) Adipic acid

38. After digestion, starch is converted into :
1) glucose 2) fructose 3) lactose 4) sucrose

39. An essential constituent of plant is :
1) cellulose 2) glucose 3) sugar 4) raffinose

40. Which of the following is/are soluble in water
1) Glucose 2) Cellulose 3) Fructose 4) Sucrose

41. Human digestive system does not hydrolyse :
1) starch 2) maltose 3) glycogen 4) cellulose

42. Starch is made up of :
1) glucose and fructose (2) amylose and amylopectin
3) amylose and glycogen 4) amylopectin and glycogen

EXERCISE - II / ANSWER

WORK SHEET- IA

01) 2	02) 2	03) 3	04) 2	05) 1	06) 3	07) 3	08) 1	09) 2	10) 3
1) 234	2) 1	3) 123	4) 3	5) 34	6) 1	7) 3	8) 234	9) 4	10) 4
11) 1,2	12) 123	13) 2	14) 4	15) 2	16) 2	17) 4	18) 1	19) 4	20) 1
21) 3	22) 1,3	23) 2	24) 3	25) 123	26) 2	27) 2	28) 4	29) 1	30) 3
31) 134	32) 3	33) 1	34) 2	35) 2	36) 1	37) 2	38) 1	39) 1	40) 134
41) 4	42) 2								

BIOCHEMICALS (ACIDS, PROTEINS, ENZYMES, VITAMINS & NUCLIC ACID)

EXERCISE - I

WORK SHEET - I

Amino acids & Proteins:

1. The functional group which found in amino acid is

1) –COOH group 2) $–NH_2$ group 3) $–CH_3$ group 4) both 1 & 2

2. The peptide linkage is

1) $\underset{|}{\overset{|}{-\mathrm{CH}}}-\mathrm{COO}-\mathrm{NH}$ 2) $\overset{|}{-\mathrm{CH}}-\mathrm{CO}-\mathrm{NH}-$

3) $\overset{|}{-\mathrm{CH}}-\mathrm{CH_2}-\mathrm{CO}-\mathrm{NH_2}$ 4) $\overset{|}{-\mathrm{CH}}-\mathrm{NH}-\mathrm{NH}-\mathrm{CO}-$

3. Which of the following contains nitrogen ?

1) Fats 2) Proteins 3) Carbohydrates 4) Hydrocarbons

4. The building unit of all proteins are

1) monosaccharides 2) lipids 3) amino acids 4) primary amines

5. A tripeptide contains ______ peptide links

1) 3 2) 2 3) 6 4) 4

6. The structural feature which distinguishes proline from α - amino acids is

1) It is optically inactive 2) It contains aromatic group

3) It is a dicarboxylic acid 4) It is a secondary amine

7. Which of the following amino acids possesses a non-polar side chain

1) isoleucine 2) serine 3) cysteine 4) glutamic acid

8. Which of following amino acids contains a thiol group in the side chain

1) methionine 2) cysteine 3) valine 4) serine

9. The amino acid which contain a hydroxy group in the side chain

1) cysteine 2) glutamine 3) serine 4) leucine

10. Essential amino acid among the following is

1) Glycine 2) Tryptophan 3) Alanine 4) Proline

11. Imino acid among these compounds is

1) Serine 2) Proline 3) Tyrosine 4) Lysine

12. The number of amino acids found in proteins that a human body can synthesize is

1) 20 2) 10 3) 5 4) 14

13. Which one of the following is not an essential anino acid ?

1) Valine 2) Leucine 3) Lysine 4) Alanine

14. Among the following the basic amino acid is

1) Glycine 2) Argenine 3) Proline 4) Cysteine

15. Which of the following statement is not correct ?
1) proteins are polyamides formed from amino aicds
2) except glycine, all other amino acids show optical activity
3) natural proteins are made up of L -isomers of amino acids
4) in α amino acids, $-NH_2$ and $-COOH$ groups are attached to different carbon atoms

16. For an aminoacid 'X', the isoelectric point is 6.1. Then 'X' is
1) Acidic amino acid 2) Basic amino acid
3) Neutral amino acid 4) Acidic or basic amino acid

17. Which of the following statement is not correct ?
1) amino acid can exist as inner salt
2) each polypeptide has one C - terminal and other N - terminal
3) Enzymes are naturally occurring simple proteins
4) The union of two amino acids produces two peptide linkages

18. The primary structure of a protein tells about
1) 3D arrangement of all atoms 2) shape of poly peptide chain
3) specific sequence of amino acids 4) 3D arrangement of oligo peptide chains

19. The dipeptide glycylalanine contains
1) glycine as C-terminal residue 2) glycine as N-terminal residue
3) alanine as N-terminal residue 4) either (1) or (b)

20. β -pleated structure of proteins is
1) Primary structure 2) Secondary structure 3) Tertiary structure 4) Quaternary structure

21. The back bone for different segments in a protein is in the following form
1) α -helix 2) α -pleated 3) coil 4) 1 or 3

22. The helical structure of proteins is stabilized by
1) H-bonding 2) Van der Waals' forces
3) ionic bond 4) peptide bond

23. Secondary structure of protein refers to
1) Mainly denatured proteins and structure of prosthetic groups
2) Three-dimensional structure, especially the bond between amino acid residues that are distinct from each other in the polypeptide chain
3) Linear sequence of amino acid residues in the polypeptide chain
4) Regular folding patterns of continuous portions of the polypeptide chain

24. The bond that determines the secondary structure of a protein is
1) Co-ordinate bond 2) Covalent bond 3) Hydrogen bond 4) Ionic bond

25. Which of the following is a globular protein?
1) Collagen 2) Myoglobin and Haemoglobin
3) Myosin 4) Enzymes

26. Tertiary structure of a protein will lead the polypeptide chains to get the following shapes
1) linear, octahedral 2) angular, tetrahedral 3) fibrous, globular 4) fibrous, planar

27. Maximum possible hydrogen bonds are present in

1) 3.6_{13} Helix 2) Keratin 3) Silk fibroin 4) β - D - fructose

28. Mark the wrong statement about denaturation of proteins
1) The primary structure of the protein does not change
2) Globular proteins are converted into fibrous proteins
3) Fibrous proteins are converted into globular
4) The biological activity of the protein is cancelled

29. The restriction of the biological nature and activity of proteins by heat or chemical agent is called
1) dehydration 2) denaturation 3) deamination 4) denitrogenation

30. Addition of an electrolyte such as sodium dodecyl sulphate causes
1) renaturation of proteins since it stabilises hydrophobic interactions
2) denaturation of proteins since it disturbs hydrophobic interactions
3) renaturation of proteins since it maintains necessary isoelectric point
4) denaturation of proteins since it causes cleavage of O = C – N – H bonds

31. Which of the following is an example of "irreversible denaturation" of a protein ?
1) boiling egg 2) change of amino acid
3) enzymatic action 4) its synthesis

32. Enzymes are
1) Complex nitrogenous substances produced in living cells 2) Steroids
3) Living organisms 4) Dead organisms

33. The non-protein portion of a protein is called
1) Functional 2) Characteristic group 3) Prosthetic 4) Enolic group

34. The prosthetic group attached to the enzymes of vitamin B_{12} at the time of reaction is
1) cellulose 2) 5 - deoxy adenosyl 3) β -methly aspartic acid 4) glutamic acid

35. The function of enzymes in the living system is to
1) transport oxygen 2) provide immunity
3) catalyse biochemical reactions 4) provide energy

36. Which one of the following is not a protein?
1) Wool 2) Nail 3) Hair 4) DNA

37. Enzymes belong to which class of compounds ?
1) Polysaccharides 2) Polypeptides
3) Polynitro heterocyclic 4) Hydrocarbons

38. Enzymes are made up of
1) Edible proteins 2) Proteins with specific structure
3) Nitrogen containing carbohydrates 4) Carbohydrates

39. Regarding enzymes, incorrect statement is
1) an enzyme is generally a protein 2) an enzyme may be a conjugated protein
3) enzyme gets deactivated during reactions 4) enzyme gets activated during reactions

40. Water soluble vitamins are
1) A,D 2) E,K 3) D,E 4) C,B

41. Which one of the following is a source of vitamin "A" ?
1) Milk 2) Liver 3) Yeast 4) Egg

BIOCHEMICALS (ACIDS, PROTEINS, ENZYMES, VITAMINS & NUCLIC ACID)

42. Night blindness is due to the deficiency of

1) Vitamin A 2) Hormones 3) Vitamin B_{12} 4) Riboflavin

43. The chief source of vitamin D is

1) Fish liver oil 2) Spinach 3) Cow dung 4) Citrous fruit

44. Antiricketic Vitamin is

1) Vitamin A 2) Vitamin B_{12} 3) Vitamin C 4) Vitamin D

45. Sterol, the basic unit of vitamin D, consists of 4 rings they are

1) Three 6-carbon rings one five carbon ring 2) Three 5-carbon rings one six carbon ring

3) Four 6-carbon rings only 4) Four 5-carbon rings only

46. Calcium absorption in intestine is the function of

1) Vitamin A 2) Vitamin B 3) Vitamin C 4) Vitamin D

47. Anti sterility factor which is necessary for fertility of men and birth process of the female is

1) Vitamin E 2) Vitamin A 3) Vitamin C 4) Vitamin D

48. Deficiency of Vitamin E leads to

1) Neurosis of heart muscles 2) Degeneration of lacrymal gland

3) Beri-Beri 4) Dermatitis

49. In all green leaves and vegetables which of the following vitamin is available ?

1) Vitamin A 2) Vitamin D 3) Vitamin K 4) Vitamin B_{12}

50. Which of the following vitamin is Naphthaquinone derivative ?

1) A 2) B 3) D 4) K

51. Anti haemorrhagic vitamin is

1) A 2) B 3) D 4) K

52. Deficiency of Vitamin B_2 leads to

1) Bow legs 2) Cheilosis 3) Pellegra 4) Vision loss

53. Which of the following vitamin is known as Nicotinic acid ?

1) B_1 2) B_2 3) B_3 4) B_5

54. Defficiency of the following vitamin leads to pellagra

1) A 2) B_2 3) B_5 4) C

55. Which of the following vitamin acts as important component of NADP (&) DPN ?

1) A 2) D 3) B_5 4) B_{12}

56. The following vitamin plays a role in transportation of amino acids across the cell membrane.

1) B_1 2) B_2 3) B_3 4) B_6

57. Convulsion is due to deficiency of vitamin

1) B_1 2) B_2 3) B_5 4) B_6

58. The cheaf source of vitamin "H" is

1) Yeast 2) Citrous fruit 3) Rice polish 4) Cereals

59. Deficiency of vitamin "H" leads to

1) Dermatitis 2) Loss of hair

3) Increase of blood cholesterol 4) All of these

60. Which of the following vitamin involves in the synthesis of RNA ?

1) A 2) B 3) C 4) B_9

61. Vitamin B_{12} is rich in

1) Sewage sludge 2) Liver of pig 3) Egg 4) all

62. Formation of RBC is because of

1) Mucoprotein 2) Vitamin B_{12} 3) Vitamin C 4) Both 1 & 2

63. Ascorbic acid resembles the structure of

1) Vitamin A 2) Glucose 3) Cellulose 4) Vitamin D

64. Deficiency of Vitamin "C" leads to

1) gum swelling 2) blead easily and teeth become loose

3) delay in wound healing 4) all

65. Dark red tongue, fissuring at corners of mouth and lips are the symptoms of the deficiency of which vitamin

1) C 2) A 3) B_2 4) D

66. Some examples are given in List - II and their type is given in List - I

List - I	**List - II**
1) Lipid	1) Histidine
2) Protein	2) Ascorbic acid
3) Amino acid	3) Cephalin
4) Hormone	4) Insulin
5) Vitamin	

	A	B	C	D		A	B	C	D
1)	4	1	2	5	2)	3	2	5	1
3)	3	5	1	4	4)	3	4	1	2

67. Vitamin B_6 is known as

1) Pyridoxine 2) Thiamine 3) Tocopherol 4) Riboflavin

68. Vitamin D is called

1) Ascorbic acid 2) Calciferol or ergocalciferol

3) Thiamine 4) Riboflavin

69. Vitamin E is also called

1) Cyanocobalamin 2) Tocopherol 3) Lactoflavin 4) Ascorbic acid

70. Which of the following vitamins is not soluble in water ?

1) C 2) B_1 3) B_2 4) D

71. The best source of vitamin C is

1) Codeliver oil 2) Egg yolk 3) Citrous fruits 4) Fish liver oil

72. The deficiency of vitamin K causes

1) Haemorrhage
2) Lengthening time of blood clotting
3) Inflammation of tunge
4) Both (1) and (b)

73. Milk contains vitamins

1) A, D and E
2) A, B_{12} and D
3) C, D and K
4) B_1, B_2 and D

74. Nervousness anaemia is caused by the deficiency of vitamin

1) B_1
2) B_2
3) B_6
4) B_{12}

75. Deficiency of vitamin E causes

1) Scurvy
2) Loss of appetite
3) Loss of sexual power and reproduction
4) Beri Beri

76. Which of the following is a fat soluble vitamin ?

1) Vitamin A
2) Riboflavin
3) Pyridoxine
4) Thiamine

77. The metal present in vitamin B_{12} is

1) Iron
2) Manganese
3) Cobalt
4) Magnesium

78. The deficiency of which of the following vitamins adversely affects eye sight ?

1) A
2) D
3) B_{12}
4) E

79. Match items List - I with those in List - II from the combinations shown:

List - I	List - II
I. Saliva	A. Genetic material
II. Nucleic acid	B. Digestive enzyme
III. Ascorbic acid	C. Antibiotic
IV. Testosterone	D. Sex hormone
	E. Vitamin

1) I - B; II - A; III - C; IV - E
2) I - B; II - A; III - E; IV - D
3) I - A; II - B; III - E; IV - C
4) I - C; II - B; III - A; IV - D

80. Match List - I with List - II and select the correct answer using the codes given below.

List - I	List - II
I.Anti-beriberi factor	A. Vitamin C
II. Pancreas	B. Glycerides
III. Palm oil	C. Vitamin B_1
IV. L (+)-Ascorbic acid	D. Insulin

1) I - C; II - D; III - B ; IV - A
2) I - C; II - D; III - A ; IV - B
3) I - A; II - B; III - D ; IV - C
4) I - A; II - B; III - C ; IV - D

81. Match List - I (name of vitamin) with List - II (deficiency result/disease) and select the correct answer using the codes given below.

List - I	List - II
I) Ascorbic acid	1) Beri-beri
II) Retinol	2) Cracked lips
III) Riboflavin	3) Scurvy

IV) Thiamine | 4) Night blindness

1) I - B; II - A; III - C; IV - D
2) I - A; II - B; III - C ; IV - D
3) I - D; II - C; III - B ; IV - A
4) I - C; II - D; III - B; IV - A

82. Match the following

List I	List II
1) B_1	I) Riboflavin
2) B_2	II) Pantothenic acid
3) B_3	III) Niacin
4) B_5	IV) Thiamine

The correct match is

	A	B	C	D		A	B	C	D
1)	IV	I	III	II	2)	IV	III	I	II
3)	III	IV	II	I	4)	IV	I	II	III

83. Which of the following constitutes the genetic material of the cell ?

1) Nucleic acids 2) Proteins 3) Lipids 4) Carbohydrates

84. Nuclic acids are called acids mainly because of the presence of

1) –COOH group
2) –OH group of sugar unit
3) –OH group of the heterocyclic base
4) –OH group of phosphate unit

85. Which of the following is not a pyrimidine base

1) Uracil 2) Thymine 3) Cytosine 4) Guanine

86. The following does not belong to either purines or pyrimidines

1) Tryptophan 2) Cytosine 3) Uracil 4) Adenine

87. Purine without ketonic group is

1) adenine 2) adenosine 3) cytidine 4) thymidine

88. The purine base present in RNA is

1) Guanine 2) Thymine 3) Cytosine 4) Uracil

89. 6 - amino purine is

1) Adenosine 2) Adenine 3) Cytosine 4) Thymine

90. The bases that are common in both RNA and DNA are

1) adenine, guanine, cytosine
2) adenine, guanine, thymine
3) adenine, uracil, cytosine
4) guanine, uracil, thymine

91. The pyrimidine bases present in RNA are

1) Cytosine and Thymine
2) Thymine and Uracil
3) Cytosine and Uracil
4) Uracil and Guanine

92. Adenosine monophosphae (AMP) is a

1) nucleotide 2) nucleoside 3) insecticide 4) antibacterial

93. An example for N - glycoside is

1) Adenine 2) Guanine 3) Cytosine 4) Cytidine

BIOCHEMICALS (ACIDS, PROTEINS, ENZYMES, VITAMINS & NUCLIC ACID)

94. Which one of the following is not present in DNA?

1) adenine 2) ribose 3) cytosine 4) guanine

95. A nitrogenous base which is present in the structure of RNA but not in DNA is

1) Uracil 2) Thymine 3) Cytosine 4) Guanine

96. The pentose sugar in DNA and RNA has

1) Open chain structure 2) Pyranose structure

3) Furanose structure 4) None of the above

97. Adenosine is an example of a

1) Nucleotide 2) Nucleoside 3) Purine base 4) Pyridine base

98. Nucleoside on hydrolysis gives

1) Pentose sugar and purine base

2) Pentose sugar, phosphoric acid, purine or pyrimidine base

3) Pentose sugar and a heterocyclic base

4) Heterocyclic base and phosphoric acid

99. In nucleic acids, the sequence is represented as

1) Phosphate - base - sugar 2) Sugar - base - phosphate

3) Base - sugar - phosphate 4) Base - phosphate - sugar

100. In nucleic acids, the nucleotides are linked to one another through

1) Hydrogen bond 2) Peptide bond 3) Glycosidic linkage 4) Phosphate groups

101. In a nucleotide the phosphate linkage is generally attached to

1) C - 1 of sugar 2) C - 2 of sugar 3) C - 5 of sugar 4) N - of base

102. In both DNA and RNA, heterocyclic base and phosphate ester linkages are at

1) C'_5 and C'_2 respectively of the sugar molecule

2) C'_2 and C'_5 respectively of the sugar molecule

3) C'_1 and C'_5 respectively of the sugar molecule

4) C'_5 and C'_1 respectively of the sugar molecule

103. Adenine pairs with thymine through

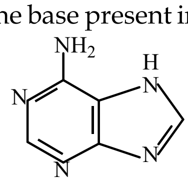
1) two hydrogen bonds 2) one hydrogen bond

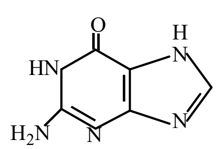
3) three hydrogen bonds 4) four hydrogen bonds

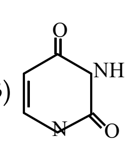
104. How many base pairs are present in each full turn of the DNA double helix ?

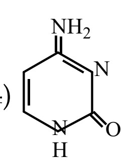
1) 4 2) 6 3) 8 4) 10

105. The base present in Cytidine : (

1) 

2) 

3) 

4) 

106. Hydrolysis of adenosine triphosphate involves rupture of

1) Base-sugar bond 2) Sugar-phosphate bond

3) P–O–P bond 4) P–N–P bond

107. The backbone of a nucleotide strand contains the following sequence of arrangement

1) Base–Sugar 2) Sugar–Phosphate 3) Base–Phosphate 4) $Base_1$–$Base_2$

108. Number of base pairs present in total DNA of human cell (human genome) is around

1) 2.9×10^5 2) 2.9×10^8 3) 2.9×10^7 4) 2.9×10^9

109. AT/GC value for human beings is

1) 1.52 2) 1.25 3) 0.93 4) 1

110. The ratio of number of A+G to the number of C + T in DNA of E. Coli species is

1) 1 : 1 2) 0.93 3) 1.52 4) 1.8

111. The couplings between base units of DNA is through :

1) Hydrogen bonding 2) Electrostatic bonding
3) Covalent bonding 4) Vander Waals forces

112. The main role of DNA in a living system is

1) It is the structural material of cell walls
2) It is an enzyme
3) It carries the hereditary characteristics of the organism
4) It participates in cellular respiration

113. Synthesis of identical copies of DNA is called

1) transcription 2) replication 3) translation 4) reverse transcription

114. Which of the following statements about RNA is incorrect ?

1) It has a single strand 2) It does not undergo replication
3) It contain any pyridimine base 4) It controls the synthesis of proteins

115. If the sequence of bases in DNA is TGAACCCTT, the sequence of bases in m-RNA is

1) ACUUGGGAA 2) TCUUGGGTT 3) ACUUCCCAA 4) TUCUGTUTU

116. The synthesis of m RNA will be in the direction of

1) $3^1 \rightarrow 5^1$ 2) $5^1 \rightarrow 3^1$ 3) by both 4) none

117. The genetic information of a human cell contained in _____ of chromosomes

1) 46 pairs 2) 23 pairs 3) 46 4) 23

118. Which of the following processes is "semi conservative" ?

1) translation 2) transcription 3) replication 4) reverse transciption

119. During the replication of DNA, one of the two strands is synthesized in pieces and are joined latter in the presence of enzyme called

1) RNA ligase 2) DNA ligase 3) r-RNA 4) m-RNA

120. Which of the following statements about DNA is not correct ?

1) It has a double helix structure
2) It undergoes replication
3) The two strands in a DNA molecule are exactly similar
4) It contains the pentose sugar, 2-deoxyribose

121. The RNAs which take part in the synthesis of proteins is/are

1) m-RNA 2) r- RNA 3) t-RNA 4) All the three above

BIOCHEMICALS (ACIDS, PROTEINS, ENZYMES, VITAMINS & NUCLIC ACID)

122. Each codon consists of _____ nitrogen bases

1) four 2) twenty 3) three 4) sixty four

123. Transcription is a process when

1) messenger RNA is formed from DNA 2) ribosome RNA is formed from DNA

3) protein is synthesised at the ribosomes 4) none of the above

124. The chemical change in DNA molecule that could lead to synthesis of protein with an altered amino acid sequence is called

1) Replication 2) Lipid formation 3) Cellular membrane 4) Mutation

125. The relationship between the nucleotide triplets and the amino acids is called

1) Translation 2) Transcription 3) Replication 4) A genetic code

EXERCISE - I /ANSWERS

WORK SHEET - I

1) 4	2) 2	3) 2	4) 3	5) 2	6) 4	7) 1	8) 2	9) 3	10) 2
11) 2	12) 2	13) 4	14) 2	15) 4	16) 3	17) 4	18) 3	19) 2	20) 2
21) 4	22) 1	23) 4	24) 3	25) 2	26) 3	27) 1	28) 4	29) 2	30) 2
31) 1	32) 1	33) 3	34) 2	35) 3	36) 4	37) 2	38) 2	39) 4	40) 4
41) 2	42) 1	43) 1	44) 4	45) 1	46) 4	47) 1	48) 1	49) 3	50) 4
51) 4	52) 2	53) 4	54) 3	55) 3	56) 4	57) 4	58) 1	59) 4	60) 4
61) 2	62) 2	63) 2	64) 3	65) 3	66) 3	67) 1	68) 2	69) 2	70) 4
71) 3	72) 4	73) 4	74) 4	75) 3	76) 1	77) 3	78) 1	79) 2	80) 1
81) 4	82) 4	83) 1	84) 4	85) 4	86) 1	87) 1	88) 1	89) 2	90) 1
91) 3	92) 1	93) 4	94) 2	95) 1	96) 3	97) 2	98) 3	99) 3	100) 4
101) 3	102) 3	103) 1	104) 4	105) 4	106) 3	107) 2	108) 3	109) 1	110) 1
111) 1	112) 3	113) 2	114) 3	115) 1	116) 2	117) 2	118) 3	119) 2	120) 3
121) 4	122) 3	123) 1	124) 4	125) 4					

BIOCHEMICALS (ACIDS, PROTEINS, ENZYMES, VITAMINS & NUCLIC ACID)

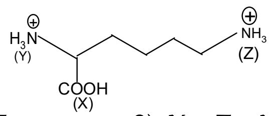
EXERCISE - II

WORK SHEET- IA

01. The simplest amino acid is
1) Crysteine 2) alanine 3) glycine 4) histidine

02. Amino acids usually exist in the form of Zwitter ions. This means that they consist of

1) the basic NH_2 group and acidic COOH group
2) the basic NH_3^+ group and the acidic COO^- group
3) basic COO^- group and acidic NH_3^+ group
4) no acidic or basic group as such

03. Consider in the compound given :  The correct order of acidic nature of the positions X, Y, Z is
1) Z > X > Y 2) X > Y> Z 3) X > Z > Y 4) Y > X > Z

04. One of the the essential alpha amino acids is
1) Iysine 2) glycine 3) serine 4) proline

05. The pH value of a solution in which a polar amino acid doesn't migrate under the influence of an electric field is called
1) isoelectronic point 2) isoelectric point 3) neutralisation point 4) None of these

06. An amino acid which contain secondary amine group is
1) serine 2) proline 3) tyrosine 4) lysine

07. The structural feature which distinguishes proline from natural $\alpha-$amino acids is that

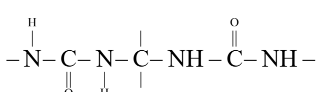
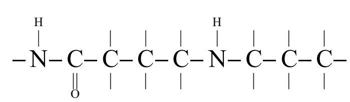
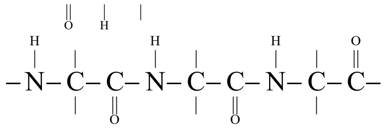
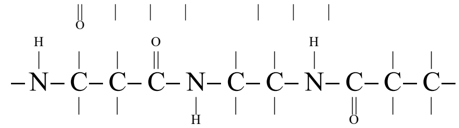
1) proline is optically inactive
2) proline contains an aromatiac group
3) proline is a dicaraboxylic acid
4) proline is a secondary amine

08. Which amino acid is achiral?
1) Alanine 2) Valine 3) Proline 4) None of these

09. Which is not a true statement?
1) α -carabon atom of α -amino acids is asymmetric except in glycine
2) All proteins contain α -amino acids of L-configuration
3) Human body can synthesize all proteins they need
4) At pH=7 both amino group and carboxylic group exists in the ionised form

10. The acid showing salt-like character in aqeous solutions is
1) acetic acid 2) benzoic acid 3) formic acid 4) α -amino acetic acid

11. Which of the following structure represents the peptide chain?

1) 
2) 
3) 
4) 

12. All common amino acids except one react with cold nitrous acid (HNO_2) and evolve nitrogen

gas, that amino acid is

1) cysteine 2) proline 3) histidine 4) None of these

13. The amino acid cysteine often forms a disulphide bond with another nearby cysteine. The reaction is best classified as

1) an addition 2) a substitution 3) an oxidation 4) a reduction

14. Which of the following is not an amino acid?

1) Glycine 2) Alanine 3) Histidine 4) Benzidine

15. Peptides on hydrolysis gives

1) amines 2) amino acids 3) ammonia 4) alcohols

16. Peptides are composed of amino acids joined by amide bonds. Which of the following statemaents is not correct?

1) Amide groups are more resistant to hydrolysis than are similar ester groups

2) p- π resonance stabilises the amide bond

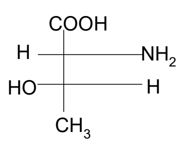
3) Stable conformations of peptide are restricted to those having planar amide groups

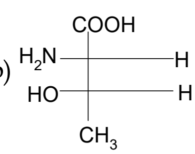
4) Amide groups doesnot participate in hydrogen bonding

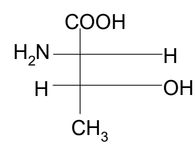
17. A tripeptide is composed equally of L-valine, L-tyrosine and L-alanine (one molecule of each). How many isomeric tripeptides of this kind may exist?

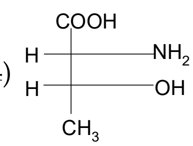
1) Three 2) four 3) Six 4) Eight

18. Threonine is (2S, 3R)-2-amino-3-hydroxybutanoic acid. Which of the following is threonine?

1) 

b) 

3) 

4) 

19. The methyl and ethyl esters of many amino acids are sold commercially as their hydrochloride salts. Why are these derivatives not sold in the form of the neutral amino esters?

1) The salts are solids, whereas many amino esters are liquids and are difficult to package

2) Rearrangement to the N-alkyalmino acid takes place

3) Polymerisation takes place by acylation of amine groups by an ester

4) An extra step in their preparation would be required

20. Which of the following is used in a colour test of amino acid?

1) Ninhydrin 2) Cyanogen bromide 3) Trypsin 4) Chymotrypsin

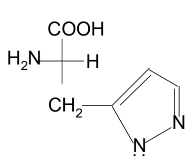
21. Isoelectric point is

1) the pH at which all molecular species are ionised and that carry the same charge

2) the pH at which all molecular species are neutral and uncharged

3) the pH at which half the molecular species are ionised (charge4) and other half unionised

4) the pH at which negataively and positively charged molecular species are present in equal concentration

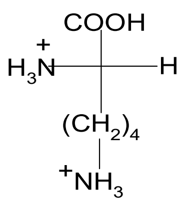
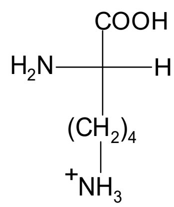
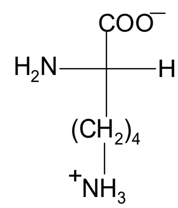
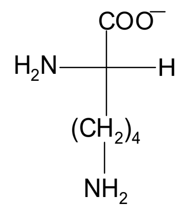
22. 

Histidine has pK_{a1}=1.8, pK_{a2}=9.2 and pK_{a3}=6.0. The isoelectric point, PI of histidine is likely to be

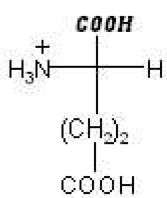
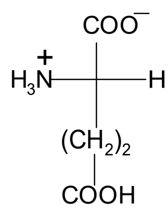
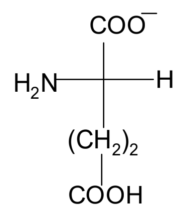
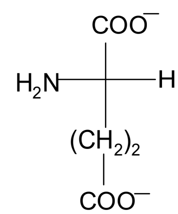
1) in between 1.8 and 6.0 2) in between 6.0 and 9.2
3) below 1.8 4) above 9.2

23. Glutamic acid, $H_2N-CH(CH_2CH_2COOH).COOH$ has pK_{a1}, (α-COOH) = 2.2, $pK_{a2}(\alpha-\overset{+}{N}H_3)$ = 9.8 and pK_{a3}(R group COOH) = 4.3. The isoelectric point of glutamic acid is
1) 5.9 2) 7 3) 10.2 4) 3.25

24. Which of the following is the major solute species in a solution of lysine at pH = 10.5(pI=9.6)?

1) 
2) 
3) 
4) 

25. Which of the following is the major solute species in a solution of glutamic acid at pH=4.3 ?

1) 
2) 
3) 
4) 

26. In an electric field, if an amino acid migrates towards cathode, the pH of the solution is said to be
1) less than pI 2) more than pI 3) equal than pI 4) 7 (seven)

27. Deamination of proteins occurs mainly in the
1) small intestine 2) liver 3) spleen 4) pancreas

28. During the process of digestion, the proteins present in food materials are hydrolysed to amino acids. The two enzymes are involved in the process.

Proteins $\xrightarrow{\text{Enzyme}-A}$ polypeptides $\xrightarrow{\text{Enzyme}-B}$ amino acids are respectively.

1) pepsin and trypsin 2) invertase and zymase
3) amylase and maltase 4) diastase and lipase

29. The helical structure or a secondary structure of proteins is stabilised by
1) peptide bonds 2) dipeptide bonds 3) H-bond 4) ether bonds

30. Proteins give
1) a violet colour with alkaline $CuSO_4$ solution
2) a purple colour on boiling with dilute ninhydrin solution
3) yellow colour on boiling with HNO_3
4) All the above

31. The destruction of the biological nature and activity of proteins by heat or chemical agent is called
1) dehydrataion 2) denaturation 3) denitrogenation 4) deamination

BIOCHEMICALS (ACIDS, PROTEINS, ENZYMES, VITAMINS & NUCLIC ACID)

32. Which of the following is not an important secondary structural feature in large peptides and proteins?

1) The α-helix 2) The β-turn 3) Chair conformation 4) The β-pleatead sheet

33. The primary structure of protein is based upon the

1) hydrogen bonding 2) van der Waal's attraction

3) ionic bonding 4) covalent bonding

34. Which of the following forces are responsible for tertiary structure?

1) Ionic bonding 2) H-bonding 3) Covalent bonding 4) Disulphide cross-linkage

35. Denaturation is the alteration or loss of the unique three-dimensional structure. Which of the following, can cause denaturation?

1) UV radiation 2) Changes in pH

3) Addition of heavy metals 4) Addition of alcohol or detergents

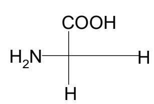
WORK SHEET- IIB

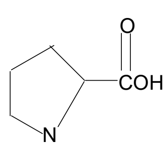
46. Match the following:

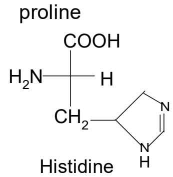
COLUMN I	COLUMN II
(1) CH_3-CH(OH)-CHO	(P) Carbohydrate
(2) $HOCH_2-CH(OH).CHO$	(Q) Amino acid
(3) $CH_3-CH(NH_2).COOH$	(R) Positive Tollen's test
(4) $Ph.CH(CH_2NH_2).COOH$	(S) Ninhydrint test

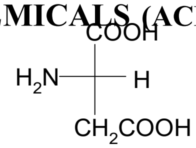
47. Match the following:

COLUMN I — COLUMN II

(1) 
Glycine
(P) Optically active amino acid

(2) 
proline
(Q) Suitable for van slyke estimation

(3) 
Histidine
(R) Neutral amino acid

(4) 

Aspartic acid

(S) Basic amino acid

EXERCISE - II / ANSWERS

WORK SHEET- IA

1) 3	2) 4	3) 1	4) 4	5) 1	6) 4	7) 2	8) 1	9) 4	10) 4
1) 3	2) 3	3) 2	4) 1	5) 2	6) 2	7) 4	8) 4	9) 4	10) 4
11) 3	12) 2	13) 3	14) 4	15) 1	16) 4	17) 3	18) 3	19) 3	20) 1
21) 4	22) 2	23) 4	24) 4	25) 2	26) 1	27) 1	28) 1	29) 3	
31) 4	31) 2	32) 3	33) 4	34) 2	35) 24 4				

WORK SHEET- IIB

46) 1 - R; 2 - P,R ; 3 - Q,S ; 4 - Q

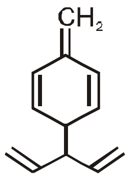
47) 1 - Q,R ; 2 - P,R ; 3 - P,Q,S ; 4 - P,Q

PRINCIPALS RELATED TO PRACTICAL CHEMISTRY

Section (A) : Catalytic hydrogenation and Monohalogenation

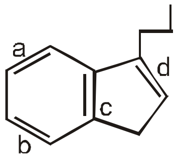
1. Which of the following hydrocarbons give same product on hydrogenation?
   (A) 2-Methylhex-1-ene & 3-Methylhex-3-ene
   (B) 3-Ethylhex-1-en-4-yne & 2-Methylhept-2-en-4-yne
   (C) 3-Ethylcycloprop-1-ene & 1,2-Dimethylcycloprop-1-ene
   (D) 2-Methylbut-2-ene & 3-Methylbut-1-ene

2. Number of moles of hydrogen will required for complete hydrogenation of one mole of following compound ?



   (A) 6 (B) 7 (C) 5 (D) 3

3. If 1 mole H_2 is reacted with 1 mole of the following compound, which double bond will be hydrogenated?



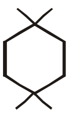
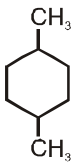
   (A) a (B) b (C) c (D) d

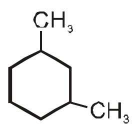
4. Only two isomeric monochloro derivatives are possible for -
   (A) n-Pentane (B) 2,4-Dimethyl pentane
   (A) n-Pentane (D) 2,3-Dimethyl butane

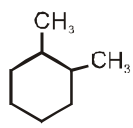
5. The number of possible monochloro derivatives of 2,2,3,3-Tetramethylbutane is -
   (A) 2 (B) 3 (C) 4 (D) 1

6. Which of the following alkene gives four monochloro (structural isomers) products after hydrogenation ?
   (A) Pent-2-ene (B) 2-Methylbut-2-ene
   (C) 3-Methylhex-2-ene (D) 2,3-Dimethylbut-2-ene

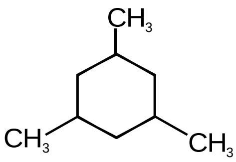
7. Which of the following compound will give four monochloro (structural) products on monochlorination?

(A) 
(B) 

(C) 

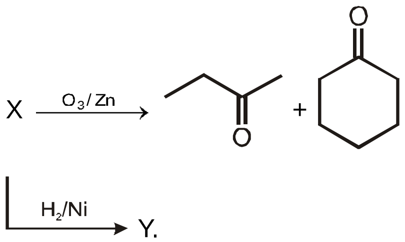
(D) 

8. How many products (structural isomers only) are formed by monochlorination of given compound?



   (A) 4 (B) 3 (C) 5 (D) 6

Section (B) : Ozonolysis reactions

9. 

The IUPAC name of compound Y is :

(A) 2-Cyclohexylbutane (B) 1-Methylpropylcyclohexane

(C) Butylcyclohexane (D) 1-Cyclohexylbutane

10. An alkene give two moles of HCHO, one mole of CO_2 and one mole of $CH_3-\underset{\overset{\|}{O}}{C}-CHO$ on ozonolysis. What is structure of alkene?

(A) $CH_2{=}CH-\underset{\overset{|}{CH_3}}{CH}-CH{=}CH_2$ (B) $CH_2{=}CH-\underset{\overset{|}{CH_3}}{CH}-CH{=}CH_2$

(C) $CH_3-\underset{\overset{|}{CH_3}}{C}{=}CH-CH{=}CH_2$ (D) $CH_2{=}C{=}CH-\underset{\overset{|}{CH_3}}{CH}-CH{=}CH_2$

11. An unknown compound on ozonolysis to give acid C_2 and a ketone CO. From this information, identifiy structure of unknown compound.

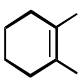
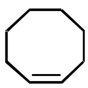
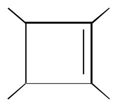
(A) $(CH_3)_2C{=}CHCH_2{-}CH_2CH_3$ (B) $CH_3CH_2\overset{\overset{CH_3}{|}}{C}{=}CHCH_2CH_3$

(C) $(CH_3)_2CHCH{=}CHCH_2CH_3$ (D) $CH_3CH_2CH_2CH{=}CHCH_2CH_3$

12. The chemical reactions of an unsaturated compund 'M' are given below. Determine the possible structural formula of 'M'

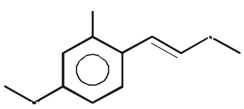
(M) C_8H_{14} $\xrightarrow{O_3}$ $C_8H_{14}O_2$(N)

(M) C_8H_{14} $\xrightarrow{H_2/Ni}$ C_8H_{16}(O) $\xrightarrow{Cl_2/h\upsilon}$ $C_8H_{15}Cl$(P) (only one monochloro product)

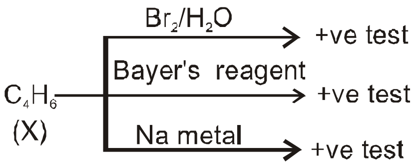
(A)  (B)  (C)  (D) 

Section (C) : Test for acidic hydrogen and unsaturation

13. When one mole of the given compound reacts with sodium metal then how many moles of H gas will release?

 (1mole)

(A) 1 mole (B) 1.5 mole (C) 2 mole (D) 0.5 mole

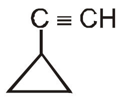
14. 

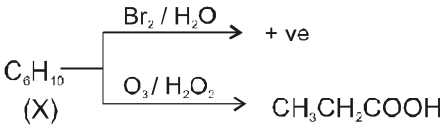
Compound X is

(A) $H_3C-C\equiv C-CH_3$

(B) $CH_2=CH-CH=CH_2$

(C) $CH_3-CH_2-C\equiv CH$

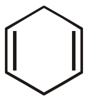
(D) 

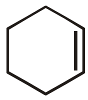
15. 

Identify X :

(A) $CH_3-CH_2-C\equiv C-CH_2-CH_3$

(B) $CH_3-C\equiv C-CH_2-CH_2-CH_3$

(C) 

(D) 

16. Ammonical AgNO gives white ppt after reaction with any compound then this reflects the presence of

(A) one CHO group

(B) one triple bond

(C) a terminal alkyne

(D) compound is unsaturated

17. Which of the following compound gives red ppt with $CuCl_4OH$?

(A) $CH_3-C\equiv C-CH_3$

(B) $CH_3-CH_2-C\equiv CH$

(C) $CH_3-CH_2-CH=CH_2$

(D) $CH_3-C\equiv C-CH=CH_2$

18. Identify the hydrocarbon having molecular formula C_5H_6 which gives white ppt with ammonical $AgNO_3$?

(A) 

(B) 

(C) 

(D) 

19. Red precipitate $\longleftarrow$ $P(C_5H_8)$ $\xrightarrow{\text{Ozonolysis}}$ 2-Methylpropanoic acid + compound (Q)

Structure of P can be -

(A) $CH_3-CH_2-CH_2-C\equiv CH$

(B) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}H}-C\equiv CH$

(C) $CH_3C\equiv C-CH_2-CH_3$

(D) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}H}-CH=CH_2$

20. Compound $A(C_3H_5N)$ gives precipitate with Tollen's reagent and H_2 gas is also evolved on addition of Na metal. Compound A can be :

(A) $CH_3-CH_2-C\equiv N$

(B) $H-C\equiv C-NH-CH_3$

(C) $CH_3-CH_2-N\equiv C$

(D) $CH_2=C=N-CH_3$

Section (D) : Test for alcohols, phenol, nitro group and alkyl halides

21. The group reagent for the test of alcohols is :

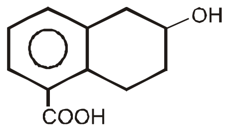
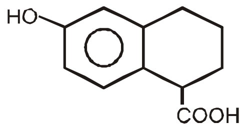
(A) Cerric ammonium nitrate

(B) Schiff's reagent

(C) Molisch's reagent

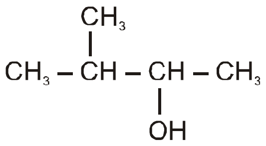
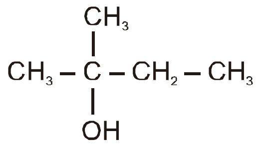
(D) Bromine water

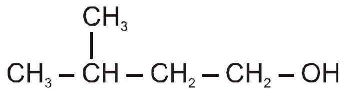
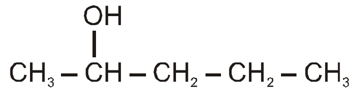
22. The following two compounds I and II can be distinguished by using reagents-

(I)  (II) 

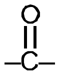
(a) aq. $NaHCO_3$ (b) Neutral $FeCl_3$ (c) Blue litmus solution
(d) Na metal (e) (e) $HCl/ZnCl_2$ anhydrous
(A) a or c (B) b or e (C) d or e (D) c or d

23. Structure of an organic compound (C5H12O), which responds with Lucas reagent immediately?

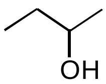
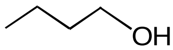
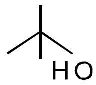
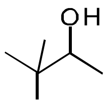
(A)  (B) 

(C)  (D) 

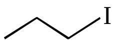
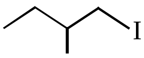
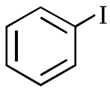
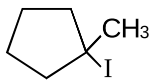
24. A compound is heated with zinc dust and ammonium chloride followed by addition of the Tollen's reagent. Formation of silver mirror indicates the presence of following group-

(A) –CHO (B)  (C) $-NO_2$ (D) $-NH_2$

25. During determination of degree of alcohol by Victor Meyer test, red colour is obtained by -

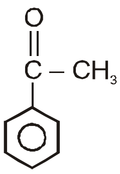
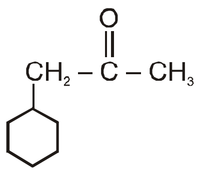
(A)  (B)  (C)  (D) 

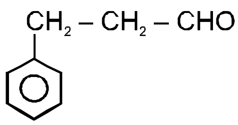
26. Which can give yellow precipatate with aqueous silver nitrate solution ?

(A)  (B)  (C)  (D) 

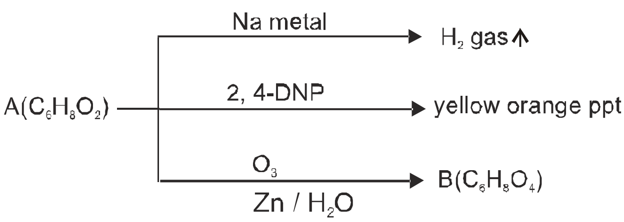
Section (E) : Test for aldehydes and ketones (carbonyl compounds)

27. Which of the following compound will not react with I_2/OH^-?

(A)  (B) 

(C)  (D) CH_3–CHO

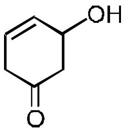
28. The compound A gives following reactions.

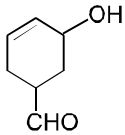


Its structure can be

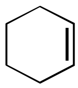
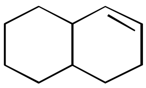
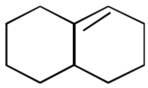
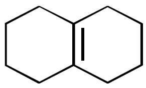
(A) $CH_2=CH-(CH_2)_2-\underset{\underset{O}{||}}{C}-CH_2OH$

(B) OHC–$(CH_2)_2$–CH=CH–COOH

(C) 

(D) 

29. A unsaturated hydrocarbon (P) on reductive ozonolysis produces a dicarbonyl compound (Q). (Q) forms precipitate with 2,4-DNP but no reaction with Tollen's reagent. Identify the structure of (P).

(A) 
(B) 
(C) 
(D) 

30. An organic compound C_8H_8O gives positive 2,4-DNP test and positive iodoform test. What is the common name of compound amongst the following which satisfies this criteria?

(A) Benzophenone
(B) Acetophenone
(C) Benzylalcohol
(D) para-ethyl phenol

Section (F) : Test for acids, esters and amides

31. An oragnic compound X ($C_4H_8O_2$) gives positive test with NaOH and phenolpthalein. Structure of X will be :

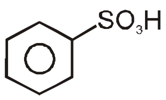
(A) $CH_3-CH_2-CH_2-\underset{\underset{O}{||}}{C}-OH$

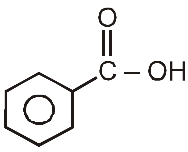
(B) $CH_3-\underset{\underset{O}{||}}{C}-\underset{\underset{O}{||}}{C}-CH_3$

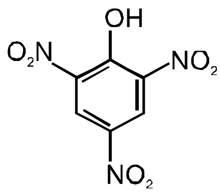
(C) $CH_3-\underset{\underset{O}{||}}{C}-O-C_2H_5$

(D) $CH_3-\underset{\underset{O}{||}}{C}-OCH_3$

32. Which of the following would produce effervescence with sodium bicarbonate?

(A) 

(B) 

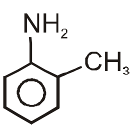
(C) 

(D) All of these

33. Which of the following compound will give smell of NH_3 with conc. NaOH ?

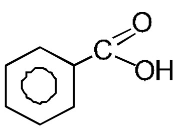
(A) $CH_3-CH_2-\underset{\underset{O}{||}}{C}-NH_2$

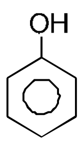
(B) $CH_3-\underset{\underset{O}{||}}{C}-CH_2-NH_2$

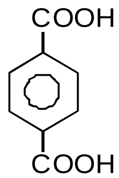
(C) 

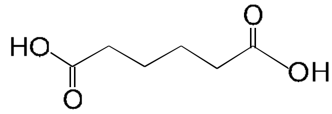
(D) $CH_3-CH_2-\underset{\underset{O}{||}}{C}-OH$

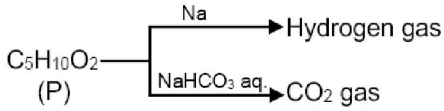
34. An aromatic organic compound with 68.9% of C and 4.92% of H gives CO_2 with $NaHCO_3$. The organic compound is :

(A) 

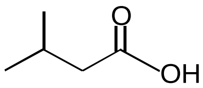
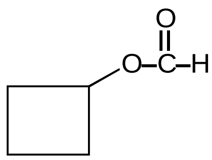
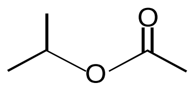
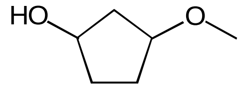
(B) 

(C) 

(D) 

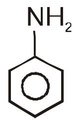
35. 

Find the isomer of P which fails to give above tests ?

(A) 
(B) 
(C) 
(D) 

Section (G) : Test for amines

36. Which of the following will not give positive test with $CHCl_3$ / KOH ?

(A) $CH_3–CH_2–NH–CH_3$
(B) $CH_3–CH_2–CH_2–NH_2$
(C) 
(D) $CH_3 – \underset{|}{\overset{CH_3}{CH}} – NH_2$

37. A positive carbylamine test is given by :

(A) N,N-dimethylaniline
(B) 2,4-dimethylaniline
(C) N-methyl-o-methylaniline
(D) N-methylaniline

38. The Hinsberg's method is used for :

(A) preparation of primary amines
(B) preparation of secondary amines
(C) preparation of tertiary amines
(D) separation of amine mixtures

39. Which of the following amine does not react with Hinsberg's reagent ?

(A) $CH_3CH_2NH_2$ (B) $(CH_3CH_2)_2NH$ (C) $(CH_3CH_2)_3N$ (D) All of these

Section (H) : Qualitative analysis of elements

40. In the Lassaigne's test, one of the organic compounds gave red colour with $FeCl_3$. Compound can be :

(A) Na_2S (B) NH_2CSNH_2 (C) C_6H_5Cl (D) NaCN

41. The compound that does not give a blue colour in Lassaigne's test is

(A) $C_6H_5–NH_2$ (B) CH_3CONH_2 (C) $NH_2–NH_2$ (D) $C_6H_5–NO_2$

42. Nitrogen containing organic compound when fused with sodium metal forms:

(A) $NaNO_2$ (B) NaCN (C) $NaNH_2$ (D) NaNC

43. The sodium extract of an organic compound on acidification with acetic acid and addition of lead acetate solution gives a black precipitate. The organic compound contains-

(A) Nitrogen (B) Halogen (C) Sulphur (D) Phosphorus

44. The sodium extract of an organic compound on treatment with $FeSO_4$ solution, $FeCl_3$ and HCl gives red solution. The Red colour of :

(A) $Fe(CN)_3$ (B) $Fe_4[Fe(CN)_6]_3$ (C) $[Fe(SCN)]^{2+}$ (D) FeS

Section (I) : Quantitative analysis of elements

45. In Kjeldahl¡¦s method, nitrogen present in the sample is estimated as :

(A) N_2 (B) NH_3 (C) NO_2 (D) None of these

46. Catalyst used in Kjeldahl¡¦s method for the estimation of nitrogen is :
(A) Sodium (B) Magnesium (C) Mercury (D) Copper

47. The dessicants used for absorbing water during Liebig¡¦s method for estimation of carbon and hydrogen are:
(A) $CaCl_2$ (B) Na_2SO_4 (C) $MgSO_4.7H_2O$ (D) $Mg(ClO_4)_2$

48. The equivalent weight of an acid is equal to
(A) Molecular weight $\times$ acidity (B) Molecular weight $\times$ basicity
(C) Molecular weight/basicity (D) Molecular weight/acidity

49. Liebig test is used to estimate :
(A) H (B) C (C) C and H both (D) N

50. In Carius method of estimation of halogen, 0.15 g of an organic compound gave 0.12 g of AgBr. What is the percentage of bromine in the compound ?
(A) 18.05 (B) 53.19 (C) 63.10 (D) 34.04

51. An organic compound having molecular mass 60 is found to contain C = 20%, H = 6.67% and N = 46.67%. The compound is
(A) CH_3NCO (B) CH_3CONH_2
(C) $(NH_2)_2CO$ (D) $CH_3CH_2CONH_2$

52. A gaseous hydrocarbon has 85% carbon and vapour density of 28. The possible formula of the hydrocarbon will be.
(A) C_3H_6 (B) C_2H_4 (C) C_2H_2 (D) C_4H_8

53. Quantitative measurement of nitrogen in an organic compounds is done by the which method?
(A) Berthelot method (B) Beilstein method (C) Lassaigne test (D) Kjeldahl's method

54. Kjeldahl¡¦s method of estimation for nitrogen is not applicable to-
(A) Acetamide (B) Aliphatic amines (C) Diazo compounds (D) Amino acids

Section (A) : Ist Group

55. A metal nitrate reacts with KI solution to give yellow precipitate which on addition of excess of more concentrated solution (6 M) of KI dissolves forming a solution. The cation of metal nitrate is :
(A) Hg_2^{2+} (B) Ag^+ (C) Pb^{2+} (D) Cu^{2+}

56. Three separate samples of a solution of a single salt gave these results. One formed a white precipitate with excess ammonia solution, one formed a white precipitate with dilute NaCl solution and one formed a black precipitate with H2S. The salt could be :
(A) $AgNO_3$ (B) $Pb(NO_3)_2$ (C) $Hg(NO_3)_2$ (D) $Mn(NO_3)_2$

57. Consider the following observation :

M^{n+} + HCl (dilute) $\longrightarrow$ white precipitate $\xrightarrow{\Delta}$ water soluble $\xrightarrow{CrO_4^{2-}}$ yellow precipitate.

The metal ion M^{n+} will be :
(A) Hg^{2+} (B) Ag^+ (C) Pb^{2+} (D) Sn^{2+}

58. When calomel reacts with NH_4OH solution the compound formed is :
(A) Hg_2Cl_2 (B) $Hg(NH_2)Cl$ (C) $Hg(NH_3)_2Cl$ (D) $HgCl_2.NH_3$

59. Consider the following equilibrium :

$AgCl\downarrow + 2NH_3 \rightleftharpoons [Ag(NH_3)_2]^+ + Cl^-$ White ppt of AgCl appears on adding

(A) NH_3 (B) aq. NaBr (C) aq. HNO_3 (D) aq. NH_4I

60. AgCl with NH_3 forms a complex :
(A) $[Ag(NH_3)_2]Cl$ (B) $AgNO_3$ (C) $[Ag(NH_2)_2]Cl$ (D) Ag mirror

Section (B) : IIA Group

61. Sometimes yellow turbidity appears while passing H_2S gas even in slightly acidic medium in the absence of II group radicals. This is because :
(A) sulphur is present in the mixture as impurity.
(B) IV group radicals are precipitated as sulphides.
(C) of the oxidation of H_2S gas by some acid radicals.
(D) III group radicals are precipitated as hydroxides.

62. H_2S in the presence of HCl precipitates II group but not IV group because :
(A) HCl activates H_2S
(B) HCl increases concentration of Cl^-
(C) HCl decreases concentration of S^{2-}
(D) HCl lowers the solubility of H_2S in solution

63. When small amount of SnCl2 is added to a solution of Hg2+ ions, a silky white precipitate is obtained. The silky white precipitate is due to the formation of :
(A) Hg_2Cl_2 (B) $SnCl_4$ (C) Sn (D) Hg

64. When excess of dilute NH_4OH is added to an aqueous solution of copper sulphate an intense blue colour is developed. This is due to the formation of :
(A) $[Cu(NH_3)_6]^{2+}$ (B) $Cu(OH)_2$ (C) $[Cu(NH_3)_4]^{2+}$ (D) $(NH_4)_2SO_4$

65. A black sulphide is formed by the action of H_2S on :
(A) cupric chloride (B) cadmium chloride (C) zinc chloride (D) ferric chloride.

66. Which one of the following salts will produce clear and transparent original solution in 2M HCl?
(A) Ag_2CO_3 (B) $Pb(CO_3)$ (C) Hg_2CO_3 (D) $CuCO_3$

67. When bismuth chloride is poured into a large volume of water the white precipitate produced is of :
(A) BiO.OH (B) $Bi_2\ O_3$ (C) BiOCl (D) $Bi(OH)_3$

68. In which of the following pairs the precipitates are red and black coloured respectively and both precipitates are soluble in excess KI solution ?
(A) HgI_2, Hg_2I_2 (B) HgI_2, BiI_3 (C) Cu_2I_2, Agl (D) CdI2, Pbl_2

69. A metal chloride original solution (i.e. O.S) on mixing with K2CrO4 solution gives a yellow precipitate soluble in aqueous sodium hydroxide. The metal may be :
(A) mercury (B) iron (C) silver (D) lead

Section (C) : IIB Group

70. Which of the following metal sulphide is soluble in YAS (yellow ammonium sulphide) :
(A) HgS (B) PbS (C) Bi_2S_3 (D) Sb_2S_3

72. When white crystalline precipitate of magnesium ammonium arsenate is treated with acidified silver nitrate solution, precipitate of silver arsenate is formed. The colour of precipitate is :
(A) Yellow (B) Brownish red
(C) White (D) Brownish black

Section (D) : IIIrd Group

73. When NH_4Cl is added to a solution of NH_4OH :
(A) the dissociation of NH_4OH increases.
(B) the concentration of OH^- increases.
(C) the concentrations of both OH^- an NH_4^+increase.
(D) the concentration of OH^- ion decreases.

74. To avoid the precipitation of Hydroxides of Zn^{2+}, Mn^{2+} and Ni^{2+} along with those of Fe^{3+}, Al^{3+} and Cr^{3+} the third group solution should be :
(A) Concentrated HNO_3 is added (B) Treated with excess of NH_4Cl
(C) Concentrated H_2SO_4 is added (D) Treated with excess of NH_4OH

75. An inorganic lewis acid (X) fumes in moist air, and intensity of fumes increases when a rod dipped in NH_4OH is brought near to it. An acidic solution of (X) on addition of NH_4Cl and NH4OH gives a precipitate which dissolves in NaOH solution. A solution of (X) does not give precipitate with H_2S Hence, compound (X) is
(A) $FeCl_3$ (B) $AlCl_3$ (C) $ZnCl_2$ (D) None of these

75. An original solution of an inorganic salt in dilute HCl gives a brown colouration with potassium hexacyanidoferrate (III) and reddish brown colouration with sodium acetate solution. The cation of the salt is :
(A) Ni^{2+} (B) Fe^{3+} (C) Cu^{2+} (D) none

76. $Fe(OH)_3$ and $Cr(OH)_3$ precipitates can be completely separated by :
(A) Aq. NH_3 (B) HCl (C) $NaOH/H_2O_2$ (D) H_2SO_4

Section (E) : IVth Group

77. A coloured solution of a salt gives following reactions.
(i) It gives white precipitate with sodium hydroxide which becomes brown on exposure to air.
(ii) It gives white precipitate with ammonia solution which is soluble in ammonium salts.
(A) Mn^{2+} (B) Zn^{2+} (C) Al^{3+} (D) Ni^{2+}

78. A metal salt form precipitate with H2S in presence of (NH_4OH + NH_4Cl) and this precipitate is soluble in acetic acid then metal sulphide could be :
(A) ZnS (B) CoS (C) MnS (D) NiS

79. To increase significantly the concentration of free Zn^{2+} ion in a solution of the complex ion $[Zn(NH_3)4]^{2+}$

$$Zn^{2+}\,(aq) + 4NH_3\,(aq) \rightleftharpoons [Zn(NH_3)_4]^{2+}\,(aq)$$

add to the solution some :
(A) H_2O (B) HCl (aq) (C) NH_3(aq) (D) NH_4Cl (aq)

80. An aqueous solution of colourless metal sulphate M, gives a white precipitate with NH_4OH. This was soluble in excess of NH_4OH. On passing H_2S gas through this solution a white precipitate is formed. The metal M in the salt is :
(A) Ca (B) Ba (C) Al (D) Zn

81. A metal salt solution when treated with dimethyl glyoxime and NH4OH gives a rose red complex. The metal is :
(A) Ni (B) Zn (C) Co (D) Mn.

82. The ion that can not be precipited by H2S in presence of dil. HCl.
(A) Pb^{2+} (B) Bi^{3+} (C) Cu^{2+} (D) Ni^{2+}

Section (F) : Vth, VIth and Zero Group

83. Aqueous Solution of BaBr2 gives yellow precipitate with :
(A) K_2CrO_4 (B) $AgNO_3$
(C) $(CH_3COO)_2Pb$ (D) (A) and (B) both

84. The addition of K2CO3 (aq) to the following solution is expected to produce a precipitate in every case but that one which does not produce precipitate is :
(A) $BaCl_2$(aq) (B) $CaBr_2$(aq)
(C) Na_2SO_4(aq) (D) $Pb(NO_3)_2$ (aq)

85. An aqueous solution of salt gives white precipitate with AgNO3 solution as well as with dilute H_2SO_4. It may be
(A) $Pb(NO_3)_2$ (B) $Ba(NO_3)_2$ (C) $BaCl_2$ (D) $CuCl_2$

86. Mg is not precipitated in V group because :
(A) $MgCO_3$ is soluble in water. (B) Ksp of $MgCO_3$ is high.
(C) $MgCO_3$ is soluble in NH_4OH. (D) None.

87. A metal salt solution form a yellow ppt with potassium chromate in acetic acid, a white ppt with dilute sulphuric acid but gives no ppt with sodium chloride or iodide it is :
(A) Lead carbonate (B) Basic lead carbonate
(C) Barium nitrate (D) Strontium nitrate

88. A white crystalline substance dissolves in water. On passing $H2_S$ in this solution, a black precipitate is obtained. The black precipitate dissolves completely in hot HNO_3. On adding a few drops of concentrated H_2SO_4, a white precipitate is obtained. This precipitate is that of :
(A) $BaSO_4$ (B) $SrSO_4$ (C) $PbSO_4$ (D) $CdSO_4$

89. The brown precipitate formed by passing ammonia into Nessler's reagent in due to the formation of
(A) HgI_4^{2-} (B) $NH_2O–Hg–Hgl$ (C) $NH_2–Hg–O–Hg–I$ (D) $NH_3–Hg–I$

Section (A) : Heating in dry test tube

90. When a metal sulphate is heated in dry test tube, the colour changes from blue to white. Then metal sulphate may be:
(A) $BaSO_4$ (B) $CuSO_4.5H_2O$ (C) Na_2SO_4 (D) None of these

91. Which of the following can not evolve more than one gas (vapour) if heated in dry test tube.
(A) $NaNO_3(s)$ (B) $MgCO_3(s)$
(C) $FeSO_4(s)$ (D) $(NH_4)2Cr_2O_7(s)$

92. On heating, a white amorphous inorganic compound becomes yellow and on cooling, turns white again.The salt may be
(A) $PbCO_3$ (B) $MgCO_3$ (C) $ZnCO_3$ (D) K_2CO_3

93. Which of the following metal carbonates liberate. $CO_2(g)$ on heating :
(A) Na_2CO_3 (B) K_2CO_3 (C) Rb_2CO_3 (D) Ag_2CO_3

94. In which of the following reactions a brown coloured gas is evolved ?
(A) KBr (s) + dil. $H_2SO_4 \longrightarrow$ (B) $NH_4NO_2 \xrightarrow{\Delta}$
(C) $NaNO_3 \xrightarrow[800^0C]{\Delta}$ (D) $AgNO_3(s)$ + conc. $H_2SO_4 \longrightarrow$

Section (B) : Flame and borax bead test

95. Why is concentrated HCl used to dissolve the given metal salt in the flame test ?
(A) strong acids produce better flame test.
(B) HCl is volatile
(C) Volatile metal chloride produce better flame test.
(D) sharper coloured are seen in the flame in presence of Cl^- ions.

96. The hottest part of the flame of a Bunsen burner is the
(A) Blue Zone (B) Zone of complete combustion
(C) Zone fo partial combustion (D) All parts of the flame are equally hot.

97. Metal (M) shows crimson red colour in flame test and its halide is deliquescent then metal (M) could be:
(A) Li (B) Mg (C) Ca (D) Ba

98. In Borax bead test, metal oxides react with B_2O_3 and form a coloured bead. This bead contains.
(A) orthoborate ion (B) metaborate ion (C) double oxide (D) tetraborate ion

99. Which one of the following ions does not give borax bead test :
(A) Cr^{3+} (B) Cu^{2+} (C) Mn^{2+} (D) Zn^{2+}

100. In the Borax bead test of Co^{2+}, the blue colour of bead is due to the formation of :
(A) B_2O_3 (B) Co_3B_2 (C) $Co(BO_2)_2$ (D) CoO

101. A salt gives white residue in charcoal cavity test but in cobalt nitrate test it gives pink mass. It represents:
(A) Zn^{+2} (B) Al^{+3} (C) Mg^{+2} (D) PO_4^{-3}

Section (C) : dil. HCl / dil. H2SO4 group

102. Which of the following anions are identified by dil. HCl :
(A) NO_2^-, NO_3^{2-}, CO_3^{2-} (B) NO_2^-, NO_3^-, SO_{32}^{-}
(C) S^{2-}, SO_3^{2-}, NO_2^- (D) CH_3COO^-, I^-, CO_3^{2-}

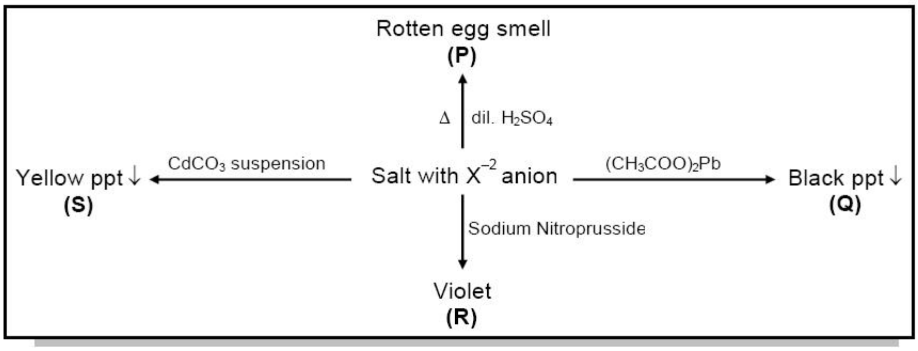
103. Two inorganic compounds **A** and **B** were heated in a dry test tube. **A** evolved a colourless gas which turned lead acetate paper black and **B** evolved a gas which turned lime water milky. The anions in **A** and **B** respectively are :
(A) SO_3^{2-}, CO_3^{2-} (B) SO^{2-}, CO_3^{2-} (C) PO_4^{3-}, HSO_3^- (D) S^{2-}, NO_3^-

104. If addition of conc. H_2SO_4 is made to an unknown salt, a colourless and odourless gas is produced then which of the following can be present ?
(A) CO_3^{2-} (B) S^{2-} (C) Cl^- (D) NO_3^-

105. A gas turns lime water milky and acidified $K_2Cr_2O_7$ solution green then gas is :
(A) HCl (B) H_2S (C) SO_2 (D) CO_2

106. A gas has smell like rotten egg and turns lead acetate paper black. The gas is :
(A) NO_2 (B) H_2S (C) CO_2 (D) SO_2

106.



Anion (X2¡V) is:
(A) CO_3^{2-} (B) SO_3^{2-} (C) SO^{2-} (D) $S_2O_3^{2-}$

107. The acidic solution of a salt produces blue colour with KI starch solution. The reaction indicates the presence of :
(A) Sulphite (B) Bromide (C) Nitrite (D) Chloride

108. Sulphide ion reacts with $Na_2[Fe(CN)_5NO]$ to form a purple coloured compound (X). In this reaction oxidation state of iron.
(A) changes from +2 to +3 (B) changes from +3 to +2
(C) changes from +2 to +4 (D) does not change.

Section (D) : Conc. H2SO4 group

109. Which of the following pair of anions are identified by conc. H_2SO_4.
(A) NO_3^-, CO_3^{2-} (B) Cl^-, NO_3^- (C) Br^-, CO_3^{2-} (D) CO_3^{2-}, CH_3COO^-

110. Which of the following anion behaves in a different manner than other on heating with conc. H_2SO_4?

(A) Cl^- (B) I^-

(C) Br^- (D) All behave in a similar manner

111. Which of the following reagents turns white precipitate of AgCl yellow ?

(A) $NaNO_3$ (B) Na_3AsO_3 (C) Na_3AsO_4 (D) NaCN

112. A Unknown salt **(S)** when heated with dil. H_2SO_4 does not evolve brown vapours but with conc. H_2SO_4 brown vapours are obtained. The vapours when brought in contact with $AgNO_3$ solution do not give any precipitate. The salt **(S)** contains.

(A) NO_2^- (B) NO_3^- (C) I^- (D) Br^-

113. When a mixture of solid NaCl and solid $K_2Cr_2O_7$ is heated with concentrated H_2SO_4, deep red vapours are obtained. This is due to the formation of :

(A) chromous chloride (B) chromyl chloride (C) chromic chloride (D) chromic sulphate

114. AgCl dissolves in ammonia solution giving :

(A) Ag+, NH_4^+ and Cl^- (B) $[Ag(NH_3)]^+$ and Cl^-

(C) $[Ag_2(NH_3)]^{2+}$ and C^- (D) $[Ag(NH_3)_2]^+$ and Cl^-

115. A mixture upon adding conc. H_2SO_4 gives deep red fumes. Mixture may contain the anions pair:

(A) $Cr_2O_7^{2-}$ and Cl^- (B) Br^- and $Cr_2O_72^-$

(C) NO_3^- and Cl^- (D) CrO_42^- and NO_32^-

116. A solution of a salt in concentrated H_2SO_4 produced a deep blue colour with starch iodide solution. The salt may contain :

(A) chloride (B) carbonate (C) acetate (D) bromide

117. A colourless solution of a compound gives a precipitate with $AgNO_3$ solution but no precipitate with a solution of Na_2CO_3. The action of concentrated H_2SO_4 on the compound liberates a suffocating reddish brown gas. The compound is :

(A) $Ba(CH_3COO)_2$ (B) $CaCl_2$ (C) NaI (D) NaBr

118. Which of the following gas turn starch iodide paper blue?

(A) CO_2 (B) SO_2 (C) NO_2 (D) H_2S

119. Nitrate is confirmed by ring test. The brown colour of the ring is due to formation of :

(A) ferrous nitrite (B) nitroso ferrous sulphate

(C) ferrous nitrate (D) $FeSO_4 .NO_2$

Section (E) : Precipitation Reactions

120. When a mixture containing phosphate is heated with conc. HNO_3 and ammonium molybdate solution, a canary yellow precipitate is formed. The formula of the yellow precipitate is :

(A) $(NH_4)_3PO_4$ (B) $(NH_4)3PO_4.12MoO_4$

(C) $(NH_4)_3PO_4.12MoO_3$ (D) $(NH_4)3PO_4.(NH_4)2MO_4$

121. A metal salt solution gives a yellow precipitate with silver nitrate. The precipitate dissolves in dil. Nitric acid as well as in ammonium hydroxide. The solution contains.

(A) Br^- (B) I^- (C) PO_4^{3-} (D) SO_42^-