EAPCET (E) – 2024

(Engineering, Agriculture and Pharmacy Common Entrance Test)

MODEL TEST

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MOCK TEST – 2024
MATHEMATICS

1. The Coefficient of expansion of x^6 in the Power Series expantion of $\frac{x^4-12x^2+7}{(x^2+1)^3}$

1) 149 2) –253 3) –145 4) 253

1. $1-\frac{3}{16}+\frac{1.4}{1.2}\left(\frac{3}{16}\right)^2-\frac{1.4.7}{1.2.3}\left(\frac{3}{16}\right)^3+.....$

1) $\left(\frac{15}{6}\right)^{2/8}$ 2) $\left(\frac{4}{5}\right)^{2/3}$ 3) $\left(\frac{7}{4}\right)^{1/16}$ 4) $\left(\frac{4}{15}\right)^{-2/5}$

3. The number of positive divisors of 360 multiples of 3 is

1) 16 2) 15 3) 24 4) 23

4. The number of different permutations of letters that can be formed by taking 4 letters at a time from the word "REPETITION"

1) 210 2) 720 3) 1398 4) 5040

5. If $\mathsf{A}=\begin{bmatrix}1 & 2\\ 3 & 5\end{bmatrix}$ and $\alpha,\beta\in R$ are such that $\alpha\mathsf{A}^2-\beta\mathsf{A}=2\mathsf{I}$ then $\alpha^2+\beta=$

1) –8 2) 16 3) 12 4) 20

6. Let A and B are two 3×3 Matrices and C be a 3×3 Unit Matrix such that AB–C is a non-Singular Matrix. Let D= $(AB-C)^{-1}$. Then, Consider the following Statements.

Statement I: det (BA) = det (BA–C) det (BDA)

Statement II: ABD = DAB.

Which of the absove Statement is true ?

1) Statement I is true, but Statement II is false.

2) Statement I is true, but Statement II is false.

3) Both Statement I and Statement II is true.

4) Both Statement I and Statement II is false.

7. If the System of equations $x + y + z = 1$, $x + 2y + 4z = k$ and $x + 4y + 10z = k^2$ is Consistent then K is equal to

1) 1, –2 2) –1, 2 3) 1, 2 4) –1, –2

8. If $Z = x + i\beta$ satisfies the equation $|z| - z = 2i$ and $|z|=\sqrt{\alpha^2+\beta^2}$ then $z\bar{z}=$

1) $\frac{5}{2}$ 2) $\frac{25}{4}$ 3) $\frac{16}{9}$ 4) $\frac{36}{25}$

9. If Cos α is the common Value of $(-1)^4$ and $(-i)^2$, then tan x =

1) –1 2) 1 3) $\sqrt{3}$ 4) $\frac{1}{\sqrt{3}}$

10. The real part of z that satisfies $iz^4 + 1 = 0$ is

1) $\sin\frac{\pi}{4}$ 2) $\cos\frac{\pi}{8}$ 3) 0 4) -1

11. The quadratic equation whose roots are $\sin^2 18°$ and $\cos^2 36°$ is

1) $16x^2-12x-1=0$ 2) $16x^2-12x+4=0$ 3) $16x^2-12x+1=0$ 4) $16x^2+12x+1=0$

12. If x is real, then the Maximum and Minimum value of $\frac{x^2+14x+9}{x^2+2x+3}$ respectively

1) $4,-5$ 2) $5,-4$ 3) 9, 3 4) 24, 6

13. If α, β, γ are the roots of the equation $2x^3+x^2-13x+6=0$ then $\alpha^3+\beta^3+\gamma^3 =$

1) $-\frac{161}{8}$ 2) 36 3) 99 4) $-\frac{151}{8}$

14. If $2+2^{2/3}+2^{1/3}$ then x^3-6x^2+6x is euqal to

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

15. The equation $\sin^4 x-(k+3)\sin^2 x-k-4=0$ has a Solution if

1) k > 4 2) $-4 \le k \le -3$

3) k is any positive integer 4) k =0

16. The range of $f(x)=-\sqrt{-x^2-6x-5}$ is

1) [0, 2] 2) [–2, 0] 3) [–2, 2] 4) $[-\infty, 2]$

17. Let R be the set of all real numbers, let $f: R \to R$ be a function defined by

$$f(x)=\begin{cases} 2x-5, \text{if } x<-3 \\ x+2, \text{ if } -3 \le x<5 \\ 3x+1, \text{if } x \ge 5 \end{cases}$$

Match the following.

List-I	**List-II**
A. $f(-5)+f(0)+f(-1)=$	I. 16
B. $f((f(5)+10f(-3))=$	II. 40
C. $f(\lvert f(-4)\rvert=$	III. –32
D. $f(f(f(1))=$	IV. -12
	V. 19

	A	B	C	D
1)	III	II	V	I
3)	IV	V	II	I

	A	B	C	D
2)	V	IV	I	III
4)	IV	V	III	I

18. If $\frac{x^2-2}{(x^2+1)(x^2+3)}=\frac{Ax+B}{x^2+1}+\frac{(x+1)}{x^2+3}$ then D =

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

19. If $\frac{x^5-5}{x^3+x^2}=f(x)+\frac{A}{x}+\frac{B}{x^2}+\frac{C}{x+1}$ then the largest value of K for which f(K) + A+B+C=1 is

1) 3 2) 2 3) –2 4) 4

20. If a, b, c are real numbers such that $a - b = 1$, $b - c = 3$, then the number of Matrices of the from $A=\begin{bmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{bmatrix}$ such that $\lvert A\rvert=-12$ is

1) 1 2) 2 3) 3 4) Infinitely many

21. The Mean deviation from the mean of the discrete data 1, 3, 4, 7, 11, 18, 29, 47, 78 is

1) 22 2) 24 3) $\frac{176}{9}$ 4) $\frac{182}{9}$

22. The Variance of the data 2, 3, 5, 11, 13, 17, 19 is nearly

1) 6.258 2) 24.25 3) 4.95 4) 39.71

23. If x is a Poisson Variate satisfying the Condition
3P (x = 2) = P(x = 4) then P(x = 6) =

1) $\frac{162}{5e^6}$ 2) $\frac{108}{5e^6}$ 3) $\frac{324}{5e^6}$ 4) $\frac{648}{5e^6}$

24. A and B are two independent events $P(A)=\frac{2}{5}, P(B)=\frac{1}{3}$

Match the following.

List - I	**List - II**
A. $P(\bar{A}\cup B)$	I. 2/3
B. $P\left(\frac{A}{B}\right)$	II. 11/2
C. $P(A\cup B)$	III. 3/5
D. $P\left(\frac{\bar{B}}{A}\right)$	IV. 2/5
	V. 1/3

The Correct match is

	A	B	C	D		A	B	C	D
1)	I	III	IV	II	2)	II	IV	V	I
3)	II	IV	III	V	4)	II	IV	III	I

25. If two dice are thrown and if X denotes the sum of the numbers that shown up on the faces of the dice, then mean of the random Variable X is

1) 27/4 2) 35/6 3) 41/3 4) 7

26. If P(A/B) = $\frac{3}{10}$ P(B/A) = $\frac{4}{5}$ and $P(A\cup B)$ = K.P(B), then $\frac{1}{k}$ is equal to

1) $\frac{40}{49}$ 2) $\frac{40}{43}$ 3) $\frac{100}{101}$ 4) 1

27. If $\tan A=\frac{2}{3}$ then $\sin h\,4A$ =

1) $\frac{8}{27}$ 2) $\frac{120}{169}$ 3) $\frac{144}{169}$ 4) $\frac{16}{27}$

28. If $|\sin\alpha-\cos\alpha|=\frac{3}{4}$ then $|\sec 2\alpha-\tan 2\alpha|$ =

1) $\frac{12}{17}$ 2) $\frac{4}{\sqrt{23}}$ 3) $\frac{3}{\sqrt{23}}$ 4) $\frac{1}{\sqrt{23}}$

29. $\frac{1}{\sin 250^0}+\frac{\sqrt{3}}{\cos 290^0}$ =

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

30. Assertion (A) If A = 15°, B=17° and C = 13° then Ccos 2A + Cos 2B + Cot 2C = Cot 2A Cot 2B Cot 2C

Reason (R) In a ΔPQR

$$\tan\frac{P}{2}\tan\frac{Q}{2}+\tan\frac{Q}{2}\tan\frac{R}{2}+\tan\frac{P}{2}\tan\frac{R}{2}=1$$

The Correct option among the following is

1) (A) is true, (R) is true and (R) is the correct explanation for (A)
2) (A) is true, (R) is true but (R) is not the correct explanation for (A)
3) (A) is true but (R) is false
4) (A) is false but (R) is true.

31. The Period Cos (3x + 5) + 7 is

1) $\frac{2\pi}{5}$ 2) $\frac{2\pi}{3}$ 3) $\frac{2\pi}{15}$ 4) $\frac{2\pi}{7}$

32. $\cos\frac{\pi}{7}-\cos\frac{2\pi}{7}+\cos\frac{3\pi}{7}-\cos\frac{4\pi}{7}+\cos\frac{5\pi}{7}-\cos\frac{6\pi}{7}=$

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

33. If $\frac{\sin^4 x}{2}+\frac{\cos^4 x}{3}=\frac{1}{5}$ then $27\sec^6\alpha+8\cos ec^6\alpha$

1) 250 2) 125 3) 175 4) 350

34. If $\sin A\,(A+B)\sin(A-B)+\cos(A+B)\cos(A-B)=\frac{1}{2}$ and $0<B<\frac{\pi}{2}$ then B =

1) $\frac{\pi}{6}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{3}$ 4) $\frac{5\pi}{12}$

35. If $\frac{\sin(x+y)}{\sin(x-y)}=\frac{a+b}{a-b}$ then $\frac{\tan x}{\tan y}=$

1) $\frac{b}{a}$ 2) $\frac{a}{b}$ 3) ab 4) a^b

36. The number of integral values of k for which the equation $7\cos x+5\sin x=2k+1$ has a solution is

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

37. In ΔABC, if a = 7, b = 8, c = 9 then $\frac{1}{r_1^2}+\frac{1}{r_2^2}+\frac{1}{r_3^2}=$

1) $\frac{97}{360}$ 2) $\frac{5}{72}$ 3) $\frac{169}{360}$ 4) $\frac{67}{72}$

38. In ΔABC, if BC is the hypotenuse, then $r_2+r_3=$

1) r_1+r 2) a 3) $r-r_1$ 4) $2(R+r)$

39. In ΔABC, if a = 7, b = 10, c = 11 then $\frac{R}{r}=$

1) 14 2) 77 3) $\frac{24}{11}$ 4) $\frac{55}{24}$

40. In-centre of the triangle having the vertices $(1,\sqrt{3})(0,0)(2,0)$ is

1) $(1,\frac{\sqrt{3}}{2})$ 2) $(\frac{2}{3},\frac{1}{\sqrt{3}})$ 3) $(\frac{2}{3},\frac{\sqrt{3}}{2})$ 4) $(1,\frac{1}{\sqrt{3}})$

41. If 4 times the area of a ΔABC is $c^2-(a-b)^2$ then sinc=

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

42. In ΔABC, if $rr_2 = r_1 r_3$ then cos2B=

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

43. If $\sin^{-1}\left(\frac{x}{5}\right)+\cos ec^{-1}\left(\frac{5}{4}\right)=\frac{\pi}{2}$ then $5+x=$

1) 6 2) 5 3) 7 4) 8

44. $\sec\left(\tan^{-1}\left(\frac{y}{2}\right)\right)=$

1) $\sqrt{\frac{4+y^2}{2}}$ 2) $\sqrt{\frac{4-y^2}{2}}$ 3) $\frac{\sqrt{4+y^2}}{2}$ 4) $\frac{\sqrt{4-y^2}}{2}$

45. If $x=\log\left(y+\sqrt{y^2+1}\right)$ then $y=$

1) $\tanh x$ 2) $\coth x$ 3) $\sinh x$ 4) $\cosh x$

46. If $\sinh x = \tan A$, then $|\tanh x|=$

1) |sin A| 2) |cos A| 3) |sec A| 4) |cosec A|

47. If $\sinh x=\frac{3}{4}$ and $\cosh y=\frac{5}{3}$, then $x+y=$

1) log 2 2) log 6 3) log 3 4) log 5

48. A rod of length 6 units slides with its ends on the coordinate axes. The locus of the midpoint of the rod is

1) $x^2+y^2=9$ 2) $x+y=3$ 3) $x^2+y^2=36$ 4) $x+y=6$

49. The transformed equation of $3x^2-4xy=r^2$. When the coordinate axes are related through an angle $\tan^{-1}(2)$ is

1) $x^2-4y^2=r^2$ 2) $2xy+r^2=0$ 3) $4y^2-x^2=r^2$ 4) $xy=r^2$

50. If $ax^2-xy-3y^2-5x+20y+c=0$ represents a pair of lines passing through the points (2, 3) then $a-c=$

1) -23 2) 27 3) 23 4) -27

51. If the lines $x+y-1=0,\ k+2y+1=0$ and $4x+2ky+7=0$ are concerrent, then k =

1) 2 2) 13/2 3) $-13/2$ 4) -2

52. If P is a part of equidistent from all the vertices $A(-1,3),\ B(3,5),\ C(5,7)$ of ΔABC, then PA =

1) 11 2) $\sqrt{140}$ 3) 13 4) $\sqrt{130}$

53. IF (h, k) is the image of the point (2, –3) with respect to the line line $5x-3y=2$, then h + k =

1) –3 2) $-3/34$ 3) $-3/34$ 4) 5

54. The points A (2, 1) B (3, –2) C (a, b) are Vertices of the rectangle ABCD. If the point P(3, 4) lies on CD produced, then $5a + 10b$ =

1) 41 2) 10 3) 45 4) –15

55. If the pair of lines $6x^2 + xy - y^2 = 0$ and $3x^2 - axy - y^2 = 0$, a > 0 have a Common line, then a =

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

56. If the Circle passing through (1, –2) has $x - y = 2$ and $2x + 3y = 14$ as its diameter, then the radius of the Circle is

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

57. If the angle between the Circles $x^2 + y^2 - 2x - 4y + C =$ and $x^2 + y^2 - 4x - 2y + 4 = 0$ is 60^0 then C =

1) $\frac{3\pm\sqrt{5}}{2}$ 2) $\frac{6\pm\sqrt{5}}{2}$ 3) $\frac{7\pm\sqrt{5}}{2}$ 4) $\frac{9\pm\sqrt{5}}{2}$

58. Let the Circle S = $x^2 + y^2 + 2gx + 2fy + C = 0$ touch the Position X-axis and the position Y-axis. Let (2, 4) be a point on the Circle S = 0. If two such Circles exist, then the difference of their areas is

1) 104π 2) 96π 3) 9π 4) 41π

59. If the angle between the Circles $x^2 + y^2 - 4x - 6y + K = 0$ and $x^2 + y^2 + 8x - 4y + 11 = 0$ is $\frac{\pi}{2}$, then k =

1) –3 2) 3 3) –15 4) 15

60. The Value of C such that the line $y = 4x + C$ touches the ellipse $\frac{x^2}{4} + \frac{y^2}{1} = 1$ is

1) ± 13 2) ± 1 3) $\pm\sqrt{65}$ 4) $\pm\sqrt{74}$

61. The Cartesian equation of the Parabola $x = -2 + 2t^2$, $y = 2 + 4t$ is

1) $y^2 - 8x - 4y + 12 = 0$ 2) $y^2 - 8x - 4y - 12 = 0$

3) $y^2 + 8x - 4y - 12 = 0$ 4) $y^2 - 8x + 4y - 12 = 0$

62. The equation of hyperbole, whose eccentricity is $\sqrt{2}$ and whose foci are 16 units apart, is

1) $9x^2 - 4y^2 = 36$ 2) $2x^2 - 3y^2 = 37$ 3) $x^2 - y^2 = 16$ 4) $x^2 - y^2 = 32$

63. Let a = $2i - 3j + k$, b = $i + 2j - 3k$, C = $i - j$ and $d = i + j + xk$. If $(a \times b) \times C$ is $\perp$ to d, then x is equal to

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

64. If a, b and c are three non-Collinear points and $ka + 2b + 3c$ is a point in the plane of a, b, c then K.

1) 4 2) 5 3) –5 4) –4

65. If OA = $6i + 3j - 4k$, OB = $2j + k$, OC = $5i - j + 2k$ are Coterminous edges of a parallelopiped, then the height of the parallelopiped drawn from the vertex A is

1) $85/3$ 2) $5/\sqrt{32}$ 3) $85/\sqrt{257}$ 4) $17/\sqrt{6}$

66. If (2, –1, 3) is the fort of perpendicular drawn from the origin to a plane, then the equation of that Plane is.

1) $2x+y-3z+6=0$ 2) $2x-y+3z-14=0$

3) $2x-y+3z-13=0$ 4) $2x+y+3z-10=0$

67. If $f(x)=-\left(\sin^2+\cos^5 x\right)$ then $\underset{x\to 0}{\text{Lt}}\dfrac{1}{x}f'(x)$

1) exist and is equal to O 2) exist and is equal to 7

3) exist and is equal to 3 4) does not exist.

68. $\underset{x\to 0}{Lt}\dfrac{1-\cos(1-\cos x)}{\sin^2 x}$

1) 1/2 2) 1/4 3) 1/6 4) 1/8

69. $\underset{x\to\infty}{Lt}\ x\left(\log\left(1+\dfrac{x}{2}\right)-\log\dfrac{x}{2}\right)$

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

70. If $2x^2+3x-y^2+4x-5y+6=0$ then $\dfrac{dy}{dx}$ at $(x,y)=(0,-2)$ is

1) 1 2) -1 3) 7/2 4) 0

71. If $f(x)=\dfrac{1+\sec x}{2(\sec x-1)}$ for $0<x<\dfrac{\pi}{2}$ and $f'(x)=f(x).g(x)$ then $g(x)=$

1) $\text{cosec}\ x$ 2) $-\text{cosec}\ x$ 3) $2\text{cosec}\ x$ 4) $-2\text{cosec}\ x$

72. An angle between the curve $x^2-y^2=4$ and $x^2+y^2=4\sqrt{2}$

1) $\pi/6$ 2) $\pi/4$ 3) $\pi/3$ 4) $\pi/2$

73. Slope of the tangent at (1, 2) to the curve $x=t^2-7t+7$ and $y=t^2-4t-10$ is

1) $8/5$ 2) $5/8$ 3) $-8/5$ 4) $-5/8$

74. $\displaystyle\int\frac{dx}{\sqrt{\left(5+2x+x^2\right)^3}}=$

1) $\dfrac{1}{4}\displaystyle\int\frac{1}{\sqrt{5+2x+x^2}}+c$ 2) $\displaystyle\int\frac{1}{\sqrt{5+2x+x^2}}+c$ 3) $\dfrac{x+1}{\sqrt{5+2x+x^2}}+C$ 4) $\dfrac{1}{4}\dfrac{x+1}{\sqrt{5+2x+x}}+C$

75. Let In $=\int\sec^n x dx$ If $5I_6-4I_4=f(x)$ then $f\left(\dfrac{\pi}{4}\right)=$

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

76. $\displaystyle\int_0^{\pi/2}\sin^4\theta\cos^3\theta d\theta=$

1) 1/35 2) 2/35 3) 4/35 4) 8/35

77. $\displaystyle\int_0^4\left||x-2|-x\right|dx=$

1) 2 2) 3 4) 6 4) 12

78. If $y=f(x)$ is the solution of the differental equation $x\dfrac{dy}{dx}=x^2+3y,\ x>0, y(2)=4,$ then $f(x)=$

1) 48 2) 260 3) 80 4) 36

79. The solution of the differental equation $(x+2y^3)\frac{dy}{dx}=y$ is

1) $x=y^3+c$ 2) $x=y^3+cy$ 3) $y=x^3+c$ 4) $y=x^3+cx+d$

80. The differental equation for which $y=ax^2+bx=c$ is the general solution is

1) $\frac{d^4y}{dx^4}=0$ 2) $\frac{d^3y}{dx^3}=0$ 3) $\frac{d^5y}{dx^5}=0$ 4) $\frac{d^3y}{dx^3}+\frac{d^4y}{dx^4}=0$

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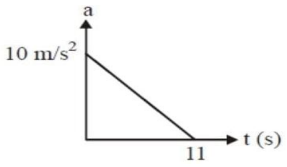
81. In $S=a+bt+ct^2$, S is measured in meters and t in seconds. The unit of c is

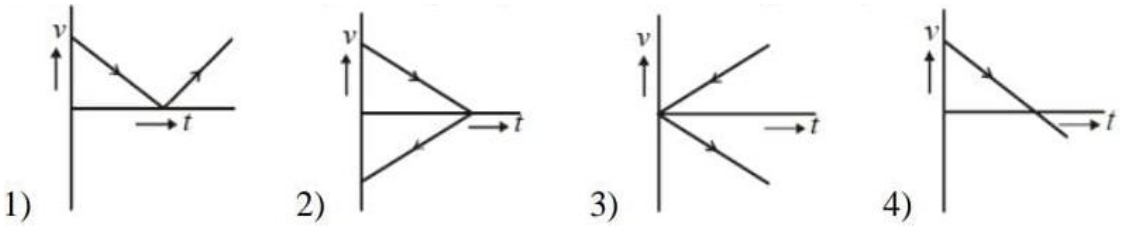
1) ms^{-2} 2) m 3) ms^{-1} 4) No units

82. A particle starts from rest. Its acceleration (a) versus time (t) graph is as shown in the figure. The maximum speed of the particle will be



1) 110 m/s 2) 55 m/s
3) 550 m/s 4) 660 m/s

83. A ball is thrown vertically upwards. Which of the following graphs represent velocity-time graph of the ball during its flight? (air resistance is neglected)



84. As shown in figure the tension in the horizontal cord is 30 N. The weight W and tension in the string OA in Newtons are

1) $30\sqrt{3},30$ 2) $30\sqrt{3},60$ 3) $60\sqrt{3},30$ 4) None of these

85. A ball is thrown from ground level so as to just clear a wall 4 metres high at a distance of 4 metres and falls at a distance of 14 metres from the wall. The magnitude of velocity of the ball will be

1) $\sqrt{182}m/s$ 2) $\sqrt{175}m/s$ 3) $\sqrt{165}m/s$ 4) $\sqrt{155}m/s$

86. A particle is moving in a circular path with velocity varying with time as $v = 1.5t^2+2t$. If the radius of circular path is 2 cm, the angular acceleration at t = 2 sec will be

1) 4 rad/sec^2 2) 40 rad/sec^2 3) 400 rad/sec^2 4) 0.4 rad/sec^{28}

87. A body of mass m tied at the end of a string of length is projected with velocity $\sqrt{4\ell g}$,at what height will it leave the circular path

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

88. The equivalent resistance between A and B is

1) $16/3\Omega$ 2) 16Ω 3) 8Ω 4) $3/16\Omega$

89. The magnitude of the force (in Newton) acting on a body varies with time t (in microsecond) as shown in fig. AB, BC, and CD are straight line segments. The magnitude of the total impulse on the body from t=4 μ s to to 16 μ s is

1) $5\times100^{-4}\ N.s$ 2) $5\times10^{-3}N.s$ 3) $5\times10^{-5}\ N.s$ 4) $5\times10^{-2}\ N.s$

90. Three equal weights of mass m each are hanging on a string passing over a fixed pulley as shown in fig. The tensions in the string connecting weights A to B and B to C will respectively be

1) $\frac{2}{3}mg, \frac{2}{3}mg$ 2) $\frac{2}{3}mg, \frac{4}{3}mg$ 3) $\frac{4}{3}mg, \frac{2}{3}mg$ 4) $\frac{3}{2}mg, \frac{3}{4}mg$

91. A block of mass 2 kg is on a horizontal surface. The co-efficient of static & kinetic frictions are 0.6 & 0.2 The minimum horizontal force required to start the motion is applied and if it is continued, the velocity acquired by the body at the end of the 2nd second is ($g = 10ms^{-2}$)

1) 8N, $8ms^{-1}$ 2) 8N, 4 ms^{-1} 3) 8N, 2 ms^{-1} 4) 8N, zero

92. Two satellites S_1, and S_2, revolve round a planet in the same direction in circular orbits. Their periods of revolutions are 1 hour and 8 hour respectively. The radius of S_1, is 10^4 km. The velocity of S_2, with respect to S_1, will be

1) $\pi\times10^4$ km/hr 2) $\pi/3\times10^4$ km/hr 3) $2\pi\times10^4$ km/hr 4) $\pi/2\times10^4$ km/hr

93. A uniform steel wire of density 7800kg/m^3 is 2.5 m long and weighs 15.6×10^{-3} kg. It extends by 1.25 mm when loaded by 8kg. Calculate the value of young's modulus of elasticity for steel.

1) $1.96\times10^{11}N/m^2$ 2) $19.6\times10^{11}\ N/m^2$ 3) $196\times10^{11}\ N/m^2$ 4) None of these

94. An ideal gas expands isothermally from a volume V_1 to V_2 and then compressed to original volume V_1adiabatically. Initial pressure is Pand final pressure is P_3. The total work done is W. Then

1) $P_3 > P_1$, $W > 0$ 2) $P_3 < P_1$, $W < 0$ 3) $P_3 > P_1$,$W < 0$ 4) $P_3 = P_1$, $W = 0$

95. A charged ball B hangs from a silk thread S, which makes an angle with a large charged conducting sheet P, as shown in the figure. The surface charge density σ of the sheet is proportional to

1) $\sin\theta$ 2) $\tan\theta$ 3) $\cos\theta$ 4) $\cot\theta$

96. Figure given below shows two identical parallel plate capacitors connected to a battery with switch S closed. The switch is now opened and the free space between the plates of capacitors is filled with a dielectric of dielectric constant 3. What will be the ratio of total electrostatic energy stored in both capacitors before and after the introduction of the dielectric?

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

97. In the fig. shown, Calculate the current through 3 ohm resistor. The emf of battery is 2 volt and its internal resistance is 2/3 ohm.

1) 0.33 amp 2) 0.44 amp 3) 1.22 amp 4) 0.88 amp

98. A thin circular wire carrying a current I has a magnetic moment M. The shape of the wire is changed to a square and it carries the same current. It will have a magnetic moment

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

99. Consider the arrangements shown in figure in which the north pole of a magnet is moved away from a thick conducting loop containing capacitor. Then excess positive charge will arrive on

1) plate a 2) plate b
3) both plates a and b 4) None of the plates a and b

100. A current 10 A in the primary coil of a circuit is reduced to zero at a uniform rate in 10^{-3} second. If the coefficient of mutual inductance is 3H, the induced e. m.f. in the secondary coil will be

1) 3 kV 2) 30 kV 3) 2 kV 4) 20 kV

101. An alternating current is given by the equation $i = i_1\cos\omega t + i_2\sin\omega t$. The r.m.s. current is

given by

1) $\frac{1}{\sqrt{2}}(i_1+i_2)$ 2) $\frac{1}{\sqrt{2}}(i_1+i_2)^2$ 3) $\frac{1}{\sqrt{2}}(i_1^2+i_2^2)^{1/2}$ 4) $\frac{1}{2}(i_1^2+i_2^2)^{1/2}$

102. A light beam travelling in the X-direction is described by the electric field E_y, (300V/m) $\sin\omega(t-x/c)$. An electron is constrained to move along the Y - direction with a speed of 2.0×10^7 m/s. The maximum magnetic force (in N) on the electron is.

1) 3.2×10^{-18} 2) 5.1×10^{-16} 3) 6.5×10^{-11} 4)7.8×10^{-12}

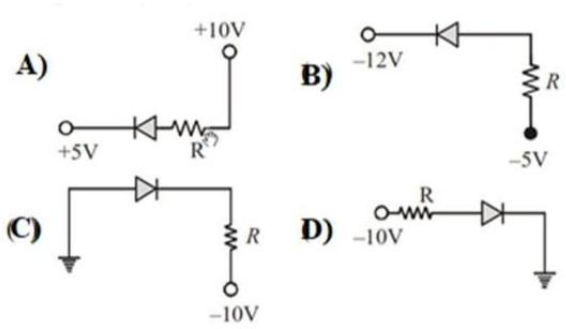
103. In Bohr model of atom an electron of charge (-e) and mass m is revolving around a nucleus of charge +ze. If $\bar{L}$ is the orbital angular momentum of electron, then its magnetic moment is given by

1) $-\frac{e}{2m}\bar{L}$ 2) $\frac{e}{2m}\bar{L}$ 3) $\frac{-Ze}{2m}\bar{L}$ 4) $\frac{Ze}{2m}\bar{L}$

104. Energy levels A, B, C of a certain atom corresponding to increasing values of energy i. e. $E_A < E_B < E_C$. If $\lambda_1,\lambda_2,\lambda_3$ are the wavelengths of radiations corresponding to the transitions C to B, B to A and C to A respectively, which of the following statements is correct?

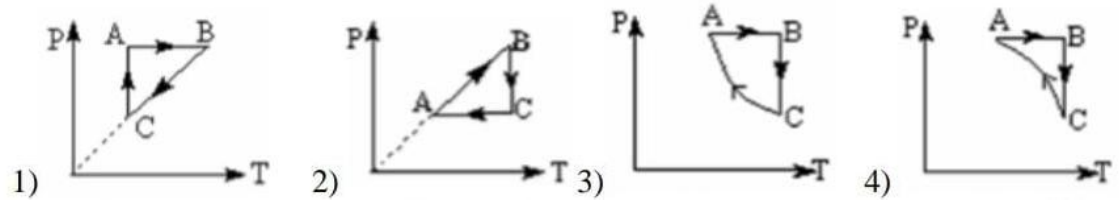
1) $\lambda_3=\lambda_1+\lambda_2$ 2) $\lambda_3=\frac{\lambda_1\lambda_2}{\lambda_1+\lambda_2}$ 3) $\lambda_1+\lambda_2+\lambda_3=0$ 4) $\lambda_3^2+\lambda_1^2+\lambda_2^2$

105. In the given figure, the diodes in forward biased are



1) A, B, C only 2) B, C only 3) A, C only 4) A only

106. An ideal gas undergoes a thermodynamics cycle as shown in figure. Which of the following graphs represents the same cycle?



107. A uniform rope of mass m and length L is hung freely from stationary ceiling. If the cross sectional area of rope is A and Young's modulus Y, then net elongation in the rope due to its own weight

1) $\frac{mgL}{AY}$ 2) $\frac{mgL}{2AY}$ 3) $\frac{mgL}{3AY}$ 4) $\frac{mgL}{4AY}$

108. Two soap bubbles to form a single large drop (r = radius of small bubbles R = radius of large drop)

Column: I	**Column - II**
A) surface energy in the process	P) $2^{1/3}$ r
B) pressure of the soap bubble inside will be	Q) Decreases
C) temperature of drop will be	R) $4^{1/3}$ r
D) radius of final single drop	S) increases.

1) A-Q,B-Q,C-S,D-P
2) A-Q,B-P,C-S,D-P
3) A-P,B-Q,C-P,D-S
4) A-P,B-Q,C-P,D-S

109. In a photo electric experiment, I(current)-V (voltage) graph is as shown. Curves a,b,c correspond to three different metal surfaces irradiated with monochromatic light of same frequency. Assuming the ratio of number of electrons emitted per second to the number of photons incident per second is the same for all the three surfaces, choose the INCORRECT statement:
1) the work function of metals b and c are equal
2) the intensities of light incident on a and b are same
3) the work functions of metals a and b are not equal
4) the intensities of light incident on a, b and c are all different

110. The value of L, C and R in an LCR series circuit are 4 mH, 40 pF and 100 Ω respectively. The quality factor of the circuit is

1) 10,000 2) 100 3) 1000 4) 10

111. Two coherent sources of light emit waves with wavelength with constant phase difference of 180°. The intensity due to each at a point on a screen is I. At a point on the screen where the path difference between two waves is $\frac{3\lambda}{2}$ the total intensity will be:

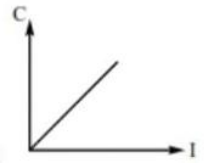
1) $2I_0$ 2) $4I_0$ 3) $6I_0$ 4) $3I_0$

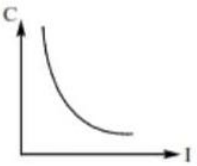
112. Statement - A: A diver under water, looks obliquely at a fisherman standing on the bank of a lake. The fisherman look shorter to the diver than what he actually is

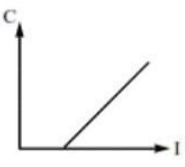
Statement - B: A convex mirror always produces a virtual image independent of location of the real object

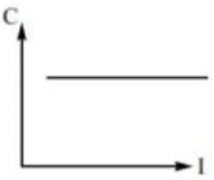
1) Both statements A & B are true 2) Statement A is true and Statement B is false
3) Statement A is false and Statement B is true 4) Both statements A & B are false

113. In photoelectric effect experiment, the intensity of light is varied by changing the distance of light source from emitter. Which of the following graphs depict he variation of photoelectric current 'C' with intensity of light 'I'?

1) 

2) 

3) 

4) 

114. Assertion (A): The Bohr model is not applicable to atoms having many electrons.

Reason (R): In atoms having many electrons, each electron interacts not only with positively charged nucleus but also with all other electrons.

1) Both assertion and reason are true and reason is correct explanations of assertion.
2) Both assertion and reason are true but reason is not correct explanation of essertion.
3) Assertion is true and reason is false
4) Assertion is false and reason is true

115. The combination of gates shown in the diagram is equivalent to

1) OR 2) AND

3) NAND 4) NOR

116. Two identical capacitors have the same capacitance C. One of them is charged to a potential Vi and the other to V2. If they are connected with their unlike plates together, the decrease in energy of the combined system is

1) $\frac{1}{4}C(V_1^2 - V_2^2)$ 2) $\frac{1}{4}C(V_1^2 + V_2^2)$ 3) $\frac{1}{4}C(V_1 - V_2)^2$ 4) $\frac{1}{4}C(V_1 + V_2)^2$

117. Some relations and laws related to fluids are given in column A, While the reasons behind them are given in column B. Match A and B

Column - I	**Column - II**
(a) Stoke's law energy	e) Surface potential
(b) Equation of continuity	f) Viscosity
(c) Bernoulli's theorem	g) Conservation of mass
(d) Velocity efflux	h) Conservation of energy

1) (a) – (e), (b) – (f), (c) – (g), (d) – (h) 2) (a) – (f), (b) – (h), (c) – (g), (d) – (e)

3) (a) – (f), (b) – (g), (c) – (h), (d) – (e) 4) (a) – (e), (b) – (h), (c) – (g), (d) – (f)

118. When two identical batteries of internal resistance 10 each are connected in series across a resistor R, the rate of heat produced in R is P_1. When the same batteries are connected in parallel across R, the rate is P_2. If P_1=2.25 P_2, the value of R is

1) 2Ω 2) 4Ω 3) 10Ω 4) 12Ω

119. If θ is the angle of projection and H, R are the maximum height, range of a projectile, then Tan θ is

1) 4H/R 2) 4R/H 3) 2H/R 4) 2R/H

120. The force per unit length on a wire carrying current of 8A making an angle of 30^0 with a uniform magnetic field of 0.15 T is

1) 1.2 N 2) 1.02 N 3) 0.6 N 4) 2.4 N

CHEMISTRY

121. A mixture of gases contains H_2 and O_2 gases in the ratio of 1:4 (w/w). What is the molar ratio of the two gases in the mixture?

1) 16 : 1 2) 2 : 1 3) 1 : 4 4) 4 : 1

122. In H-atom spectrum electron jumps from 5th excited state to 1st excited state then total number of spectral lines, number of lines in Lyman series and Paschen series respectively are:

1) 10, 4, 3 2) 15,0,4 3) 15, 4, 5 4) 10,0,3

123. The angular momentum of electron in 'd' orbital is equal to:

1) $2\sqrt{3}h$ 2) h 3) $\sqrt{6}h$ 4) $\sqrt{2}h$

124. Which of the following is correct with respect to -I effect of the substituents? [R = alkyl]

1) $-NH_2 > -OR > -F$ 2) $-NR_2 < -OR < -F$

3) $-NH_2 < -OR < -F$ 4) $-NR_2 > -OR > -F$

125. The species, having bond angles of 120° is:

1) PH_3 (b) CIF_3 (c) $NC1_3$ BCl_3

126. The species Ar, K^+ and Ca^{2+} contain the same number of electrons. In which order do their radii increase?

1) $Ca^{2+} < K^+ < Ar$ 2) $K^+ < Ar < Ca^{2+}$

3) $Ar < K^+ < Ca^{2+}$ 4) $Ca^{2+} < Ar < K^+$

127. The solubility of $BaSO_4$, in water is $2.42 \times 10^{-3} gL^{-1}$ at 298K. The value of solubility product (K_{sp}) will be [Given molar mass of $BaSO_4$ = 233 g mol^{-1}]

1) 1.08×10^{-2} mol^2L^{-1} 2) 1.08×10^{-12} mol^2L^{-2}

3) 1.08×10^{-14} mol^2L^{-2} 4) 1.08×10^{-8} mol^2L^{-2}

128. What is the activation energy for a reaction if its rate doubles when the temperature is raised from 20°C to 35°C? (R= 8.314J mol^{-1} K^{-1})

1) 342 kJ mol^{-1} 2) 269 kJ mol^{-1} 3) 34.7 kJ mol^{-1} 4) 15.1 kJ mol^{-1}

129. In which of the following options the order of arrangement does not agree with the variation of property indicated against it?

1) I < Br< Cl< F (increasing electron gain enthalpy)
2) Li < Na < K < Rb (increasing metallic radius)
3) $Al^{3+} < Mg^{2+} < Na^+ < F^-$ (increasing ionic size)
4) B < C <N< O (increasing first ionization enthalpy)

130. Aqueous solution of which of the following compounds is the best conductor of electric current?

1) Hydrochloric acid, HCI 2) Ammonia, NH_3

3) Fructose, $C_6H_{12}O_6$ 4) Acetic acid, $C_2H_4O_2$

131. The rate of first-order reaction is 0.04 mol L^{-1} s^{-1} at 10 seconds and 0.03 mol $L^{-1}s^{-1}$ at 20 seconds after initiation of the reaction. The half-life period of the reaction is:

1) 44.1 s 2) 54.1 s 3) 24.1 s 4) 34.1 s

132. In acidic medium, H_2O_2 changes $Cr_2O_7^{2-}$ to CrO_5 which has two (–O–O–) bonds. Oxidation state of Cr in CrO_5 is:

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

133. The reaction of H_2O_2 with hydrogen sulphide is an example of ..... reaction:

1) addition 2) oxidation 3) reduction 4) redox acidic

134. The enthalpy of vaporization of $H_2O(l)$ is x kJ/mol and enthalpy of formation of water vapour y kJ/mol. Enthalpy of formation of $H_2O(l)$. would be

1) $(y - x)$ kJ mol^{-1} 2) $(x - y)$ kJ mol^{-1} 3) $(x + y)$ kJ mol^{-1} 4) $(2x–y)$ kJ mol^{-1}

135. Equal volumes of four acid solutions having pH 1, 2, 3 and 4 are mixed in a container. The concentration of hydrogen ion in the mixture of.

1) 4.25×10^{-4} M 2) 2.78×10^{-2} M 3) 2.30×10^{-3} M 4) 1.35×10^{-2} M

136. A button cell used in watches functions as following:

$Zn(s) + Ag_2O(s) + H_2O(l) \rightarrow 2\,Ag(s) + Zn^{2+}(aq) + 20H^-(aq)$

If half-cell potentials are: $Zn^{2+}(aq) + 2e^-$ $Zn(s)$ $E° = –0.76$ V

$Ag_2O(s) + H_2O(l) + 2e^- \rightarrow 2Ag(s) + 2OH^-(aq)$, $E° = 0.34$ V

The cell potential will be:

1) 1.10 V 2) 0.42 V 3) 0.84 V 4) 1.34 V

137. The correct order of increasing bond length of C–H, C–O, C–C and C = C is:

1) C—C < C = C < C—O < C—H 2) C—O < C—H < C—C < C = C

3) C—H < C—O < C—C < C = C 4) C—H < C = C < C—O < C—C

138. Which one of the following orders is correct for the bond dissociation enthalpy of halogen molecules?

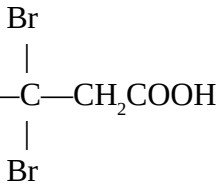
1) $Br_2 > I_2 > F_2 > Cl_2$ 2) $F_2\ Cl_2 > Br_2 > I_2$ 3) $I_2 > Br_2 > Cl_2 > F_2$ 4) $Cl_2 > Br_2 > F_2 > I_2$

139. Gadolinium belongs to 4f series. It's atomic number is 64. Which of the following is the correct electronic configuration of gadolinium?

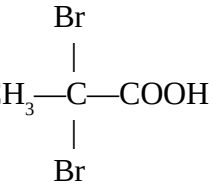
1) [Xe] $4f^8\ 6s^2$ 2) [Xe] $4f^9\ 5s^1$ 3) [Xe] $4f^7\ 5d^1 6s^2$ 4) [Xe] $4f^6\ 5d^2 6s^2$

140. Propionic acid with Br_2/P yields a dibromo product. Its structure would be:

1) $CH_2Br—CHBr—COOH$

2) 

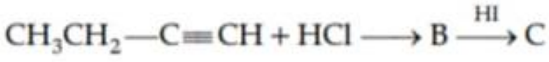
3) $CH_2Br—CH_2—COBr$

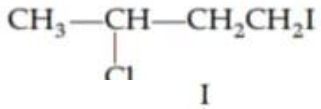
3) 

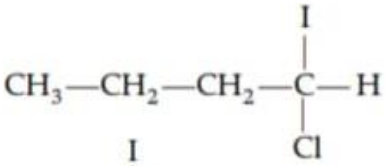
141. At 25°C and 730 mm pressure, 380 ml of dry oxygen was collected. If the temperature is constant, what volume will the oxygen occupy at 760 mm pressure?

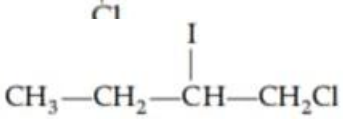
1) 365 ml (b) 2 ml (c) 10 ml (d) 20 ml

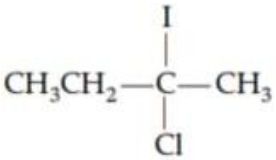
142. Predict the product C obtained in the following reaction of 1-butyne.



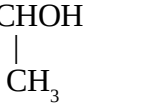
1) 

2) 

3) 

4) 

143. Following compounds are given:

(i) CH_3CH_2OH (ii) CH_3COCH_3 (iii)  (iv) CH_3OH

Which of the above compound(s), on being warmed with iodine solution and NaOH, will give iodoform?

1) (i), (iii) and (iv) 2) Only (ii) 3) (i), (ii) and (iii) 4) (i) and (ii)

144. Consider the following statements.

(1) XeF_4 is colourless crystalline solid and undergoes sub-limation.

(2) $XeOF_4$ is colourless volatile liquid.

(3) XeO_4 is colourless explosive solid.

The correct statements are:

1) (1) and (2) only 2) (2) and (3) only 3) (1) and (3) only 4) (1), (2) and (3)

145. A solution has 1 : 4 mole ratio of pentane to hexane. The vapour pressure of the pure hydrocarbons at 20°C are 440 mm of Hg for pentane and 120 mm of Hg for hexane. The mole fraction of pentane in the vapour phase would be:

1) 0.549 2) 0.200 3) 0.786 4) 0.478

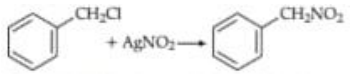
146. One mole of $Al3^+$ discharged completely by using charge?

1) 3F 2) 1F 3) 0.3F 4) 2F

147. In which of the following molecules/ions BF_3, NO_2^-, NH_2^- and H_2O, the central atom is sp^2 hybridised?

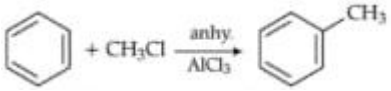
1) NO_2^- and NH_2^- 2) NH_2^- and H_2O 3) NO_2^- and H_2O 4)BF_3 and NO_2^-

148. Which one of the following is a free-radical substitution reaction?

1) 

2) $CH_3CHO + HCN \longrightarrow CH_3—\underset{\displaystyle OH}{\underset{|}{CH}}—CN$

3) 

4) 

149. Consider the following reaction:

$$\text{Ethanol} \xrightarrow{PBr_3} X \xrightarrow{\text{alc. KOH}} Y \xrightarrow[H_2O,\ \text{heat}]{H_2SO_4,\ \text{room temperature}} Z$$

1) $CH_3CH_2O—CH—CH_3$ 2) $CH_3—CH_2—O—SO_3H$

3) CH_3CH_2OH 4) $CH_2=CH_2$

150. Which of the following is an ideal solution?

1) Ethanol + water 2) Nitric acid + water

3) Ethanol + benzene 4) Benzene + toluene

151. The efficiency of a fuel cell is given by:

1) $\frac{\Delta G}{\Delta S}$ 2) $\frac{\Delta G}{\Delta H}$ 3) $\frac{\Delta S}{\Delta G}$ 4) $\frac{\Delta H}{\Delta G}$

152. Which of the following will not show cis-trans isomerism?

1) $CH_3—CH = CH—CH_3$ 2) $CH_3—CH_2—CH=CH—CH_2CH_3$

3) $CH_3—\underset{\displaystyle CH_3}{\underset{|}{C}} = CH—CH_2—CH_3$ 4) $CH_3—\underset{\displaystyle CH_3}{\underset{|}{C}}—CH = CH—CH_2—CH_3$

153. Among the following compounds, one that is most reactive towards electrophilic nitration is

1) benzoic acid. 2) nitrobenzene. 3) toluene. 4) benzene.

154. At 25°C, the dissociation constant of a base, BOH is 1.0×10^{-12}. The concentration of hydroxyl ions in 0.01 M aqueous solution of the base would be:

1) 2.0×10^{-6} mol L^{-1} 2) 1.0×10^{-5} mol L^{-1}

(c) 1.0×10^{-6} mol L^{-1} (d) 1.0×10^{-7} mol L^{-1}

155. If the enthalpy change for transition of liquid water to steam is 30 $kJmol^{-1}$ at 27°C. The entropy change for the process would be:

1) 1.0J mol^{-1} K^{-1} 2) 0.1 J mol^{-1} K^{-1} 3) 100 J mol^{-1} K^{-1} 4) 10J mol^{-1} K^{-1}

156. In which electrophilic substitution reaction slow step is breaking of C—H bond?

1) Sulphonation of benzene 2) Nitration of benzene

3) Chlorination of benzene 4) All of these

157. Acetone and ethanol can be chemically distinguished by:

(a) I_2/NaOH (b) 2,4 DNP 3) Tollen's reagent 4) Both (a) and (b)

158. In which of the following reaction C—C bond formation does not take place?

(1) Gattermann-Koch reaction (2) Étard reaction

(3) Benzoin condensation (4) Swarts reaction

159. The value of Δ AH and AS for the reaction,

$C_{(gradually)}(s) + CO_2(g) \rightarrow 2CO(g)$ are 170 kJ and 170 JK^{-1}, respectively. This reaction will be spontaneous at:

1) 710 K 2) 910 K 3) 1110 K 4) 510 K

160. The experimental data for the reaction $2A + B_2 \longrightarrow 2AB$

Exp.	[A]	[B]	Rate (Ms^{-1})
1.	0.50	0.50	1.6×10^{-4}
2.	0.50	1.00	3.2×10^{-4}
3.	1.00	1.00	3.2×10^{-4}

The rate equation for the above data is:

1) rate = $k[B_2]$ 2) rate = $k[B_2]^2$ 3) rate = $k[A]^2[B]^2$ (c) rate = $k[A]^2[B]$