EAMCET (E) – 2023

(Engineering and Agriculture Common Entrance Test)

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MODEL TEST

CENTRE FOR EDUCATIONAL DEVELOPMENT OF MINORITIES

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MATHEMATICS

1. If $f:R\to R$, $g:R\to R$ are defined by $f(x)=5x-3$, $g(x)=x^2+3$ then $\left(gof^{-1}\right)(3)=$

(1) $\frac{25}{9}$ (2) $\frac{111}{25}$ (3) $\frac{9}{25}$ (4) $\frac{25}{111}$

2. The function of $f(x)=\log(x+\sqrt{x^2+1})$

(1) an even function (2) an odd function (3) a periodic function
(4) neither an even function nor an odd function

3. If A, B are symmetric matrices of the same order then $AB-BA$ is

(1) a symmetric matrix (2) skew-symmetric matrix
(3) diagonal matrix (4) none of these

4. The rank of the matrix $\begin{bmatrix}3 & 2 & 1 & -4\\ 2 & 3 & 0 & -1\\ 1 & -6 & 3 & -8\end{bmatrix}$ is

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

5. If a and b are any two real numbers, then $\begin{vmatrix}2a-2b-4 & 4a & 4a\\ 4 & 2-b-a & 4\\ 2b & 2b & b-a-2\end{vmatrix}$ is

(1) $4\left[(a+b)^3+8(a+b)^2+16(a+b)+8\right]$ (2) $\frac{1}{2}(a+b+2)^3$

(3) $2\left[(a+b)^3+6(a+b)^2 12(a+b)+8\right]$ (4) $(a+b+2)^3$

6. If the system of equations $x+y+2z=3$, $x+2y+3z=4$ and $x+cy+2cz=5$ is inconsistent, then

(1) $c=1$ (2) $c=3$ (3) $c\in R$ (4) $c\neq 1$

7. If ω is a complex cube root of unity, then $\left(1-\omega+\omega^2\right)^6+\left(1-\omega^2+\omega\right)^6=$

(1) 0 (2) 6 (3) 64 (4) 128

8. $\frac{(1+i)^{2016}}{(1-i)^{2014}}=$

(1) $-2i$ (2) $2i$ (3) 2 (4) -2

9. If $x+iy=(1+i)^6-(1-i)^6$, then which one of the following is true?

(1) $x+y=16$ (2) $x+y=-16$ (3) $x+y=-8$ (4) $x+y=8$

10. If the roots of $(b-c)x^2+(c-a)x+(a-b)=0$ are equal, then a, b, c are in

(1) A.P. (2) G.P. (3) H.P. (4) None of these

11. If x is real, then the maximum and minimum values of $\frac{x^2+14x+9}{x^2+2x+3}$ are respectively

(1) 4, –5 (2) 5, –4 (3) 9, 3 (4) 24, 6

12. If α,β,γ are the roots of the equation $x^3+3x^2-x-3=0$, then $\left(1+\alpha^2\right)\left(1+\beta^2\right)\left(1+\gamma^2\right)=$

(1) 16 (2) 24 (3) 36 (4) 40

13. The sum of all the real numbers satisfying the equation $x^2+|x-3|=4$ is

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

14. If α, β, γ are the roots of $x^3 + px^2 + qx + r = 0$, then $\alpha^3 + \beta^3 + \gamma^3 =$

(1) $p^3 - 3pq + r$ (2) $p^2 - 2pq + r$ (3) $3pq - 3r - p^3$ (4) $3pq + 3r + p^3$

15. 10 men and 6 women are to be seated in a row so that no two women sit together, The number of ways they can be seated is

(1) 11! 10! (2) $\frac{11!}{6!5!}$ (3) $\frac{10!9!}{5!}$ (4) $\frac{11!10!}{5!}$

16. ${}^{34}C_5 + \sum_{r=0}^{4} {}^{(38-r)}C_4$ is equal to

(1) $22 \times {}^{39}C_4$ (2) ${}^{39}C_4$ (3) ${}^{3\times 39}C_5$ (4) ${}^{39}C_5$

17. The sixth term in the expansion of $\left(3 - \sqrt{\frac{17}{4} + 3\sqrt{2}}\right)^{10}$ is a

(1) positive rational number (2) negative rational number
(3) positive irrational number (4) negative irrational number

18. $y = \frac{3}{4} + \frac{3 \cdot 5}{4 \cdot 8} + \frac{3 \cdot 5 \cdot 7}{4 \cdot 8 \cdot 12} + \ldots \infty$, then

(1) $y^2 - 2y + 5 = 0$ (2) $y^2 + 2y - 7 = 0$ (3) $y^2 - 3y + 4 = 0$ (4) $y^2 + 4y - 6 = 0$

19. If $\frac{9x-7}{(x+3)(x^2+1)} = \frac{A}{x+3} + \frac{Bx+C}{x^2+1}$, where $A, B, C \in R$, then $A + B + C$ is equal to

(1) $\frac{17}{5}$ (2) $\frac{-6}{5}$ (3) $\frac{6}{5}$ (4) $\frac{-17}{5}$

20. If $\frac{x^4 + 3x + 1}{(x+1)^2(x-1)} = Ax + B + \frac{C}{x+1} + \frac{D}{(x+1)^2} + \frac{E}{x-1}$. Then $A + B + C + D + E =$

(1) $\frac{3}{2}$ (2) $\frac{9}{2}$ (3) $\frac{5}{2}$ (4) 0

21. If $\sin\theta + \cos\theta = a$ and $\tan\theta + \cot\theta = b$ then $b(a^2 - 1) =$

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

22. The period of $\cos(3x + 5) + 7$ is

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

23. If $A + B + C = \pi$, then $\sin A - \sin B + \sin C =$

(1) $4\cos\left(\frac{A}{2}\right)\cos\left(\frac{B}{2}\right)\cos\left(\frac{C}{2}\right)$ (2) $4\sin\left(\frac{A}{2}\right)\sin\left(\frac{B}{2}\right)\cos\left(\frac{C}{2}\right)$

(3) $\sin\left(\frac{A}{2}\right)\cos\left(\frac{B}{2}\right)\sin\left(\frac{C}{2}\right)$ (4) $4\sin\left(\frac{A}{2}\right)\cos\left(\frac{B}{2}\right)\sin\left(\frac{C}{2}\right)$

24. $\tanh^{-1}\left(\frac{1}{3}\right) + \coth^{-1}(2)$ is equal to

(1) $\log\sqrt{6}$ (2) $\log 6$ (3) $-\log\sqrt{6}$ (4) $-\log 6$

25. $\sinh\left[\log\left(2 + \sqrt{5}\right)\right] + \cosh\left[\log\left(2 + \sqrt{3}\right)\right] =$

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

26. If ΔABC is such that $\angle A = 90°$, $\angle B \neq \angle C$, then $\frac{b^2+c^2}{b^2-c^2}\sin(B-C) =$

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

27. If $p_1, p_2\ p_3$ are the altitudes of a triangle ABC from the vertices A, B, C respectively, then with the usual notation, $\frac{1}{r_1^2}+\frac{1}{r_2^2}+\frac{1}{r_3^2}+\frac{1}{r^2} =$

(1) $p_1\ p_2\ p_3$ (2) $\frac{a^2b^2c^2}{4\Delta^2}$ (3) $\frac{a^2b^2c^2}{\Delta^2}$ (4) $4\left(\frac{1}{p_1^2}+\frac{1}{p_2^2}+\frac{1}{p_3^2}\right)$

28. In ΔABC, $r_1 + r_2 + r_3 =$

(1) $4R$ (2) $4R + r$ (3) $4R - r$ (4) $4R + s^2$

29. The vectors $2i - 3j + k$, $i - 2j + 3k$, $3i + j - 2k$

(1) are linearly dependent (2) are linearly independent
(3) form sides of a triangle (4) are coplanar

30. If a, b, c are three mutually perpendicular vectors such that the magnitudes of *b* and *c* are $\frac{1}{2}$ times and $\frac{\sqrt{3}}{2}$ times that of *a* respectively, then the angle between the vectors $a + b + c$ and *b* is

(1) 45° (2) $\cos^{-1}\left(\frac{1}{2\sqrt{2}}\right)$ (3) $\cos^{-1}\left(\frac{\sqrt{6}}{4}\right)$ (4) $\cos^{-1}\left(\frac{1}{4}\right)$

31. If $|a| = 3$, $|b| = 4$ and the angle between *a* and *b* is 120°, then $|4a + 3b|$ is equal to

(1) 25 (2) 7 (3) 13 (4) 12

32. $\overline{a} \neq 0$, $\overline{b} \neq 0$, $\overline{c} \neq 0$ $a \times b = 0$, $b \times c = 0 \Rightarrow a \times c =$

(1) b (2) a (3) 0 (4) $i + j + k$

33. The angle between the vectors $2\hat{k} - 3\hat{j}$ and $\hat{i} - 2\hat{k}$ is

(1) $\cos^{-1}\left(\frac{8}{\sqrt{65}}\right)$ (2) $\cos^{-1}\left(\frac{-4}{\sqrt{65}}\right)$ (3) $\cos^{-1}\left(\frac{2}{\sqrt{65}}\right)$ (4) $\cos^{-1}\left(\frac{3}{\sqrt{13}}\right)$

34. If a plane is at a distance of 6 units from the origin and the vector $2\hat{i} + 6\hat{j} - 3\hat{k}$ is its normal, then the equation of the plane in Cartesian form is

(1) $2x + 3y - 6z - 35 = 0$ (2) $2x + 6y - 3z - 42 = 0$
(3) $2x + 6y - 3z - 35 = 0$ (4) $2x - 6y + 3z - 42 = 0$

35. If 10 is the mean of the data 2, 3, 5, 18, 17, 15, 13, *x*, 9 and 7, then the mean deviation of this data about its mean is

(1) 4.7 (2) 4.8 (3) 4.9 (4) 5.0

36. Two fair dice are rolled. The probability of the sum of digits on their faces to be greater than or equal to 10 is

(1) $\frac{1}{5}$ (2) $\frac{1}{4}$ (3) $\frac{1}{8}$ (4) $\frac{1}{6}$

37. Let *A* and *B* be not mutually exclusive events. If $P(A) = \frac{4}{9}$, $P(A \cap \overline{B}) = \frac{3}{7}$ then $P\left(\frac{B}{A}\right) =$

(1) 0 (2) $\frac{1}{28}$ (3) $\frac{3}{13}$ (4) $\frac{4}{7}$

38. In a hospital, on an average if there are 35 births in a week, then the probability that there will be less than 3 births in a day, is

(1) $\frac{118}{e^{35}}$ (2) $\frac{37}{2e^{5}}$ (3) $\frac{6}{2e^{35}}$ (4) $1-\frac{118}{3e^{5}}$

39. The probability distribution of a random variable is given below:

$X=x$	0	1	2	3	4	5	6	7
$P(X=x)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2+k$

Then $P(0<X<5)=$

(1) $\frac{1}{10}$ (2) $\frac{3}{10}$ (3) $\frac{8}{10}$ (4) $\frac{7}{10}$

40. The mean and the variance of a binomial are 4 and 2 respectively. Then the probability of 2 successes is

(1) $\frac{37}{256}$ (2) $\frac{28}{256}$ (3) $\frac{128}{256}$ (4) $\frac{219}{256}$

41. If M is the foot of the perpendicular drawn from the origin O on to the variable line L, passing through a fixed point (a, b), then the locus of the mid-point of OM is

(1) $x^2+y^2=a^2+b^2$ (2) $2x^2+2y^2-ax-by=0$

(3) $ax+by=0$ (4) $2x^2+2y^2-ay-bx=0$

42. The point (4, 1) undergoes the following transformations successively:

(i) Reflection in the line $x-y=0$

(ii) Shifting through a distance of 2 units along the positive X-axis

(iii) Projection on X-axis

The coordinates of the point in its final position are

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

43. If x_1, x_2, x_3 as well as y_1, y_2, y_3 are in G.P. with same common ratio, then the points $P(x_1, y_1)$, $Q(x_2, y_2)$ and $R(x_3, y_3)$

(1) lie on a straight line (2) lie on an ellipse

(3) lie on a circle (4) are vertices of a triangle

44. The distance from the origin to the image of (1, 1) with respect to the line $x+y+5=0$ is

(1) $7\sqrt{2}$ (2) $3\sqrt{2}$ (3) $6\sqrt{2}$ (4) $4\sqrt{2}$

45. The combined equation of the straight lines passing through (1, 1) and making an angle of 45° with the straight line $x+y-1=0$ is

(1) $2x^2+3xy-2y^2-7x+y+1=0$ (2) $xy-x-y+1=0$

(3) $xy+2y^2-x-5y-3=0$ (4) $2x^2-xy-3x+y+1=0$

46. For $c\neq 0$, $c\neq 1$ if the straight lines $x+y=1$, $2x-y=c$ and $bx+2by=c$ have one common point, then

(1) $c<1 \Rightarrow b\in\left(-3,\frac{3}{4}\right)$ (2) $c>1 \Rightarrow b\in\left(-\frac{3}{4},3\right)$

(3) $c<1 \Rightarrow b\in\left(-3,\frac{3}{2}\right)$ (4) $c>1 \Rightarrow b\in\left(-\frac{3}{4},\frac{3}{4}\right)$

47. The combined equation of the three sides of a triangle is $\left(x^2-y^2\right)(2x+3y-6)=0)$. If the point $(0,\alpha)$ lies in the interior of this triangle then

(1) $-2 < \alpha < 0$ (2) $-2 < \alpha < 2$ (3) $0 < \alpha < 2$ (4) $\alpha \geq 2$

48. If the slope of one of the lines is twice the slope of the other in the pair of straight lines $ax^2 + 2hxy + by^2 = 0$ then $8h^2 =$
(1) $-9ab$ (2) $9ab$ (3) $7ab$ (4) $-7ab$

49. The equation of the pair of lines joining the origin to the points of intersection of $x^2 + y^2 = 9$ and $x + y = 3$, is
(1) $x^2 + (3-y)^2 = 9$ (2) $(3+y)^2 + y^2 = 9$ (3) $x^2 - y^2 = 9$ (4) $xy = 0$

50. If the lines $3x - 4y - 7 = 0$ and $2x - 3y - 5 = 0$ are two diameters of a circle of area 49π square units, the equation of the circle is
(1) $x^2 + y^2 - 2x + 2y - 62 = 0$ (2) $x^2 + y^2 - 2x + 2y - 47 = 0$
(3) $x^2 + y^2 + 2x - 2y - 47 = 0$ (4) $x^2 + y^2 + 2x - 2y - 62 = 0$

51. If the angle between the circles $x^2 + y^2 - 4x - 6y + k = 0$ and $x^2 + y^2 + 8x - 4y + 11 = 0$ is $\frac{\pi}{3}$, then the value of k is
(1) -3 (2) 36 (3) 3 (4) 2

52. The equation of the circle passing through (2, 0) and (0, 4) and having the minimum radius is
(1) $x^2 + y^2 = 20$ (2) $x^2 + y^2 - 2x - 4y = 0$
(3) $x^2 + y^2 = 4$ (4) $x^2 + y^2 = 16$

53. If (4, 2) and (k, -3) are conjugate points with respect to $x^2 + y^2 - 5x + 8y + 6 = 0$ then k=
(1) $\frac{28}{3}$ (2) $-\frac{28}{3}$ (3) $\frac{3}{28}$ (4) $-\frac{3}{28}$

54. If the circles $x^2 + y^2 - 2\lambda x - 2y - 7 = 0$ and $3(x^2 + y^2) - 8x + 29y = 0$ are orthogonal then λ=
(1) 4 (2) 3 (3) 2 (4) 1

55. The condition for the circles $x^2 + y^2 + ax + 4 = 0$ and $x^2 + y^2 + by + 4 = 0$ to touch each other is
(1) $\frac{1}{a^2} - \frac{1}{b^2} = \frac{1}{16}$ (2) $a^2 + b^2 = 16$ (3) $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{16}$ (4) $\frac{1}{a^2} + \frac{1}{b^2} = 4$

56. The slopes of the focal chords of the parabola $y^2 = 32x$ which are tangents to the circle $x^2 + y^2 = 4$ are
(1) $\frac{1}{\sqrt{3}}, \frac{-1}{\sqrt{3}}$ (2) $\frac{1}{\sqrt{15}}, \frac{-1}{\sqrt{15}}$ (3) $\frac{2}{\sqrt{5}}, \frac{-2}{\sqrt{5}}$ (4) $\frac{1}{2}, \frac{-1}{2}$

57. If $y = mx + c$ is a common tangent to the parabola $y^2 = 4\sqrt{k}x$ and the circle $2x^2 + 2y^2 = k$ then the product of the slopes of such common tangents is
(1) -2 (2) $\frac{k+2}{3}$ (3) -1 (4) $\frac{k}{2}$

58. The equation of the ellipse with directrix $3x + 4y - 5 = 0$, focus (1, 2) and eccentricity $\frac{1}{2}$, is
(1) $x^2 + 84y^2 - 24xy - 360y + 170x + 475 = 0$
(2) $91x^2 + 84y^2 - 24xy - 170x - 360y + 475 = 0$

(3) $91x^2+84y^2-24xy-170x+360y+475=0$

(4) $91x^2+84y^2-24xy-170x-360y-475=0$

59. The equation of the ellipse in the standard form whose length of the latus rectum is 4 and whose distance between the foci is $4\sqrt{2}$, is

(1) $\frac{x^2}{2}+\frac{y^2}{3}=1$ (2) $2x^2+y^2=8$ (3) $x^2+2y^2=16$ (4) $x^2+5y^2=25$

60. The value of b^2 in order that the foci of the hyperbola $\frac{x^2}{144}-\frac{y^2}{81}=\frac{1}{25}$ and the ellipse $\frac{x^2}{16}+\frac{y^2}{b^2}=1$ coincide is

(1) 1 (2) 5 (3) 7 (4) 9

61. The equation of the common tangent drawn to the curves $y^2=8x$ and $xy=-1$ is

(1) $y=2x+1$ (2) $2y=x+6$ (3) $y=x+2$ (4) $3y=8x+2$

62. Points $A(3, 2, 4)$, $B\left(\frac{33}{5},\frac{28}{5},\frac{38}{5}\right)$ and $C(9, 8, 10)$ are given. The ratio in which B divides $\overline{AC}$ is

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

63. If the direction cosines of two lines are such that $l+m+n=0$, $l^2+m^2-n^2=0$, then the angle between them is

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

64. The perpendicular distance of the point (1, –1, 2) form the plane $x+2y+z=4$, is

(1) $\sqrt{17}$ (2) $\sqrt{6}$ (3) $\sqrt{\frac{3}{2}}$ (4) $\sqrt{\frac{2}{3}}$

65. $f:R^+\to R$ be an increasing function such that $f(x)>0$ for all x. If $\lim_{x\to\infty}\frac{f(9x)}{f(3x)}=1$, then $\lim_{x\to\infty}\frac{f(6x)}{f(3x)}=$

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

66. If $[x]$ is the greatest integer function, then $\lim_{x\to 2^+}\left(\frac{[x]^3}{3}-\left[\frac{x}{3}\right]^3\right)=$

(1) 0 (2) $\frac{64}{27}$ (3) $\frac{8}{3}$ (4) $\frac{7}{3}$

67. $\lim_{x\to 0}\frac{\sqrt{x^2+100}-10}{x^2}=$

(1) 0 (2) 0.1 (3) 0.05 (4) –0.05

68. If $\sqrt{\frac{y}{x}}+4\sqrt{\frac{x}{y}}=4$, then $\frac{dy}{dx}=$

(1) xy (2) $\frac{x}{y}$ (3) –4 (4) 4

69. Let $g(x)\neq 0$, $g'(x)\neq 0$, $f(x)\neq 0$, $f'(x)\neq 0$. If $F(x)=f(x)g(x)$, $G(x)=f'(x)g'(x)$ and $F'(x)=G(x)H(x)=F(x)K(x)$, then $H(x)+K(x)=$

(1) $\frac{f'}{f}+\frac{f}{f'}+\frac{g}{g'}$ (2) $\frac{f'}{f}+\frac{g}{g'}+\frac{g'}{g}$ (3) $\frac{f'g'+fg}{ff'gg'}$ (4) $\frac{f'}{f}+\frac{g}{g'}+\frac{f}{f'}+\frac{g'}{g}$

70. If the error in measuring the side l of an equilateral triangle is 0.01, then the percentage error in the area of the triangle, in terms of its side l is

(1) $\frac{2}{l}$ (2) $\frac{3}{l}$ (3) $\frac{4}{l}$ (4) $\frac{6}{l}$

71. If the lines $y=-4x+b$ are tangents to the curve $y=\frac{1}{x}$, then, $b=$

(1) ± 4 (2) ± 2 (3) 1 (4) ± 8

72. If $A>0$, $B>0$ and $A+B=\frac{\pi}{3}$, then the maximum value at $\tan A\tan B$ is

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

73. $\int\frac{dx}{(x-1)\sqrt{x^2-1}}=$

(1) $-\sqrt{\frac{x-1}{x+1}}+C$ (2) $\sqrt{\frac{x-1}{x^2+1}}+C$ (3) $-\sqrt{\frac{x+1}{x-1}}+C$ (4) $\sqrt{\frac{x^2+1}{x-1}}+C$

74. $\int e^x\left\{\frac{1-x}{1+x^2}\right\}^2 dx=$

(1) $\frac{e^x}{(1+x^2)^2}+c$ (2) $e^x\frac{(1-x)}{(1+x^2)}+c$ (3) $\frac{e^x}{1+x^2}+c$ (4) $\frac{(1-x)}{(1+x^2)^2}+c$

75. $\int\frac{3^x}{\sqrt{9^x-1}}dx=$

(1) $\frac{1}{\log 3}\log\left|3^x+\sqrt{9^x-1}\right|+C$ (2) $\frac{1}{\log 3}\log\left|3^x-\sqrt{9^x-1}\right|+C$

(3) $\frac{1}{\log 9}\log\left|3^x-\sqrt{9^x-1}\right|+C$ (4) $\frac{1}{\log 9}\log\left|9^x-\sqrt{9^x-1}\right|+C$

76. If $A(x)=\begin{vmatrix}x+1 & 2x+1 & 3x+1\\ 2x+1 & 3x+1 & x+1\\ 3x+1 & x+1 & 2x+1\end{vmatrix}$ then $\int_0^1 A(x)dx=$

(1) -15 (2) $\frac{-15}{2}$ (3) -30 (4) -5

77. $\underset{n\to\infty}{Lt}\left[\frac{1}{\sqrt{n^2-1^2}}+\frac{1}{\sqrt{n^2-2^2}}+\ldots+\frac{1}{\sqrt{2n-1}}\right]=$

(1) π (2) 2π (3) $\frac{\pi}{2}$ (4) $\frac{3\pi}{2}$

78. The area of the region described by $A=\{(x,y):x^2+y^2\leq 1$ and $y^2\leq 1-x\}$ is

(1) $\frac{\pi}{2}-\frac{2}{3}$ (2) $\frac{\pi}{2}+\frac{2}{3}$ (3) $\frac{\pi}{2}+\frac{4}{3}$ (4) $\frac{\pi}{2}-\frac{4}{3}$

79. The order and degree of the differential equation $\frac{d^2y}{dx^2}+y+\left(\frac{dy}{dx}-\frac{d^3y}{dx^3}\right)^{3/2}=0$ are respectively.
(1) 3, 4 (2) 2, 2 (3) 3, 2 (4) 3, 3

80. The general solution of the differential equation $\left(1+y^2\right)dx=\left(\tan^{-1}y-x\right)dy$ is
(1) $x=\left(\tan^{-1}y\right)-1+Ce^{-\tan^{-1}y}$ (2) $x=\left(\tan^{-1}y\right)-1+Ce^{\tan^{-1}y}$
(3) $x=\left(\tan^{-1}y\right)-1+C$ (4) $x=\left(\tan^{-1}y\right)+Ce^{-\tan^{-1}y}$

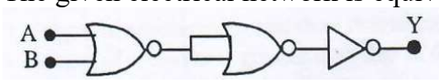
PHYSICS

81. The dimensions of a × b in the relation $E=\frac{b-x^2}{at}$, where E is the energy, x is the displacement and t is time are
(1) ML^2T (2) $M^{-1}L^2T$ (3) ML^2T^{-2} (4) MLT^{-2}

82. A particle starting with certain initial velocity and uniform acceleration covers a distance of 12m in first 3 seconds and a distance of 30m in next 3 seconds. The initial velocity of the particle is
(1) 3 ms^{-1} (2) 2.5 ms^{-1} (3) 2 ms^{-1} (4) 1 ms^{-1}

83. A particle undergoes simple harmonic motion having time period T. The time taken in 3/8th oscillation is
(1) $\frac{3}{8}T$ (2) $\frac{5}{8}T$ (3) $\frac{5}{12}T$ (4) $\frac{7}{12}T$

84. When current in a coil changes from 5 A to 2 A in 0.1 s, average voltage of 50 V is produced. The self – inductance of the coil is
(1) 6 H (2) 0.67H (3) 3 H (4) 1.67 H

85. The given electrical network is equivalent to:


(1) OR gate (2) NOR gate (3) NOT gate (4) AND gate

86. The work function of aluminum is 4.2 eV. If two photons each of energy 3.5 eV strike an electron of aluminum, then emission of electron will
(1) depend upon the density of the surface (2) possible
(3) not possible (4) none of these

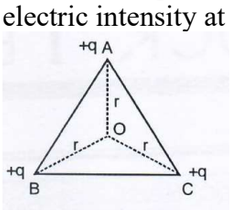
87. A doubly ionized Li atom is excited from its ground state $(n=1)$ to $n=3$ state. The wavelengths of the spectral lines are given by $\lambda_{32},\lambda_{31}$ and λ_{21}. The ration $\lambda_{32}/\lambda_{31}$ and $\lambda_{21}/\lambda_{31}$ are, respectively
(1) 8.1, 0.67 (2) 8.1, 1.2 (3) 6.4, 1.2 (4) 6.4, 0.67

88. Two wires A and B of the same material, having radii in the ration 1:2 and carry currents in the ration 4:1. The ratio of drift speed of electrons in A and B is
(1) 16:1 (2) 1:16 (3) 1:4 (4) 4:1

89. A bullet of mass 5g, travelling with a speed of 210 m/s, strikes a fixed wooden target. One half of its kinetics energy is converted into heat in the bullet while the other half is converted into heat in the wood. The rise of temperature of the bullet if the specific heat of its material is 0.030 cal/(g-C°) (1 cal = 4.2 × 10^7ergs) close to:
(1) 87.5°C (2) 83.3°C (3) 119.2°C (4) 38.4°C

90. An object undergoing SHM takes 0.5 s to travel from one point of zero velocity to the next such point. The distance between those points is 50cm. The period, frequency and amplitude of the motion is
(1) 1s, 1Hz, 25cm (2) 2s,1Hz, 50cm (3) 1s,2Hz, 25cm (4) 2s,2Hz, 50cm

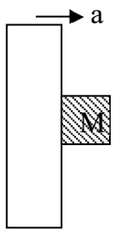
91. ABC is an equilateral triangle. Charges +q are placed at each corner as shown in fig. the electric intensity at centre O will be



(1) $\frac{1}{4\pi \in_o}\frac{q}{r}$ (2) $\frac{1}{4\pi \in_o}\frac{q}{r^2}$ (3) $\frac{1}{4\pi \in_o}\frac{3q}{r^2}$ (4) zero

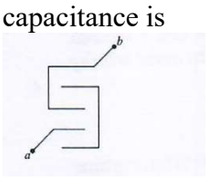
92. A metallic bar is heated from 0°C to 100°C. The coefficient of linear expansion is 10^{-5} K^{-1}.What will be the percentage increase in length?
(1) 0.01% (2) 0.1% (3) 1% (4) 10%

93. A rough vertical board has an acceleration *a* along the horizontal so that a block of mass M pressing against it does not fall. The coefficient of friction between block and the board is



(1) $> \frac{a}{g}$ (2) $> \frac{g}{a}$ (3) $= \frac{a}{g}$ (4) $> \frac{g}{a}$

94. Plates of area A are arranged as shown. The distance between each plate is d, the net capacitance is



(1) $\frac{\varepsilon_0 A}{d}$ (2) $\frac{7\varepsilon_0 A}{d}$ (3) $\frac{6\varepsilon_0 A}{d}$ (4) $\frac{5\varepsilon_0 A}{d}$

95. A plane wave of wavelength 6250 A is incident normally on a slit of width 2×10^{-2} cm. The width of the principal maximum on a screen distant 50cm will be
(1) 312.5×10^{-3}cm (2) 312.5×10^{-6} m (3) 312.5×10^{-3} m (4) 312.5×10^{-6} cm

96. The heat radiated per unit area in 1 hour by a furnace whose temperature is 3000 K is $(\sigma = 5.7 \times 10^{-8} W\, m^{-2}\, K^{-4})$
(1) 1.7×10^{10}J (2) 1.1×10^{12}J (3) 2.8×10^{8}J (4) 4.6×10^{6}JTwo isolated conducting spheres S_1 and S_2 of radius $\frac{2}{3}R$ and $\frac{1}{3}R$ have 12 μC and -3 μC charges, respectively, and are at a large distance from each other. They are now connected by a conducting wire. A long time after this is done the charges on S_1 and S_2 are respectively:
(1) 4.5 μC on both (2) +4.5 μC and -4.5 μC
(3) 3 μC and 6 μC (4) 6 μC and 3 μC

98. A gun fires two bullets at 60° and 30° with horizontal. The bullets strike at some horizontal distance. The ratio of maximum height for the two bullets is in the ratio of

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

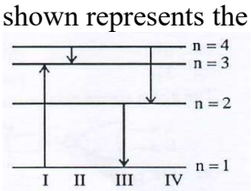
99. A generator has an e.m.f. of 440 Volt and internal resistance of 400b Ohm. Its terminals are connected to a load of 4000 Ohm the voltage across the load is
(1) 220 Volt (2) 440 Volt (3) 200 Volt (4) 400 Volt

100. Electric field inside a copper wire of length 10 meters, resistance 2 Ohm connected to a 10 volt battery is
(1) 1 Vm^{-1} (2) 0.5 Vm^{-1} (3) 10 Vm^{-1} (4) 5 Vm^{-1}

101. A large number of liquid drops each of radius γ coalesce to from a single drop of radius R. The energy released in the process is converted into kinetic energy of the big drop so formed. The speed of the big drop is (given, surface tension of liquid T, density r)
(1) $\sqrt{\frac{T}{\rho}\left(\frac{1}{r}-\frac{1}{R}\right)}$ (2) $\sqrt{\frac{2T}{\rho}\left(\frac{1}{r}-\frac{1}{R}\right)}$ (3) $\sqrt{\frac{4T}{\rho}\left(\frac{1}{r}-\frac{1}{R}\right)}$ (4) $\sqrt{\frac{6T}{\rho}\left(\frac{1}{r}-\frac{1}{R}\right)}$

102. The path difference between the two waves: $y_1 = a_1 \sin\left(\omega t - \frac{2\pi x}{\lambda}\right)$ and $y_2 = a_2 \sin\left(\omega t - \frac{2\pi x}{\lambda} + \phi\right)$ will be
(1) $\frac{2\pi}{\lambda}\phi$ (2) $\frac{2\pi}{\lambda}\left(\phi - \frac{\pi}{2}\right)$ (3) $\frac{\lambda}{2\pi}\phi$ (4) $\frac{2\pi}{\lambda}\left(\phi + \frac{\pi}{2}\right)$

103. The diagram shows the energy levels for an electron in a certain atom. Which transition shown represents the emission of a photon with the most energy?



(1) IV (2) III (3) II (4) I

104. A body of mass 10 kg and velocity 10 m/s collides with a stationary body of mass 5 kg. After collision both bodies stick to each other, velocity of the bodies after collision will be
(1) $\frac{3}{10} m/s$ (2) $\frac{18}{3} m/s$ (3) $\frac{9}{20} m/s$ (4) $\frac{20}{3} m/s$

105. Two particles of mass m_1 and m_2 ($m_1 > m_2$) attract each other with a force inversely proportional to the square of the distance between them. If the particles are initially held at rest and then released, the centre of mass will
(1) move towards m_1 (2) move towards m_2
(3) remain at rest (4) Nothing can be said

106. The r.m.s velocity of oxygen molecule at 16°C is 474 m/sec. The r.m.s velocity in m/s of hydrogen molecule at 127°C is
(1) 1603 (2) 1896 (3) 2230.59 (4) 2730

107. The oscillating electric and magnetic field vectors of electromagnetic wave are oriented along
(1) the same direction and in phase
(2) the same direction but have a phase difference of 90°
(3) mutually perpendicular directions and are in same phase
(4) mutually perpendicular directions but has a phase difference of 90°

108. At 0°K which of the following properties of a gas will be zero?
(1) kinetic energy (2) potential energy (3) vibrational energy (4) density

109. A uniform rod of mass m, length ℓ, area of cross-section A has Young's modulus Y. If it is hanged vertically, elongation under its own weight will be

(1) $\frac{mg\ell}{2AY}$ (2) $\frac{2mg\ell}{AY}$ (3) $\frac{mg\ell}{AY}$ (4) $\frac{mgY}{A\ell}$

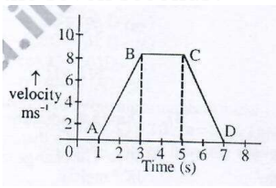
110. If two soap bubbles of different radii are connected by a tube. Then
(1) air flows from the smaller bubble to the bigger bubble
(2) air flows from bigger bubble to the smaller bubble till the sizes are interchanged
(3) air flows from the bigger bubble to the smaller bubble till the sizes become equal
(4) there is no flow of air.

111. In a transistor
(1) both emitter and collector have same length
(2) length of emitter is greater than that of collector
(3) length of collector is greater than that of emitter
(4) any one of emitter and collector can have greater length

112. A brass scale of a barometer gives correct reading at 0°C. α_{Brass}= 0.00002/°C. the barometer reads 75 cm at 27°C. The atmospheric pressure at 0°C is
(1) 74.20cm (2) 74.62cm (3) 74.92cm (4) 75.04cm

113. The total length of a sonometer wire between fixed ends is 110cm. Two bridges are placed to divide the length of wire in ratio 6 : 3 : 2. The tension in the wire is 400 N and the mass per unit length is 0.01 kg/m. What is the minimum common frequency with which three parts can vibrate?
(1) 1100 Hz (2) 1000 Hz (3) 166 Hz (4) 100 Hz

114. For the velocity time graph shown in the figure below the distance covered by the body in the last two seconds of its motion is what fraction of the total distance travelled by it in all the seven seconds?

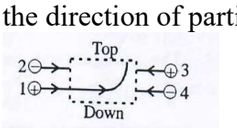


(1) $\frac{1}{2}$ (2) $\frac{1}{4}$ (3) $\frac{2}{3}$ (4) $\frac{1}{3}$

115. A 25 cm long solenoid has radius 2 cm and 500 total number of turns. It carries a current of 15A. If it is equivalent to a magnet of the same size and magnetization $\vec{M}$ (magnetic moment/volume), the $\left|\vec{M}\right|$ is
(1) 3000π Am^{-1} (2) 3πAm^{-1} (3) 3000 Am^{-1} (4) 300 Am^{-1}

116. A stone is thrown with a velocity u making an angle θ with the horizontal. The horizontal distance covered by its fall to ground is maximum when the angel θ is equal to
(1) 0° (2) 30° (3) 45° (4) 90°

117. The figure shown the path of a positively charged particle 1 through a rectangular region of uniform electric field as shown in the figure. What is the direction of electric field and the direction of particles 2, 3 and 4?

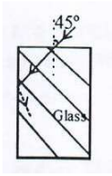


(1) Top, down, top, down (2) Top, down, down, top
(3) Down, top, top, down (4) Down, top, down, down

118. A circular disc A of radius r is made from an iron plate of thickness t and another circular disc B of radius 4r is made from an iron plate of thickness t/4. The relation between the moments of inertia I_A and I_B is
(1) $I_A > I_B$ (2) $I_A = I_B$
(3) $I_A < I_B$ (4) depends on the actual values of t and r

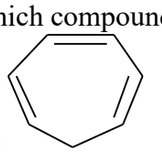
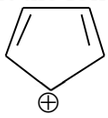
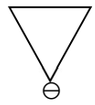
119. The threshold frequency for a photosensitive metal is 3.3×10^{14} Hz. If light of frequency 8.2×10^{14} Hz is incident on this metal, the cut-off voltage for the photoelectric emission is nearly
(1) 2V (2) 3V (3) 5V (4) 1 V

120. A light ray falls on a rectangular glass slab as shown. The index of refraction of the glass, if total internal reflection is to occur at the vertical face, is



(1) $\sqrt{\frac{3}{2}}$ (2) $\frac{(\sqrt{3}+1)}{2}$ (3) $\frac{(\sqrt{2}+1)}{2}$ (4) $\frac{\sqrt{5}}{2}$

CHEMISTRY

121. Which compound amongst the following is not an aromatic compound?
(1)  (2)  (3)  (4) 

122. Identify the incorrect statement from the following
(1) Li is the strongest reducing agent among the alkali metal
(2) Alkali metals react with water to form their hydroxides
(3) The oxidation number of K in KO_2 is +4
(4) I.E of alkali metal decreases from top to bottom in one group

123. Which statement regarding polymer is not correct?
(1) Thermosetting polymers are reusable
(2) Elastomers have polymers chains held together by weak intermolecular process
(3) Fibres possess high tensile strength
(4) Thermoplastic polymers are capable of repeatedly softening and hardening with heat changes

124. $RMgX + CO_2 \xrightarrow[\text{ether}]{\text{dry}} Y \xrightarrow{H_3O^{\oplus}} RCOOH$
(1) $(RCOO)_2Mg$ (2) $RCOO^{\ominus}Mg^{\oplus}X$ (3) $R_2CO^{\ominus}Mg^{\oplus}X$ (4) $RCOO^{\ominus}X^{\oplus}$

125. **Assertion (A):** ICI is more radioactive than I_2.
Reason (R): ICI bond is weaker than I-I bond
(1) (A) is not correct but (R) is correct
(2) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(3) Both (A) and (R) are correct and (R) is the incorrect explanation of (A)
(4) (A) is correct but (R) is incorrect

126. Identify the incorrect statement from the following
(1) The shapes of *dxy*, *dyz* and *dzx* orbitals are similar to each other and dx^2y^2, dz^2 are similar to each other
(2) All the 5*d* orbitals are different in size when compared to respective 4*d* orbitals
(3) All the 4*d* orbitals have shapes similar to respective 3*d* orbitals
(4) In an atom all the five 3*d* orbitals are equal in energy in free state

127. The IUPAC name of an element with atomic number 119 is
(1) Ununoctium (2) Ununennium (3) Unnilennium (4) Unununnium

128. In one molar solution that contains 0.5 mole of salute, there is
(1) 1000g of solvent (2) 500 ml of solvent (3) 500g of solvent (4) 100 ml of solvent

129. Match List – I with List – II

List – I (Drug class)	List – II (Drug molecule)
1) Antacids	(i) Salvarsan
2) Anti histamines	(ii) Morphine
3) Analgesics	(iii) Cimetidine
4) Anti microbial	(iv) Seldane

Choose the correct answer.

(1) 1-iv, 2-iii, 3-i, 4-iii(2) 1-iii, 2-ii, 3-iv, 4-i (3) 1-iii, 2-iv, 3-ii, 4-i (4) 1-I, 2-iv, 3-ii, 4-iii

130. Choose the correct statement
(1) Both diamond and graphite are used as dry lubricants
(2) Diamond and graphite have two dimensional networks
(3) Diamond is covalent and graphite is ionic
(4) Diamond is sp^3 hybridized and graphite is sp^2 hybridized

131. Which amongst the following is incorrect statement?
(1) O_2^+ ion is diamagnetic
(2) The basic order of O_2^+, O_2, $O_2^-$and O_2^{2-} are 2.5, 2, 1.5 and 1
(3) C_2 molecule has four electrons in its degenerate π molecular orbitals
(4) H_2^+ ion has one electron

132. Given below are two statements.
I: The acidic strength of monosubstituted nitrophenol is higher than phenol because of electron withdrawing nitro group
II: *o*-nitro phenol, *m*-nitro phenol and *p*-nitro phenol will have same acidic strength as they have same acidic strength as they have one nitro group attached to the phenolic ring
(1) **I** is incorrect but **II** is correct (2) Both **I** and **II** are correct
(3) Both **I** and **II** are incorrect (4) **I** is correct but **II** is incorrect

133. The incorrect statement regarding enzymes is
(1) Enzymes are very specific for a particular reaction and substrate
(2) Enzymes are biocatalyst
(3) Like chemical catalyst enzymes reduce the activation energy of bioprocess
(4) Enzymes are polysaccharides

134. The incorrect statement regarding chirality is
(1) A racemic mixture shows zero optical rotation
(2) SN^1 reaction yields 1 : 1 mixture of both enantiomers
(3) The product obtained by SN^2 reactions of haloalkane having chirality at reactive site shows invention of configuration

135. Given below are two statements
I: In the coagulation of a negative sol, the flocculating power of the three given ions is in the order $AI^{3+} > Ba^{2+} > Na^+$.
II: In the coagulation of a positive sol, the flocculating power of the three given salts is in the order $NaCl > Na_2SO_4 > Na_3PO_4$
(1) **I** is incorrect but **II** is correct (2) Both **I** and **II** are correct
(3) Both **I** and **II** are incorrect (4) **I** is correct but **II** is incorrect

136. Match

List – I	List – II
(a) Li	(i) Absorbent for CO_2
(b) Na	(ii) Electrochemical cells
(c) KOH	(iii) Coolant in fast breeder reactions
(d) CS	(iv) Photo electric cell

Choose the correct answer.

(1) a-ii, b-iii, c-I, d-iv (2) a-iv, b-i, c-iii, d-ii (3) a-iii, b-iv, c-ii, d-i (4) a-I, b-ii, c-iv, d-iii

137. At 298K, the standard electrode potential of Cu^+ / Cu, Zn^+ / Zn, Fe^+ / Fe and Ag^+ / Ag are 0.34V, –0.76V, –0.44V and +0.80V respectively on the basis of SEP, predicts which cannot occur
(1) $2CuSO_4(aq) + 2Ag(s) \rightarrow 2Cu(s) + Ag_2SO_4$
(2) $CuSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Cu(s)$
(3) $CuSO_4(aq) + Fe(s) \rightarrow FeSO_4(aq) + Cu(s)$
(4) $FeSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Fe(s)$

138. **I:** The boiling points of aldehydes and ketones are higher than hydrocarbons of comparable molecular masses because of weak molecular association in aldehydes and ketones due to dipole-dipole interaction.
II: The boiling points of aldehyde and ketones are lower than the alcohols of similar molecular masses due to absence of H-bonding
(1) **I** is incorrect but **II** is correct (2) both **I** and **II** are correct
(3) Both **I** and **II** are correct (4) **I** is correct but **II** is incorrect

139. Find the emf of the cell in which the following reaction takes place at 298K
$Ni(s) + 2Ag^+ (0.002M) \rightarrow Ni^{2+} (0.001M) + 2Ag(s)$
[Given that E° cell = 10.5V, $\frac{2.303RT}{F} = 0.059$ at 298K]
(1) 1.05V (2) 1.4115V (3)1.385 V (4) 0.9615 V

140. The IUPAC name of the complex $[Ag(H_2O)_2]\,[Ag(CN)_2]$ is
(1) diaqua silver (i) dicyanide argentite (i) (2) dicyanide silver (ii) diaquaargentate
(3) diaqua silver (ii) dicyanide argentite (ii) (4) dicyanide silver (i) diaqua argentite (i)

141. Gadolinium has a low value of third ionisation enthalpy because of
(1) high basic character (2) small size
(3) high exchange enthalpy (4) high electronic activity

142. In the natural or saintly alkaline medium, $KMnO_4$ oxidises iodide into iodate. The change in oxidation state of manganese in this reaction is from
(1) +6 to +5 (2) +7 to +4 (3) +6 to +4 (4) +7 to +3

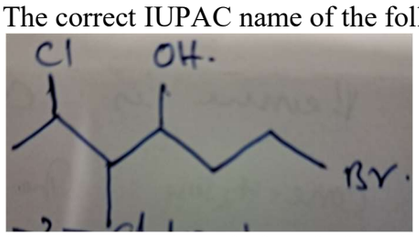
143. A 10 litre flask contains 64 gram of oxygen at 27°C. The pressure inside the flask in bar is (And O_2 gas is behaving ideally) ($R = 0.0831\ \mu$ bar K^{-1} mol^{-1})
(1) 4.9 (2) 2.5 (3) 498.6 (4) 49.8

144. Copper crystallises in FCC unit cell with cell edge length of 3.608×10^{-8} cm. The density of copper is 8.92 gcm^{-3}. Calculate the atomic mass of copper.
(1) 65 μ (2) 63.1 μ (3) 31.55 μ (4) 60 μ

145. The order of energy absorbed which is responsible for the color of compresses
(A) $[Ni(H_2O)_2(en)_2]^{2+}$ (B) $[Ni(H_2O)_4(en)_2]^{2+}$ (C) $[Ni(en)_3]^{2+}$
(1) B > A > C (2) A > B > C (3) C > B > A (4) C > A > B

146. The pollution due to oxides of sulphur gets enhanced due to the presence of
(a) particulate matter (b) ozone (c) hydrocarbon (d) hydrogen peroxide
(1) a, c, d only (2) a, d only (3) a, b, d only (4) b, c, d only

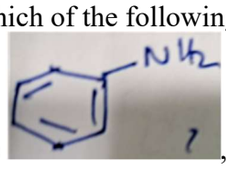
147. The correct IUPAC name of the following compound is



(1) 6-bromo-4-methyl-z-choloro hexon-4-01
(2) 1-bromo-2-cholor-4-methythexon-4-01
(3) 6-bromo-2-chloro-4-methythexan-4-01

(4) 1-bromo-4-methyl-5-chloro hexon-3-01

148. Which of the following square of reaction is suitable to synthesize chlorobenzene

(1)  , HCL, Heating (2) Benzene, Cl_2, anhydrous $FeCl_3$

(3) Phenol, $NaNO_2$ HCl, CuCl (4)  , HCl

149. The p^H of the solution containing 50ml each of 0.10M sodium acetate and 0.01M acetic acid is (Given pka of CH_3COOH = 4.57)
(1) 2.57 (2) 5.57 (3) 3.57 (4) 4.57

150. What mass of 95% pure $CaCO_3$ will be required to nutralize 50 ml of 0.5M HCl solution according to the following reaction?
$CaCO_3(l) + 2HCl(aq) \rightarrow CaCl_2(aq) + CO_2 + 2H_2O(l)$
(1) 9.50g (2) 1.25g (3) 1.32g (4) 3.65g

151. Nitration of benzene is carried out with concentrated HNO_3 in pressure of concentrated H_2SO_4 in to provide
(1) Nucleophile during the reaction (2) Free radical during the reaction
(3) Electrophile during the reaction (4) Catalyst during the reaction

152. Some meta directing substitutes in aromatic substitution are given which one is most deactivating?
(1) –COOH (2) $–NO_2$ (3) –C≡N (4) $–CO_3H$

153. In calcium fluoride having the fluorite structure, the coordination numbers for calcium ion (Ca^{+2}) and fluoride ion (F^-) are
(1) 4 & 2 (2) 6 & 6 (3) 8 & 4 (4) 4 & 8

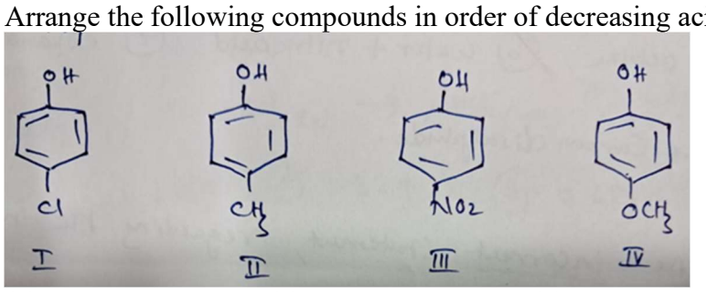
154. The mixture that from maximum boiling azeotrope is
(1) heptane + octane (2) water + nitric acid (3) ethanol + water
(4) acetone + carbon disulphide

155. Identify the incorrect statement, regarding the molecule XeO_4.
(1) XeO_4 molecule if square planar (2) There are four $p\pi–d\pi$ bonds
(3) There are four $sp^3–p$, σ bonds (4) XeO_4 molecule is tetra hedral

156. The pair of compound boiling metals in their highest oxidation state is
(1) $[Fe(CN)_6]^{3-}$ and $[Cu(CN)_6]^{2-}$ (2) $[FeCl_4]^-$ and CO_2O_3
(3) $[NiCl_4]^{2-}$ and $[COCl_4]^{2-}$ (4) MnO_2 and CrO_2Cl_2

157. The type of Isomerism shown by the complex $[CoCl_2(en)_2]$ is
(1) Geometrical isomerism (2) Coordination isomerism
(3) Ionisation isomerism (4) Linkage isomerism

158. Arrange the following compounds in order of decreasing acidity



(1) IV > III > I > II (2) II > IV > I > III (3) I > II > III > IV (4) III > I > II > IV

159. Which of the following reaction is appropriate for converting acefamide to methanamine?

(1) Hoffmann hypobromamide reaction (2) Stephens reaction
(3) Gabriel pthlamide synthesis (4) carbylamine reaction

160. In a protein molecule various amino acids are linked together by
(1) peptide bon (2) dative bond (3) α-glycosidic bond (4) β-glycosidic bon