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28-Jan-2026_Shift-I_JEE Main-2026_Session-I(Jan)

MATHEMATICS

Max Marks: 100

SECTION-I

(SINGLE CORRECT ANSWER TYPE)

This section contains 20 Multiple Choice Questions. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which ONLY ONE option can be correct.

Marking scheme: +4 for correct answer, 0 if not attempted and -1 in all other cases.

1. Let A, B and C be three 2×2 matrices with real entries such that $B = (I + A)^{-1}$ and

$$A + C = I. \text{ If } BC = \begin{pmatrix} 1 & -5 \\ -1 & 2 \end{pmatrix} \text{ and } CB \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} 12 \\ -6 \end{pmatrix}, \text{ then } x_1 + x_2 \text{ is}$$

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

Key: 4

Sol: $(I + A)B = I \Rightarrow B + AB = I$ ----- (1)

As well as $B + BA = I$ ----- (2)

$A + C = I \Rightarrow A = I - C$ ----- (3)

Sub (3) in (1) $\Rightarrow B + (I - C)B = I \Rightarrow 2B - CB = I$ ----- (4)

$$BC = \begin{bmatrix} 1 & -5 \\ -1 & 2 \end{bmatrix} \Rightarrow B(I - A) = \begin{bmatrix} 1 & -5 \\ -1 & 2 \end{bmatrix}$$

$$B - (I - B) = \begin{bmatrix} 1 & -5 \\ -1 & 2 \end{bmatrix}$$

$$2B - I = \begin{bmatrix} 1 & -5 \\ -1 & 2 \end{bmatrix}$$

$$CB = \begin{bmatrix} 1 & -5 \\ -1 & 2 \end{bmatrix}$$

$$\begin{bmatrix} 1 & -5 \\ -1 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 12 \\ -6 \end{bmatrix}$$

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \frac{1}{-3} \begin{bmatrix} 2 & 5 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} 12 \\ -6 \end{bmatrix} = \frac{1}{-3} \begin{bmatrix} -6 \\ 6 \end{bmatrix} = \begin{bmatrix} 2 \\ -2 \end{bmatrix}$$

$$x_1 + x_2 = 0$$

2. The mean and variance of 10 observations are 9 and 34.2, respectively. If 8 of these observations are 2,3,5,10,11,13,15,21, then the mean deviation about the median of all the 10 observations is

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

Key: 4

Sol: $2 + 3 + 5 + 10 + 11 + 13 + 15 + 21 + a + b = 90$

$$a + b = 90 - 80$$

$$a + b = 10 \quad \text{----- (1)}$$

$$4 + 9 + 25 + 100 + 121 + 169 + 225 + 441 + a^2 + b^2 = 10(34.2 + 81)$$

$$1094 + a^2 + b^2 = 1152$$

$$a^2 + b^2 = 58$$

$$(1) \Rightarrow a^2 + b^2 + 2ab = 100$$

$$ab = 21 \text{ then } a = 3, b = 7 \text{ or } a = 7, b = 3$$

Numbers \longrightarrow 2, 3, 3, 5, 7, 10, 11, 13, 15, 21

$$\text{Mean} = \frac{7+10}{2} = 8.5$$

$$M.D = \frac{6.5 + 5.5 + 5.5 + 3.5 + 1.5 + 1.5 + 2.5 + 4.5 + 6.5 + 12.5}{10} = \frac{50}{10}$$

$$M.D = 5$$

3. Let $y = x$ be the equation of a chord of the circle C_1 (in the closed half – plane $x \geq 0$) of diameter 10 passing through the origin. Let C_2 be another circle described on the given chord as its diameter. If the equation of the chord of the circle C_2 , which passes through the point $(2, 3)$ and is farthest from the center of C_2 , is $x + ay + b = 0$, then $a - b$ is equal to

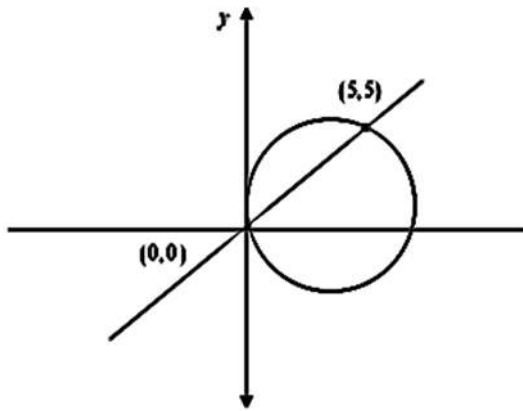
- 1) -2 2) -6 3) 6 4) 10

Key: 1

Sol: $C_1 = (x - 5)^2 + y^2 = 25$

$$C_2 = \left(x - \frac{5}{2}\right)^2 + \left(y - \frac{5}{2}\right)^2 = \frac{25}{4}$$

Let centre of C_2 be P



$$Q(2, 3)$$

$$\text{Slope of } PQ = \frac{1/2}{-1/2} = -1$$

$$\text{Req } x - y + 1 = 0$$

$$a - b = -2$$

4. For three unit vectors a, b, c satisfying $|a - b|^2 + |b - c|^2 + |c - a|^2 = 9$ and

$$|2a + kb + kc| = 3, \text{ the positive value of } k \text{ is}$$

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

Key:2

$$\text{Sol: } 6 - 2(\overline{a \cdot b} + \overline{b \cdot c} + \overline{c \cdot a}) = 9$$

$$\overline{a \cdot b} + \overline{b \cdot c} + \overline{c \cdot a} = \frac{-3}{2}$$

$$|2\overline{a} + k\overline{b} + k\overline{c}| = 3$$

$$|2\overline{a} + k(-\overline{a})| = 3$$

$$|(2 - k)\overline{a}| = 3$$

$$2 - k = \pm 3 \Rightarrow k = 5, -1$$

5. The value of $\sum_{k=1}^{\infty} (-1)^{k+1} \left(\frac{k(k+1)}{k!} \right)$ is

1) $2/e$

2) $e/2$

3) \sqrt{e}

4) $1/e$

Key: 4

Sol: $\sum_{k=1}^{\infty} (-1)^{k+1} \frac{k(k+1)}{k!}$

$$\sum_{k=1}^{\infty} (-1)^{k+1} \frac{(k(k-1) + 2k)}{k!}$$

$$\sum_{k=2}^{\infty} (-1)^{k+1} \frac{1}{(k-2)!} + \sum_{k=1}^{\infty} \frac{(-1)^{k+1}}{(k-1)!} = -e^{-1} + 2e^{-1} = e^{-1} = \frac{1}{e}$$

6. Let $S = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$. Let x be the number of 9-digit numbers formed using the digits of the set S such that only one digit is repeated and it is repeated exactly twice. Let y be the number of 9-digit numbers formed using the digits of the set S such that only two digits are repeated and each of these is repeated exactly twice. Then:

1) $45x = 7y$

2) $21x = 4y$

3) $56x = 9y$

4) $29x = 5y$

Key: 2

Sol: $S = \{1, 2, 3, \dots, 9\}$

$$x = 9 \cdot {}_9C_1 \cdot 8 \cdot {}_7C_7 \times \frac{9!}{2} = \frac{9 \times 8 \times 9}{2}$$

$$y = 9 \cdot {}_9C_2 \cdot 7 \cdot {}_5C_5 \times \frac{9!}{2! \times 2!} = \frac{9 \times 8}{2} \times \frac{7 \times 6}{2} \times \frac{9!}{2! \times 2!}$$

$$\frac{x}{y} = \frac{4}{21}$$

$$21x = 4y$$

7. A bag contains 10 balls out of which k are red and $(10 - k)$ are black, where $0 \leq k \leq 10$. If three balls are drawn at random without replacement and all of them are found to be black, then the probability that the bag contains 1 red and 9 black balls is:

1) $\frac{14}{55}$

2) $\frac{7}{11}$

3) $\frac{7}{55}$

4) $\frac{7}{110}$

Key: 1

$$\text{Sol: } P\left(\frac{1R \ 9B}{3B}\right) = \frac{\frac{9}{10} \times \frac{8}{9} \times \frac{7}{8}}{\sum_{r=3}^{10} \frac{r(r-1)(r-2)}{10 \times 9 \times 8}} = \frac{9 \times 8 \times 7}{1 \times 2 \times 3 \times \sum_{r=3}^{10} r_{c_3}} = \frac{84}{3_{c_3} + 4_{c_3} + \dots + 10_{c_3}}$$

$$= \frac{84}{11_{c_4}} = \frac{14}{55}$$

8. Let ABC be an equilateral triangle with orthocenter at the origin and the side BC on the line $x + 2\sqrt{2}y = 4$. If the co-ordinates of the vertex A are (α, β) , then the greatest integer less than or equal to $|\alpha + \sqrt{2}\beta|$ is:

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

Key: 4

Sol: A lies on $2\sqrt{2}x - y = 10$

$$\tan \theta = 2\sqrt{2}$$

Perpendicular distance from $(0,0)$ on BC } $P = \frac{4}{\sqrt{1+8}} = \frac{4}{3} \Rightarrow OA = \frac{8}{3}$

$$A = \left(-\frac{8}{3} \cos \theta, -\frac{8}{3} \sin \theta\right) = \left(-\frac{8}{3} \cdot \frac{2\sqrt{2}}{3}, -\frac{8}{3} \cdot \left(\frac{1}{3}\right)\right) = \left(-\frac{16\sqrt{2}}{9}, -\frac{8}{9}\right) = (\alpha, \beta)$$

$$|\alpha + \sqrt{2}\beta| = \left|\frac{16\sqrt{2}}{9} + \frac{8\sqrt{2}}{9}\right| = \left|\frac{24\sqrt{2}}{9}\right| = 3$$

9. If α, β , where $\alpha < \beta$, are the roots of the equation $\lambda x^2 - (\lambda + 3)x + 3 = 0$ such that

$$\frac{1}{\alpha} - \frac{1}{\beta} = \frac{1}{3}, \text{ then the sum of all possible values of } \lambda \text{ is}$$

- 1) 4 2) 8 3) 2 4) 6

Key: 4

Sol: $\lambda x^2 - (\lambda + 3)x + 3 = 0$

$$\frac{1}{\alpha} - \frac{1}{\beta} = \frac{1}{3} \Rightarrow \frac{\beta - \alpha}{\alpha\beta} = \frac{1}{3}$$

$$\frac{\sqrt{(\alpha + \beta)^2 - 4\alpha\beta}}{\alpha\beta} = \frac{1}{3}$$

$$\left(\frac{\lambda + 3}{\lambda}\right)^2 - 4 \cdot \frac{3}{\lambda} = \frac{1}{3} \times \frac{3}{\lambda} \Rightarrow \lambda^2 - 6\lambda + 8 = 0$$

$$\lambda_1 + \lambda_2 = 6$$

10. If $\int \left(\frac{1 - 5 \cos^2 x}{\sin^5 x \cos^2 x} \right) dx = f(x) + C$, where C is the constant of integration, then

$f\left(\frac{\pi}{6}\right) - f\left(\frac{\pi}{4}\right)$ is equal to

1) $\frac{1}{\sqrt{3}}(26 - \sqrt{3})$ 2) $\frac{2}{\sqrt{3}}(4 + \sqrt{6})$ 3) $\frac{4}{\sqrt{3}}(8 - \sqrt{6})$ 4) $\frac{1}{\sqrt{3}}(26 + \sqrt{3})$

Key: 3

Sol: $\int \frac{1 - 5 \cos^2 x}{\sin^2 x \cos^2 x} dx$

$$\int \frac{\sec^2 x dx}{\sin^5 x} - \int \frac{5}{\sin^5 x} dx$$

$$\int \frac{1}{\sin^5 x} \tan x - \int \frac{-5}{\sin^6 x} \cos x \cdot \tan x dx - \int \frac{5}{\sin^6 x} dx = \frac{\tan x}{\sin^5 x} = f(x)$$

$$f\left(\frac{\pi}{6}\right) - f\left(\frac{\pi}{4}\right) = \frac{32}{\sqrt{3}} - \frac{1}{\left(\frac{1}{\sqrt{2}}\right)^5} = \frac{32}{\sqrt{3}} - 4\sqrt{2} = \frac{4}{\sqrt{3}}(8 - \sqrt{6})$$

11. Let $S = \{x^3 + ax^2 + bx + c : a, b, c \in N \text{ and } a, b, c \leq 20\}$ be a set of polynomials. Then the number of polynomials in S , which are divisible by $x^2 + 2$, is

1) 20 2) 6 3) 120 4) 10

Key: 4

Sol: $(x^2 + 2)(px + q) = x^3 + ax^2 + bx + c$

$$\Rightarrow px^3 + qx^2 + 2px + 2q = x^3 + ax^2 + bx + c$$

$$p = 1 \Rightarrow x^3 + qx^2 + 2x + 2q = x^3 + ax^2 + bx + c$$

$$\Rightarrow b = 2 \text{ and } c = 2a$$

$$(a, b, c) = (a, 2, 2a) \quad a \in N \text{ and } 1 \leq a \leq 10$$

Required polynomials = 10

12. Let $y = y(x)$ be the solution of the differential equation

$$x \frac{dy}{dx} - \sin 2y = x^3(2 - x^3) \cos^2 y, x \neq 0. \text{ If } y(2) = 0, \text{ then } \tan(y(1)) \text{ is equal to}$$

- 1) $\frac{3}{4}$ 2) $\frac{7}{4}$ 3) $-\frac{7}{4}$ 4) $-\frac{3}{4}$

Key: 2

Sol: $\sec^2 y \frac{dy}{dx} - \frac{2 \tan y}{x} = x^3(2 - x^3)$

Put $\tan y = t \Rightarrow \sec^2 y \cdot \frac{dy}{dx} = \frac{dt}{dx}$

$$\frac{dt}{dx} - \frac{2t}{x} = x^3(2 - x^3)$$

$$I.F = e^{\int -\frac{2}{x} dx} = e^{-2 \ln x} = \frac{1}{x^2}$$

$$t \cdot \left(\frac{1}{x^2}\right) = \int (2 - x^3) dx + c$$

$$\frac{t}{x^2} = 2x - \frac{x^4}{4} + c$$

$$\frac{\tan y}{x^2} = 2x - \frac{x^4}{4} + c$$

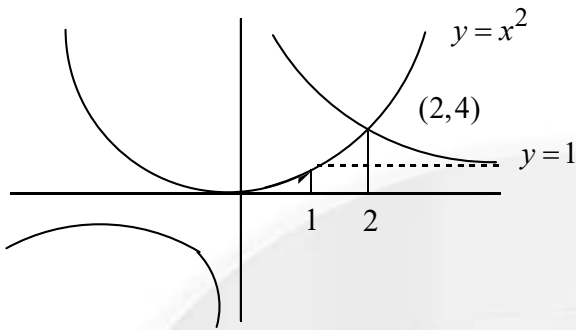
$$y(2) = 0 \Rightarrow 0 = 4 - \frac{16}{4} + c \Rightarrow c = 0$$

$$\text{Now Put } x = 1, \tan y = 2 - \frac{1}{4} = \frac{7}{4}$$

$$\tan y(1) = \frac{7}{4}$$

13. The area of the region $R = \{(x, y) : xy \leq 8, 1 \leq y \leq x^2, x \geq 0\}$ is

- 1) $\frac{1}{3}(40 \log_e(2) + 27)$ 2) $\frac{1}{3}(49 \log_e(2) - 15)$
 3) $\frac{2}{3}(24 \log_e(2) - 7)$ 4) $\frac{2}{3}(20 \log_e(2) + 9)$

Key: 3**Sol:**

$$A = \int_1^2 (x^2 - 1) dx + \int_2^8 \left(\frac{8}{x} - 1 \right) dx$$

$$A = 8 \log_e 4 - \frac{14}{3} = 16 \log_e 2 - \frac{14}{3} = \frac{2}{3} (24 \log_e (2) - 7)$$

14. If $g(x) = 3x^2 + 2x - 3$, $f(0) = -3$ and $4g(f(x)) = 3x^2 - 32x + 72$, then $f(g(2))$ is

- 1) $-\frac{25}{6}$ 2) $\frac{25}{6}$ 3) $\frac{7}{2}$ 4) $-\frac{7}{2}$

Key: 3

Sol: $g(2) = 3(2)^2 + 4 - 3 = 13$

$$f(g(2)) = f(13)$$

$$4g(f(x)) = 3x^2 - 32x + 72$$

$$4(3f^2(x) + 2f(x) - 3) = 3x^2 - 32x + 72$$

$$12f^2(x) + 8f(x) - 12 = 3x^2 - 32x + 72$$

Put $x = 13$

$$12f^2(13) + 8f(13) - 12 = 3(13)^2 - 32(13) + 72$$

$$12f^2(13) + 8f(13) - 175 = 0$$

$$f(13) = \frac{-8 \pm 92}{24} \Rightarrow f(13) = \frac{7}{2} \text{ OR } f(13) = -\frac{15}{4} (\text{rejected})$$

15. The common difference of the A.P.: a_1, a_2, \dots, a_m is 13 more than the common difference of the A.P.: b_1, b_2, \dots, b_n . If $b_{31} = -277$, $b_{43} = -385$, and $a_{78} = 327$, then a_1 is equal to:

- 1) 19 2) 21 3) 16 4) 24

Key: 1

$$\text{Sol: } b_{43} - b_{31} = 12d_b = -108$$

$$\therefore d_b = -9$$

$$d_a = -9 + 13 = 4$$

$$a_1 = a_{78} - 77d_b = 327 - 77 \times 4 = 327 - 308 = 19$$

$$16. \text{ The Value of } \lim_{x \rightarrow 0} \frac{\log_e \left(\sec(ex) \cdot \sec(e^2x) \cdots \sec(e^{10}x) \right)}{e^2 - e^{2\cos x}}$$

$$1) \frac{(e^{10} - 1)}{2e^2(e^2 - 1)} \quad 2) \frac{(e^{20} - 1)}{2e^2(e^2 - 1)} \quad 3) \frac{(e^{10} - 1)}{2(e^2 - 1)} \quad 4) \frac{(e^{20} - 1)}{2(e^2 - 1)}$$

Key: 4

$$\text{Sol: } \lim_{x \rightarrow 0} \frac{\ln(\sec(ex)) + \ln(\sec(e^2x)) + \cdots + \ln(\sec(e^{10}x))}{e^{2\cos x} \left(\frac{e^{2-2\cos x} - 1}{2 - 2\cos x} \right) \times \frac{2 - 2\cos x}{x^2} \times x^2}$$

$$\lim_{x \rightarrow 0} \frac{\ln(\sec(ex)) + \ln(\sec(e^2x)) + \cdots + \ln(\sec(e^{10}x))}{e^2 x^2}$$

Using LH Rule

$$\lim_{x \rightarrow 0} \frac{e \tan ex + e^2 \tan e^2x + \cdots + e^{10} \tan e^{10}x}{2e^2 x}$$

$$\Rightarrow \frac{1}{2e^2} [e^2 + e^4 + e^6 + \cdots + e^{20}]$$

$$\Rightarrow \frac{1}{2} \frac{e^2 \left((e^2)^{10} - 1 \right)}{e^2 (e^2 - 1)} = \frac{(e^{20} - 1)}{2(e^2 - 1)}$$

$$17. \text{ If } \frac{\tan(A-B)}{\tan A} + \frac{\sin^2 C}{\sin^2 A} = 1, A, B, C \in \left(0, \frac{\pi}{2} \right), \text{ then}$$

1) $\tan A, \tan B, \tan C$ are in G.P.2) $\tan A, \tan B, \tan C$ are in A.P.3) $\tan A, \tan C, \tan B$ are in A.P.4) $\tan A, \tan C, \tan B$ are in G.P.**Key: 4**

Sol:
$$\frac{\tan A - \tan B}{\tan A(1 + \tan A \tan B)} + \frac{1 + \cot^2 A}{1 + \cot^2 C} = 1$$

Let $\tan A = x, \tan B = y, \tan C = z$

$$\frac{x - y}{x(1 + xy)} + \frac{1 + \frac{1}{x^2}}{1 + \frac{1}{z^2}} = 1$$

$$\frac{x - y}{x(1 + xy)} + \frac{z^2(x^2 + 1)}{x^2(z^2 + 1)} = 1$$

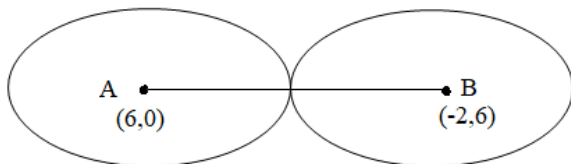
$$x(x - y)(z^2 + 1) + z^2(x^2 + 1)(1 + xy) = x^2(1 + xy)(z^2 + 1)$$

After Solving $\Rightarrow \tan^2 C = \tan A \cdot \tan B$

- 18.** Let z be a complex number such that $|z - 6| = 5$ and $|z + 2 - 6i| = 5$. Then the value of $z^3 + 3z^2 - 15z + 141$ is equal to
- 1) 37 2) 61 3) 50 4) 42

Key: 3

Sol: $|z - 6| = 5$ and $|z - (-2 + 6i)| = 5$



Z is mid point of $A(6,0), B(-2,6)$

$$z = \left(\frac{6 - 2}{2}, \frac{0 + 6}{2} \right) = (2, 3)$$

$$\therefore z = 2 + 3i$$

$$z - 2 = 3i$$

sq on both sides

$$z^2 + 4 - 4z = -9$$

$$z^2 - 4z + 13 = 0$$

Let $z^3 + 3z^2 - 15z + 141$

$$z^3 + 3z^2 - 15z + 91 + 50$$

$$(z + 7)(z^2 - 4z + 13) + 50 \Rightarrow 0 + 50 = 50$$

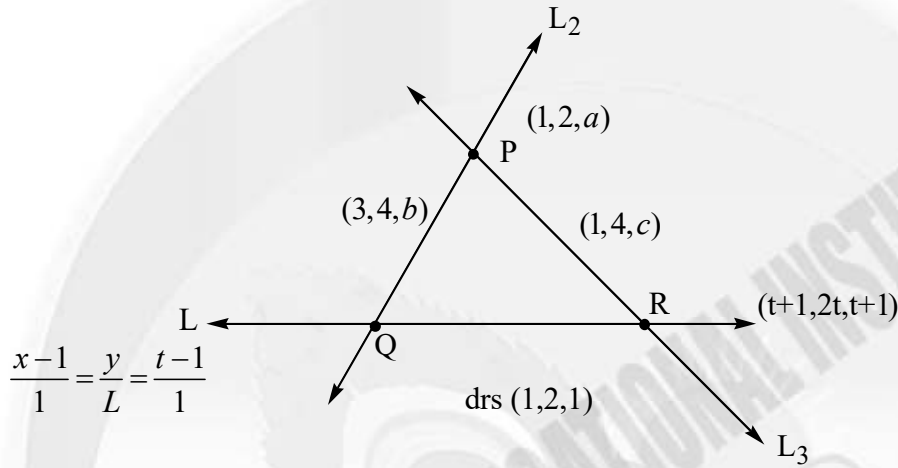
19. If the distances of the point $(1, 2, a)$ from the line $\frac{x-1}{1} = \frac{y}{2} = \frac{z-1}{1}$ along the lines

$L_1: \frac{x-1}{3} = \frac{y-2}{4} = \frac{z-a}{b}$ and $L_2: \frac{x-1}{1} = \frac{y-2}{4} = \frac{z-a}{c}$ are equal, then $a + b + c$ is equal to

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

Key: 2

Sol:



At any point on L is $Q[t+1, 2t, t+1], p(1, 2, a)$

drs of PQ: $(t, 2t-2, t+1-a)$

$PQ \parallel L_2$

$$\frac{t}{3} = \frac{2t-2}{4} = \frac{t+1-a}{b} \Rightarrow 4t = 6t - 6$$

$$6 = 2t \quad \therefore a + b = 4$$

$$t = 3$$

PQ drs $(t, 2t-2, t+1-a)$

$$RP \parallel L_3 \quad \text{so} \quad \frac{t}{1} = \frac{2t-2}{4} = \frac{t+1-a}{c}$$

$$4t = 2t - 2$$

$$2 = -2t \quad \therefore a - c = 0$$

$$t = -1 \quad a = c$$

\therefore point $Q(4, 6, 4), R(0, -2, 0)$

$$QP = RP$$

$$\sqrt{9+16+(4-a)^2} = \sqrt{1+16+a^2}$$

$$25 + 16 + a^2 - 8a = 17 + a^2$$

$$41 - 17 = 8a$$

$$a = 3 \quad \text{so } c = 3$$

$$a + b + c = 4 + 3 = 7$$

20. Let f be a polynomial function such that $f(x^2 + 1) = x^4 + 5x^2 + 2$, for all $x \in R$. Then

$$\int_0^3 f(x) dx \text{ is equal to}$$

1) $\frac{33}{2}$

2) $\frac{27}{2}$

3) $\frac{41}{3}$

4) $\frac{5}{3}$

Key: 1

Sol: $f(x^2 + 1) = x^4 + 5x^2 + 2$

Let $x^2 + 1 = t$

$$x^2 = t - 1$$

$$f(t) = (t - 1)^2 + 5(t - 1) + 2$$

$$f(t) = t^2 + 3t - 2$$

$$\int_0^3 f(t) dt = \int_0^3 (t^2 + 3t - 2) dt = \left(\frac{t^3}{3} \right)_0^3 + 3 \left(\frac{t^2}{2} \right)_0^3 - (2t)_0^3 = \frac{1}{3}(27) + \frac{3}{2}(9) - 6 = \frac{33}{2}$$

SECTION-II (NUMERICAL VALUE TYPE)

This section contains **5 Numerical Value Type Questions**. The Answer should be within **0 to 9999**. If the Answer is in **Decimal** then round off to the **Nearest Integer** value (Example i.e. If answer is above **10** and less than **10.5** round off is **10** and If answer is from **10.5** and less than **11** round off is **11**).

Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases.

21. Let PQR be a triangle such that $PQ = -2i - j + 2k$ and $PR = ai + bj - 4k, a, b \in Z$. Let S be the point on QR , which is equidistant from the lines PQ and PR . If $|PR| = 9$ and $PS = i - 7j + 2k$, then the value of $3a - 4b$ is _____

Key: Given information is not proper

Reason: Given three points Q, R, S are not collinear. So question is wrong.ss

Sol:

22. If $k = \tan\left(\frac{\pi}{4} + \frac{1}{2}\cos^{-1}\left(\frac{2}{3}\right)\right) + \tan\left(\frac{1}{2}\sin^{-1}\left(\frac{2}{3}\right)\right)$, then the number of solutions of the equation $\sin^{-1}(kx - 1) = \sin^{-1}x - \cos^{-1}x$ is _____

Key: 1

Sol: $K = \tan\theta + \cot\theta = \frac{1}{\sin\theta\cos\theta} = \frac{2}{\sin 2\theta}$

Where $\theta = \frac{1}{2}\sin^{-1}\frac{2}{3}$

$$K = \frac{2}{\frac{2}{3}} = 3$$

$$\sin^{-1}(3x - 1) = \sin^{-1}x - \cos^{-1}x$$

$$\sin^{-1}(3x - 1) = \frac{\pi}{2} - 2\cos^{-1}x$$

$$3x - 1 = \sin^{-1}\left(\frac{\pi}{2} - 2\cos^{-1}x\right)$$

$$3x - 1 = 2x^2 - 1 \Rightarrow x = 0, \frac{3}{2}$$

$$x = \frac{3}{2} \text{ (Rejected)}$$

$$x = 0 \text{ only}$$

$$\text{No of solution} = 1$$

23. In a G.P., if the product of the first three terms is 27 and the set of all possible values for the sum of its first three terms is $R - (a, b)$, then $a^2 + b^2$ is equal to:

Key: 90

Sol: Let $\frac{a}{r}, a, ar$ first 3 terms of G.P

Product of them = 27

$$a = 3$$

$$S = \text{sum of first 3 terms} = \frac{a}{r} + a + ar = a\left(\frac{1}{r} + 1 + r\right)$$

$$S = 3\left(\frac{1}{r} + r + 1\right)$$

$$\text{If } r < 0$$

$$\frac{1}{r} + r \leq -2$$

$$\text{if } r > 0$$

$$\frac{1}{r} + r \geq 2$$

$$\therefore r + \frac{1}{r} \in (-\infty, -2] \cup [2, \infty)$$

$$r + \frac{1}{r} + 1 \in (-\infty, -1] \cup [3, \infty)$$

$$3\left(r + \frac{1}{r} + 1\right) \in (-\infty, -3] \cup [9, \infty)$$

$$\therefore S \in (-\infty, -3] \cup [9, \infty)$$

$$S \in \mathbb{R} - (-3, 9)$$

$$a = -3, b = 9$$

$$a^2 + b^2 = (-3)^2 + 9^2 = 90$$

24. The value of $\sum_{r=1}^{20} \left(\sqrt{\pi \left(\int_0^r x |\sin \pi x| dx \right)} \right)$ is _____

Key: 210

$$\text{Sol: } I_r = \int_0^r x |\sin \pi x| dx$$

$$\text{King's Rule} = \int_0^r (r-x) |\sin \pi x| dx$$

$$2I_r = \int_0^r r |\sin \pi x| dx$$

$$I_r = \frac{r}{2} \int_0^r |\sin \pi x| dx$$

$$I_1 = \frac{1}{2} \int_0^1 |\sin \pi x| dx = \frac{1}{2\pi} \int_0^\pi |\sin t| dt = \frac{1}{2\pi} \cdot 2$$

$$I_2 = \frac{2}{2} \int_0^2 |\sin \pi x| dx = \frac{2}{2\pi} \int_0^{2\pi} |\sin t| dt = \frac{2}{2\pi} \cdot 4$$

$$\begin{aligned} \therefore S &= \sqrt{\pi \cdot \frac{1}{2\pi} \cdot 2} + \sqrt{\pi \cdot \frac{2}{2\pi} \cdot 4} + \sqrt{\pi \cdot \frac{3}{2\pi} \cdot 6} + \dots + \sqrt{\pi \cdot \frac{20}{2\pi} \cdot 20} \\ &= 1 + 2 + 3 + \dots + 20 = \frac{20 \times 21}{2} = 210 \end{aligned}$$

25. For some $\theta \in \left(0, \frac{\pi}{2}\right)$, let the eccentricity and the length of the latus rectum of the hyperbola $x^2 - y^2 \sec^2 \theta = 8$ be e_1 and l_1 respectively, and let the eccentricity and the length of the latus rectum of the ellipse $x^2 \sec^2 \theta + y^2 = 6$ be e_2 and l_2 respectively. If $e_1^2 = e_2^2 (\sec^2 \theta + 1)$, then $\left(\frac{l_1 l_2}{e_1 e_2}\right) \tan^2 \theta$ is equal to _____

Key: 8

Sol: Hyperbola $x^2 - y^2 \sec^2 \theta = 8$

$$\frac{x^2}{8} - \frac{y^2}{8 \cos^2 \theta} = 1$$

$$e_1 = \sqrt{1 + \frac{8 \cos^2 \theta}{8}}, l_1 = \frac{2b^2}{a} = \frac{2 \cdot (8 \cos^2 \theta)}{2\sqrt{2}} = 4\sqrt{2} \cos^2 \theta$$

$$\text{Ellipse } x^2 \sec^2 \theta + y^2 = 6 \quad e_1^2 = e_2^2 (\sec^2 \theta + 1)$$

$$\frac{x^2}{6 \cos^2 \theta} + \frac{y^2}{6} = 1 \quad (1 + \cos^2 \theta) = \sin^2 \theta \left(\frac{1 + \cos^2 \theta}{\cos^2 \theta} \right)$$

$$e_2 = \sqrt{1 - \cos^2 \theta} = \sin \theta \quad 1 = \tan^2 \theta$$

$$l_2 = \frac{2a^2}{b} = \frac{2 \cdot 6 \cos^2 \theta}{\sqrt{6}} = 2\sqrt{6} \cos^2 \theta \quad \theta \in \left(0, \frac{\pi}{2}\right)$$

$$\left(\frac{l_1 l_2}{e_1 e_2}\right) \tan^2 \theta = \frac{4\sqrt{2} \cos^2 \theta \cdot 2\sqrt{6} \cos^2 \theta}{\sqrt{1 + \cos^2 \theta} \cdot \sin \theta} \quad \therefore \text{So } \theta = \frac{\pi}{4}$$

$$\begin{aligned} &= \frac{4\sqrt{2} \left(\frac{1}{\sqrt{2}}\right)^2 \cdot 2\sqrt{6} \left(\frac{1}{\sqrt{2}}\right)^2}{\sqrt{1 + \left(\frac{1}{\sqrt{2}}\right)^2} \cdot \left(\frac{1}{\sqrt{2}}\right)} = \frac{8 \cdot \sqrt{2} \cdot \sqrt{6} \cdot \frac{1}{4}}{\frac{\sqrt{3}}{\sqrt{2}} \cdot \frac{1}{\sqrt{2}}} = \frac{2 \cdot \sqrt{2} \cdot \sqrt{2} \cdot \sqrt{3}}{\sqrt{3}} \cdot 2 = 8 \end{aligned}$$

PHYSICS

Max Marks: 100

SECTION-I
(SINGLE CORRECT ANSWER TYPE)

This section contains **20 Multiple Choice Questions**. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** option can be correct.

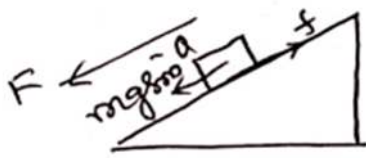
Marking scheme: +4 for correct answer, 0 if not attempted and -1 in all other cases.

26. A block of mass 5 kg is moving on an inclined plane which makes an angle of 30° with the horizontal. Friction coefficient between the block and the inclined plane surface is $\frac{\sqrt{3}}{2}$. The force to be applied on the block so that the block will move down without acceleration is _____ N. ($g = 10 \text{ m/s}^2$).

- 1) 15 2) 7.5 3) 12.5 4) 25

Key: 3

Sol:



$$F = mg(\sin \theta - \mu \cos \theta)$$

$$F = 5 \times 10 \left(-\sin 30^\circ + \frac{\sqrt{3}}{2} \cos 30^\circ \right) = 50 \left(-\frac{1}{2} + \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{3}}{2} \right) = 50 \left(-\frac{1}{2} + \frac{3}{4} \right) = 12.5 \text{ N}$$

27. Given below are two statements:

Statement I: A plane wave after passing through prism remains as plane wave but passing through small pin hole may become spherical wave.

Statement II: The curvature of a spherical wave emerging from a slit will increase for increasing slit width.

In the light of the above statements, choose the *correct* answer from the options given below:

- 1) Both Statement I and Statement II are true
 2) Statement I is true but Statement II is false
 3) Statement I is false but Statement II is true
 4) Both Statement I and Statement II are false

Key: 2

Sol: Through plane slit cylindrical wave emerges

28. The magnitudes of power of a biconvex lens (refractive index 1.5) and that of a plano-concave lens (refractive index = 1.7) are same. If the curvature of plano-concave lens exactly matches with the curvature of back surface of the biconvex lens, then ratio of radius of curvature of front and back surface of the biconvex lens is _____.
- 1) 12 : 5 2) 5 : 2 3) 2 : 5 4) 5 : 12

Key: 2

Sol: Let biconvex lens radius of curvature be R_1 and R_2 . $P = (\mu_1 - 1) \left(\frac{1}{R_1} + \frac{1}{R_2} \right)$

Let radius of curvature of plano concave lens $\rightarrow R_2$. $P = -\frac{(\mu_2 - 1)}{R_2}$

Since magnitudes are same: $(1.5 - 1) \left(\frac{1}{R_1} + \frac{1}{R_2} \right) = (1.7 - 1) \left(\frac{1}{R_2} \right)$

$$\frac{0.5}{R_1} + \frac{0.5}{R_2} = \frac{0.7}{R_2}$$

$$\frac{0.5}{R_1} = \frac{0.7 - 0.5}{R_2} \Rightarrow 0.2R_1 = 0.5R_2$$

$$\frac{R_1}{R_2} = \frac{0.5}{0.2} = \frac{5}{2}$$

29. In the potentiometer, when the cell in the secondary circuit is shunted with 4Ω resistance, the balance is obtained at the length 120 cm of wire. Now when the same cell is shunted with 12Ω resistance, the balance is shifted to a length of 180 cm. The internal resistance of cell is _____ Ω
- 1) 3 2) 4 3) 12 4) 6

Key: 2

Sol: Formula: $\frac{R+r}{R} = \frac{l_1}{l_2}$

$$\left(\frac{R_1 + r}{R_1} \times \frac{R_2}{R_2 + r} \right) = \frac{l_1}{120} \times \frac{180}{l_2}$$

$$\frac{12 \times (4 + r)}{4 \times (12 + r)} = \frac{3}{2}$$

$$8 + 2r = 12 + r$$

$$2r - r = 12 - 8$$

$$r = 4\Omega$$

30. Water drops fall from a tap on the floor, 5 m below at regular intervals of time. The first drop strikes the floor when the sixth drop begins to fall. The height at which the fourth drop will be from ground at the instant when the first drop strikes the ground is _____ m. ($g = 10 \text{ m/s}^2$).

1) 3.8 2) 4.2 3) 4.0 4) 2.5

Key: 2

Sol: According to Galileo's law of odd numbers

$$d_{6,5} : d_{5,4} : d_{4,3} : d_{3,2} : d_{2,1} = 1 : 3 : 5 : 7 : 9$$

Height of 4th drop from ground:

$$= d_{4,3} + d_{3,2} + d_{2,1}$$

$$= \frac{5 + 3 + 9}{9 + 7 + 5 + 3 + 1} \times 5$$

$$= \frac{21}{25} \times 5 = \frac{21}{5} = 4.2 \text{ m}$$

31. The electric field of an electromagnetic wave travelling through a medium is given by $E(x, t) = 25 \sin(2.0 \times 10^{15} t - 10^7 x) \hat{n}$. Then the refractive index of the medium is _____ . (All given measurements are in SI units)

1) 2 2) 1.5 3) 1.7 4) 1.2

Key: 2

Sol: Velocity of wave,

$$\text{On comparing } E(x, t) = 25 \sin(2.0 \times 10^{15} t - 10^7 x) \hat{i}$$

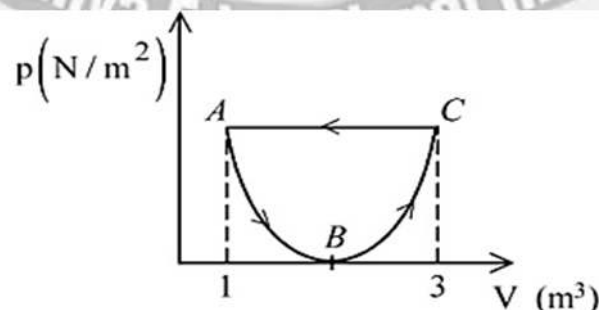
$$y = A \sin(\omega t - kx)$$

$$v = \frac{2 \times 10^{15}}{10^7} = 2 \times 10^8$$

Refractive index,

$$\mu = \frac{c}{v} = \frac{3 \times 10^8}{2 \times 10^8} = 1.5$$

32. In the following p-V diagram the equation of state along the curved path is given by $(V - 2)^2 = 4ap$, where a is a constant. The total work done in the closed path is



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

Key: 1

Sol: If $V = 1 \Rightarrow 4ap_0 = (1-2)^2$

$$p_0 = \frac{1}{4a}$$

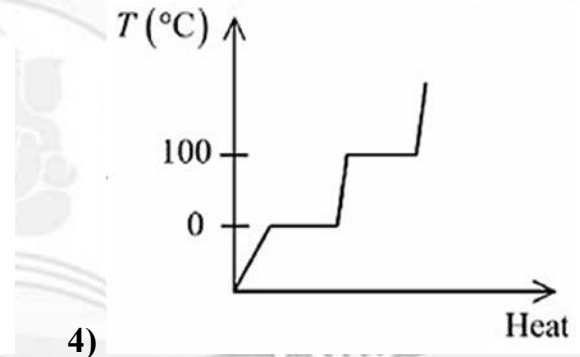
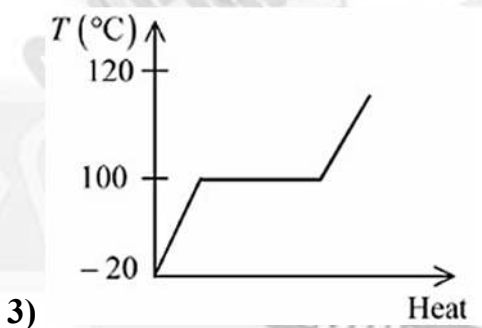
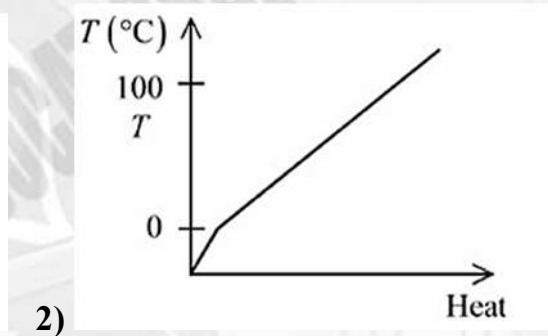
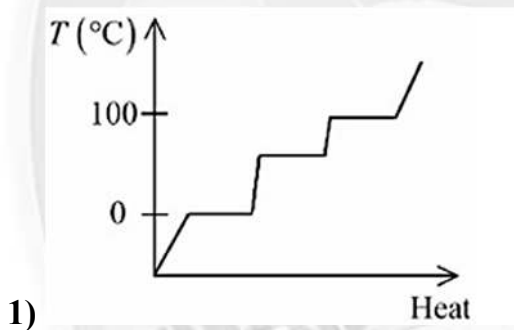
Work Done = Area of parabola ABC

$$= \text{Area} = \frac{2}{3} \times \text{Area of the rectangle ABCD} = \frac{2}{3} p_0 (3-1)$$

$$= \frac{4}{3} p_0 = \frac{4}{3} \times \frac{p_0}{4a} W = -\frac{p_0}{3a}$$

$$\therefore \text{Work done by gas} = -\frac{1}{3a}$$

33. Which of the following best represents the temperature versus heat supplied graph for water, in the range of -20°C to 120°C ?



Key: 4

Sol: The graph is plotted between temperature (T) versus heat (Q) based on the following steps:

- (i) -20°C to 0°C implies Q is directly proportional to T
- (ii) At 0°C , Q increases at constant T
- (iii) 0°C to 100°C implies Q is directly proportional to T
- (iv) At 100°C , Q increases at constant T
- (v) 100°C to 120°C implies Q is directly proportional to T

34. The magnetic field at the centre of a current carrying circular loop of radius R is $16 \mu\text{T}$.

The magnetic field at a distance $x = \sqrt{3} R$ on its axis from the centre is _____ μT .

1) 2

2) 4

3) 8

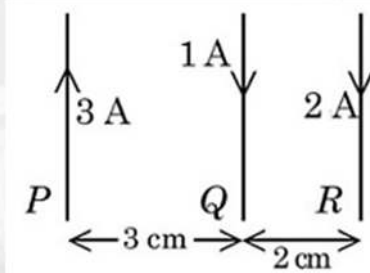
4) $2\sqrt{2}$

Key: 1

Sol:
$$B = \frac{\mu_0 IR^2}{2(R^2 + x^2)^{3/2}} \Rightarrow \frac{B_2}{B_1} = \left(\frac{R^2 + x_1^2}{R^2 + x_2^2} \right)^{3/2}$$

$$\Rightarrow B_2 = 16 \left(\frac{R^2 + 0^2}{R^2 + 3R^2} \right)^{3/2} = 16 \frac{R}{8R} = 2 \mu\text{T}$$

35. Three long straight wires carrying current are arranged mutually parallel as shown in the figure. The force experienced by 15 cm length of wire Q is _____.



$$(\mu_0 = 4\pi \times 10^{-7} \text{ T.m/A})$$

1) 6×10^{-7} N towards R2) 6×10^{-6} N towards R3) 6×10^{-7} N towards P4) 6×10^{-6} N towards P

Key: 2

Sol: Force on Q = Force on Q due to A + Force on Q due to R

$$= l \left(\frac{\mu_0}{2\pi} \left(\frac{I_p I_q}{r_{pq}} \right) + \frac{\mu_0}{2\pi} \left(\frac{I_q I_r}{r_{qr}} \right) \right)$$

$$= \left(\frac{5 \times 10^{-7} \times 2 \times 10^{-7}}{10^{-2}} \right) \left(\frac{3 \times 1}{3} + \frac{1 \times 2}{2} \right) = 30 \times 10^{-7} (1+1)$$

$$= 60 \times 10^{-7} = 6 \times 10^{-6} \text{ N toward R}$$

36. An atom ${}^8_3\text{X}$ is bombarded by shower of fundamental particles and in 10 s this atom absorbed 10 electrons, 10 protons and 9 neutrons. The percentage growth in the surface area of the nucleons is recorded by:

1) 900%

2) 225%

3) 150%

4) 250%

Key: 2

Sol: (a) $A_x = 8, A_y = 8 + 10 + 9 = 27$

(b) Surface Area, $S = 4\pi R^2$

$$\frac{S_y}{S_x} = \left(\frac{R_y}{R_x}\right)^2 = \left(\frac{A_y}{A_x}\right)^{2/3} = \left(\frac{27}{8}\right)^{2/3} = \left(\frac{3}{2}\right)^2 = \frac{9}{4}$$

$$\therefore \text{Growth in surface area} = \frac{9}{4} \times 100 = 225\%$$

37. The electric current in the circuit is given as $i = i_0(t/T)$. The r.m.s current for the period $t = 0$ to $t = T$ is _____.

- 1) $\frac{i_0}{\sqrt{3}}$ 2) $\frac{i_0}{\sqrt{2}}$ 3) $\frac{i_0}{\sqrt{6}}$ 4) i_0

Key: 1

Sol: By definition:

$$i_{\text{rms}}^2 RT = \int_0^T i^2 R dt$$

$$i_{\text{rms}}^2 RT = R \int_0^T \left(\frac{i_0 t}{T}\right)^2 dt$$

$$i_{\text{rms}}^2 RT = R \frac{i_0^2}{T^2} \left[\frac{t^3}{3}\right]_0^T$$

$$i_{\text{rms}}^2 = \frac{i_0^2}{T^3} \frac{1}{3} (T^3 - 0^3)$$

$$i_{\text{rms}}^2 = \frac{i_0^2}{T^3} \times \frac{T^3}{3}$$

$$i_{\text{rms}} = \frac{i_0}{\sqrt{3}}$$

38. When both jaws of vernier callipers touch each other, zero mark of the vernier scale is right to zero mark of main scale, 4th mark on vernier scale coincides with certain mark on the main scale. While measuring the length of a cylinder, observer observes 15 divisions on main scale and 5th division of vernier scale coincides with a main scale division. Measured length of cylinder is _____ mm.

(Least count of Vernier calliper = 0.1 mm)

- 1) 15.5 2) 15.1 3) 15.4 4) 15.9

Key: 2

Sol: Measured depth of cylinder
 = MSD + LC \times Vernier coincidence
 = 15 + 0.1(5 - 4) = 15 + 0.1 = 15.1 mm

39. Two wires A and B made of different materials of lengths 6.0 cm and 5.4 cm, respectively and area of cross sections $3.0 \times 10^{-5} \text{ m}^2$ and $4.5 \times 10^{-5} \text{ m}^2$, respectively are stretched by the same magnitude under a given load. The ratio of the Young's modulus of A to that of B is $x : 3$. The value of x is _____.

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

Key: 3

Sol: $l = \frac{mg}{\left(\frac{y_A}{L}\right)}$

$$\frac{l_A}{l_B} = \frac{L_A Y_B A_B}{Y_A A_B L_B}$$

$$l_A = l_B (\text{given})$$

$$\frac{l_A}{l_B} = \frac{6 \times y_B \times 4.5 \times 10^{-5}}{5.4 \times 3 \times 10^{-5} \times y_A}$$

$$\frac{y_A}{y_B} = \frac{5}{3}$$

40. 10 kg of ice at -10°C is added to 100 kg of water to lower its temperature from 25°C . Consider no heat exchange to surroundings. The decrement to the temperature of water is _____ $^\circ \text{C}$.

(Specific heat of ice = $2100 \text{ J/Kg} \cdot ^\circ \text{C}$, specific heat of water = $4200 \text{ J/Kg} \cdot ^\circ \text{C}$, latent heat of fusion of ice = $3.36 \times 10^5 \text{ J/Kg}$)

- 1) 11.6 2) 10 3) 6.67 4) 15

Key: 2

Sol: Heat lost by ice = Heat given by water

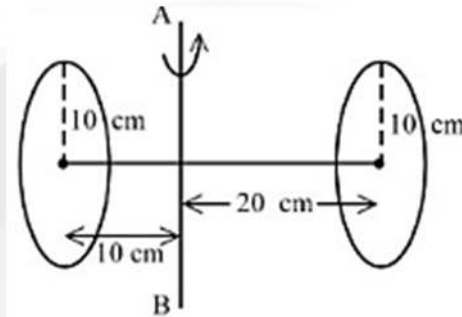
$$(10 \text{ kg}) (2100 \text{ J/Kg} \cdot ^\circ \text{C}) (10) + (10 \text{ kg}) (3.36 \times 10^5 \text{ J/Kg}) + (10 \text{ kg}) (4200 \text{ J/Kg} \cdot ^\circ \text{C}) T$$

$$= (10 \text{ kg}) (4200 \text{ J/Kg} \cdot ^\circ \text{C}) (25 - T)$$

$$T = 15^\circ \text{C} \text{ (final temperature)}$$

$$\text{Decrement} = (25 - 15)^\circ \text{C} = 10^\circ \text{C}$$

41. Two circular discs of radius each 10 cm are joined at their centres by a rod of length 30 cm and mass 600 gm as shown in figure. If the mass of each disc is 600 gm and applied torque between two discs is 43×10^5 dyne.cm, the angular acceleration of the discs about the given axis AB is _____ rad/s².



- 1) 11 2) 27 3) 22 4) 100

Key: 1

Sol: $Torque = I\alpha$

$$\alpha = \frac{43 \times 10^5}{\left(\frac{mR^2}{2} + ml_1^2\right) + \left(\frac{mR^2}{2} + ml_2^2\right) + \left(\frac{mR^2}{12} + m(d)^2\right)}$$

$$m = 600g = 0.6kg; R = 10cm = 0.1m; l_1 = 10cm = 0.1m; l_2 = 10cm = 0.1m; d = 5cm = 0.05m$$

$$\alpha = \frac{43 \times 10^5}{2 \left(\frac{(0.6)(0.1)^2}{2} + (0.6)(0.1)^2 \right) + \left(\frac{(0.6)(0.1)^2}{12} + (0.6)(0.05)^2 \right)}$$

$$\alpha \approx 11 \text{ cm}$$

42. For the two cells having same EMF E and internal resistance r , the current passing through the external resistor 6Ω is same when both the cells are connected either in parallel or in series. The value of internal resistance r is _____ Ω .

- 1) 3 2) 6 3) 4 4) 9

Key: 2

$$\text{Sol: } \frac{2E}{2r+6} = \frac{\left(\frac{E}{\frac{1}{r} + \frac{1}{r}}\right)}{\frac{1}{\frac{1}{r} + \frac{1}{r}} + 6} \Rightarrow \frac{2E}{2r+6} = \frac{2E}{r+12} \Rightarrow r = 6\Omega$$

43. Two-point charges of 1 nC and 2 nC are placed at the two corners of equilateral triangle of side 3 cm. The work done in bringing a charge of 3 nC from infinity to the third corner of the triangle is _____ μJ .

$$\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N.m}^2 / \text{C}^2$$

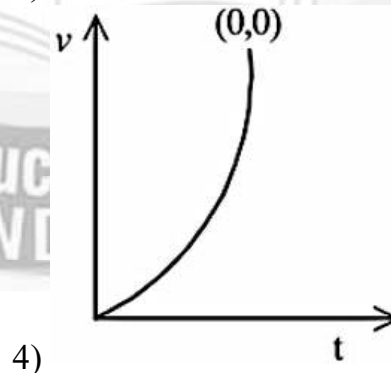
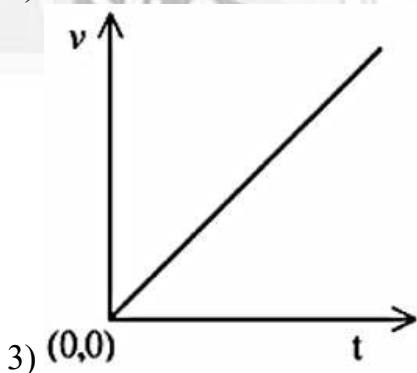
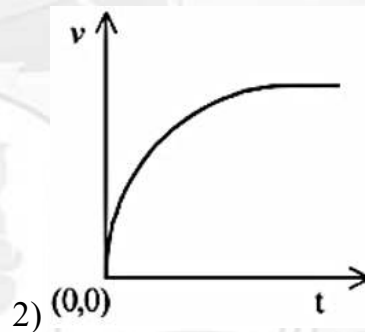
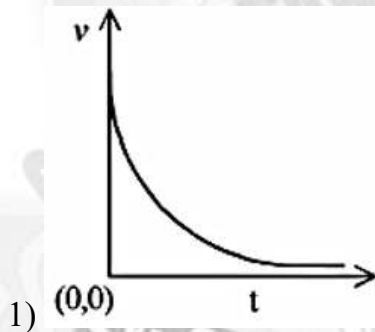
- 1) 5.4 2) 2.7 3) 27 4) 3.3

Key: 2

Sol: $W.D = \Delta U$

$$\begin{aligned} W.D &= \frac{Kq_1q}{a} + \frac{Kq_2q}{a} \\ &= \left(\frac{1}{4\pi\epsilon_0} \right) \frac{(1 \times 10^{-9} \text{ C})(3 \times 10^{-9} \text{ C})}{3 \times 10^{-2} \text{ m}} + \frac{(2 \times 10^{-9} \text{ C})(3 \times 10^{-9} \text{ C})}{3 \times 10^{-2} \text{ m}} \\ &= 2.7 \times 10^{-6} \text{ J} = 2.7 \mu\text{J} \end{aligned}$$

44. Particle of mass m falls from rest through a resistive medium having resistive force $F = -kv$, where v is the velocity of the particle and k is a constant. Which of the following graphs represents velocity (v) versus time (t)?



Key: 2

Sol: $F_{net} = mg - kv$

$$m \frac{dv}{dt} = mg - kv$$

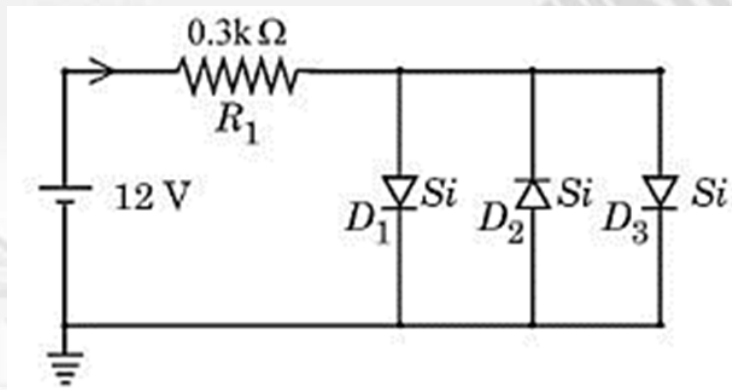
$$\int_0^v \frac{dv}{g - \frac{kv}{m}} = \int_0^t dt$$

$$v = \frac{mg}{k} (1 - e^{-kt/m})$$

This equation represents exponentially increasing curve that starts from the origin

45. Assuming in forward bias condition there is a voltage drop of 0.7 V across a silicon diode, the current through diode D_1 in the circuit is ___ mA.

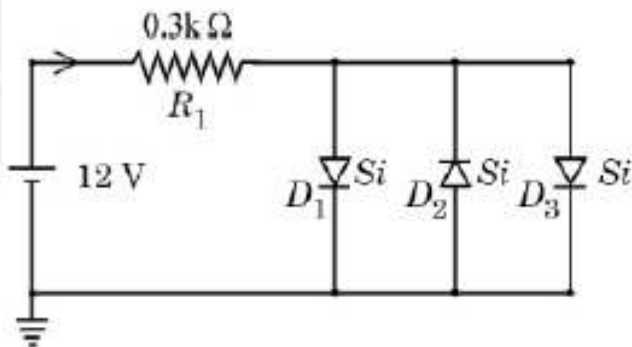
(Assume all diodes in the given circuit are identical)



- 1) 20.15 2) 11.7 3) 17.6 4) 18.8

Key: 4

Sol:



$$i = \frac{12 - 0.7}{0.3 \times 10^3} = 37.6 \text{ mA}$$

Current through each diode

$$i/2 = 18.8 \text{ mA}$$

SECTION-II
(NUMERICAL VALUE TYPE)

This section contains **5 Numerical Value Type Questions**. The Answer should be within **0 to 9999**. If the Answer is in **Decimal** then round off to the **Nearest Integer** value (Example I.e. If answer is above **10** and less than **10.5** round off is **10** and If answer is from **10.5** and less than **11** round off is **11**).

Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases

46. The displacement of a particle, executing simple harmonic motion with time period T , is expressed as $x(t) = A \sin \omega t$, where A is the amplitude. The maximum value of potential energy of this oscillator is found at $t = T/2\beta$. The value of β is _____.

Key: 2

Sol: PE is maximum at extreme position

$$t = \frac{T}{4}$$

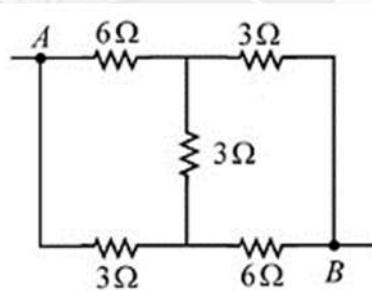
$$\frac{T}{2\beta} = \frac{T}{4}$$

Therefore, the value

$$\beta = 2$$

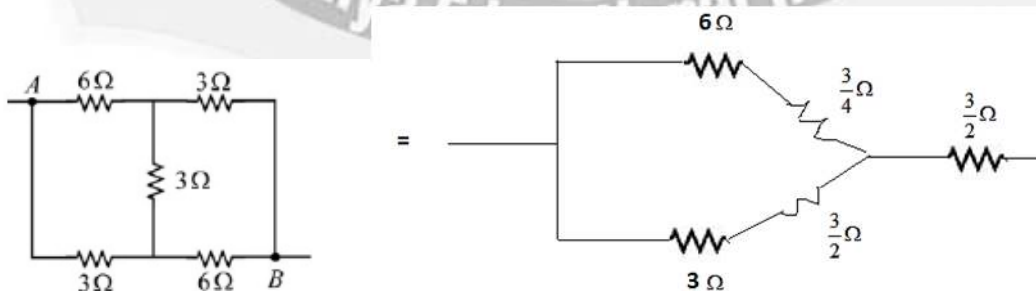
47. The equivalent resistance between the points A and B in the following circuit is $\frac{x}{5} \Omega$.

The value of x is _____.



Key: 21

Sol: Given circuit is Unbalanced Wheatstone bridge so applying delta to star conversion



$$R_{AB} = \frac{21}{5} \Omega$$

48. The ratio of de Broglie wavelength of a deuteron with kinetic energy E to that of an alpha particle with kinetic energy $2E$, is $n : 1$. The value of n is _____.
(Assume mass of proton = mass of neutron).

Key: 2

Sol: DeBroglie wavelength $\lambda = \frac{h}{\sqrt{2mE}}$

$$\frac{\lambda_D}{\lambda_\alpha} = \frac{\frac{h}{\sqrt{2 \times 2m \times E}}}{\frac{h}{\sqrt{2 \times 4m \times 2E}}} = 2$$

49. A solid sphere of radius 10 cm is rotating about an axis which is at a distance 15 cm from its centre. The radius of gyration about this axis is \sqrt{n} cm. The value of n is _____.

Key: 265

Sol: By applying parallel axis theorem

$$\frac{2}{5}mR^2 + md^2 = mK^2$$

$$\frac{2}{5}R^2 + d^2 = K^2$$

$$\frac{2}{5}(10)^2 + (15)^2 = K^2$$

$$\frac{200}{5} + 225 = K^2$$

$$K = \sqrt{265} \text{ cm}$$

50. A convex lens of refractive index 1.5 and focal length $f = 18$ cm is immersed in water. The difference in focal lengths of the given lens when it is in water and in air is $\alpha \times f$. The value of α is _____.

(refractive index of water = $4/3$)

Key: 3

Sol: In air

$$\frac{1}{f} = \left(\frac{n_2}{n_1} - 1 \right) \left(\frac{1}{R_1} - \frac{1}{R_2} \right) \quad \frac{1}{18} = (1.5 - 1) \left(\frac{2}{R} \right) \dots\dots\dots(i)$$

$$\text{In water} \quad \frac{1}{f} = \left(\frac{1.5}{4/3} - 1 \right) \left(\frac{2}{R} \right) \dots\dots\dots(ii)$$

(i) \div (ii)

$$\frac{f}{18} = 4 \Rightarrow f = 72 \quad f - 18 = 54 = 3 \times 18$$

CHEMISTRY

Max Marks: 100

SECTION-I
(SINGLE CORRECT ANSWER TYPE)

This section contains 20 Multiple Choice Questions. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which ONLY ONE option can be correct.

Marking scheme: +4 for correct answer, 0 if not attempted and -1 in all other cases.

51. 20.0 dm³ of an ideal gas 'X' at 600 K and 0.5 MPa undergoes isothermal reversible expansion until pressure of the gas is 0.2 MPa. Which of the following option is correct?

(Given: $\log 2 = 0.3010$ and $\log 5 = 0.6989$)

- 1) $w = -3.9 \text{ kJ}$, $\Delta U = 0$, $\Delta H = 0$; $q = 3.9 \text{ kJ}$
- 2) $w = +4.1 \text{ kJ}$, $\Delta U = 0$, $\Delta H = 0$; $q = -4.1 \text{ kJ}$
- 3) $w = 9.1 \text{ J}$, $\Delta U = 9.1 \text{ J}$, $\Delta H = 0$; $q = 0$
- 4) $w = -9.1 \text{ J}$, $\Delta U = 0$, $\Delta H = 0$, $q = 9.1 \text{ kJ}$

key: 4

sol: Isothermal expansion

$$\Delta U = 0 \Rightarrow -W = q = nRT \ln \frac{P_1}{P_2}$$

$$\text{moles of gas } n = \frac{PV}{RT} = \frac{0.5 \times 10^6 \times 9.86 \times 10^{-6}}{0.0821 \times 600} \times 2 = 2$$

$$-w = 2 \times 2.303 \times 8.314 \times 600 \times \log \frac{0.5}{0.2} = 9.1 \text{ KJ} \therefore +9.1$$

$$w = -9.1 \text{ KJ}$$

$$q = 9.1 \text{ KJ}$$

52. Consider a weak base 'B' of $pK_b = 5.699$. 'x' mL of 0.02 M HCl and 'y' mL of 0.02 M weak base 'B' are mixed to make 100 mL of a buffer of pH 9 at 25 °C. The values of 'x' and 'y' respectively are:

[Given: $\log 2 = 0.3010$, $\log 3 = 0.4771$, $\log 5 = 0.699$]

- | | |
|------|------|
| x | y |
| 11.1 | 88.9 |
- 1)
- | | |
|------|------|
| x | y |
| 14.3 | 85.7 |
- 2)
- | | |
|------|------|
| x | y |
| 42.7 | 57.3 |
- 3)
- | | |
|------|------|
| x | y |
| 85.7 | 14.3 |
- 4)

key: 2

sol:

$$pH = 9 \therefore pOH = 14 - 9 = 5$$

$$pOH = pK_b + \log \frac{[CA]}{[B]}$$

$$[CA] = x \text{ ml} \times 0.02$$

$$[B] = y \text{ ml} \times 0.02$$

$$\text{Total volume is } 100 \text{ ml} \therefore y = 100 - x$$

$$5 = 5.699 + \log \left(\frac{x \times 0.02}{(100 - x) \times 0.02} \right)$$

$$x = 16.66 \quad y = 83.34$$

53.

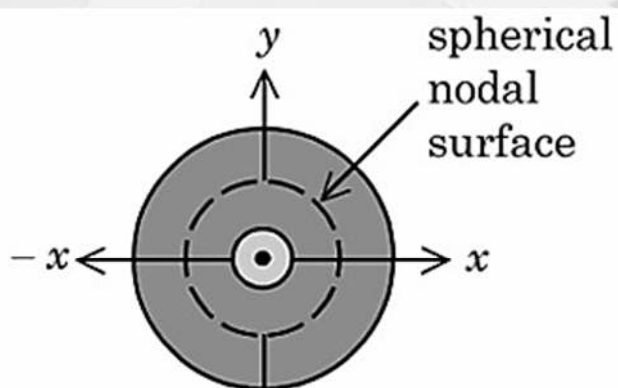


Figure 1. electron probability density for 2s orbital

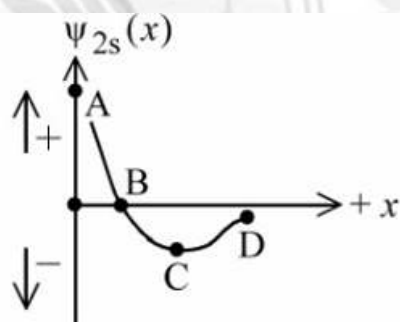


Figure 2. wave function for 2s orbital

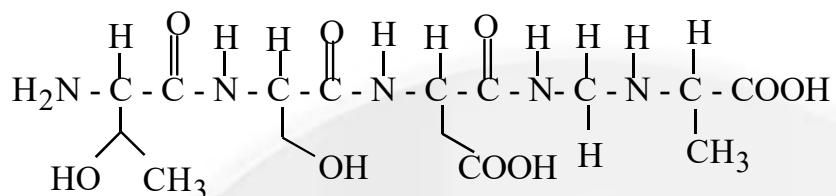
Which of the following point in Figure 2 most accurately represents the nodal surface as shown in Figure 1?

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

key: 2

sol: In $\Psi(r)$ vs r plot at radial node Ψ curve intersects the r axis

54. In the given pentapeptide, find out an essential amino acid (Y) and the sequence present in the pentapeptide:



Choose the correct answer from the options given below:

1)

(Y)	(Sequence)
Serine	Thr – Ser – Asp – Ala - Gly

2)

(Y)	(Sequence)
Threonine	Thr – Ser – Asp – Gly - Ala

3)

(Y)	(Sequence)
Serine	Ser – Asp – Thr – Ala - Gly

4)

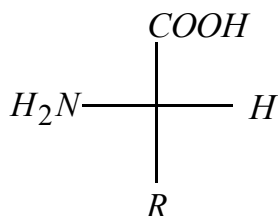
(Y)	(Sequence)
Threonine	Ser – Thr – Asp – Gly - Ala

key: 2

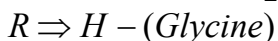
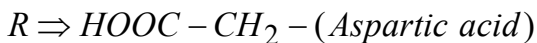
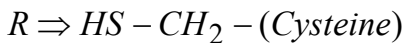
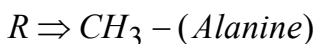
sol: Thr – Ser – Asp – Gly – Ala

Threonine is essential amino acid

\therefore Natural amino acids general form



$\therefore R \Rightarrow \text{H}_3\text{C} - \text{CHOH} - (\text{Threonine})$ (essential Amino acid)



55. In period 4 of the periodic table, the elements with highest and lowest atomic radii are respectively.

- 1) K & Br 2) Rb & Br 3) Na & Cl 4) K & Se

key: 1

sol: In a given period, atomic radius decreases from left to right due to increase in effective nuclear charge. However the group 17 elements are smaller in size (due to van-derwall forces in Group-18) than corresponding group 18 elements due to (i) Increased cumulative shielding of the electrons that outweighs the nuclear pull.

K 235pm

Br 114pm(Covalent) 186 (Vander wad)

Kr 116pm(Covalent) 202pm Calculated

56. The correct statement among the following is:

- 1) $Ni(CO)_4$ is diamagnetic and $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ are paramagnetic
- 2) $[Ni(CN)_4]^{2-}$ and $[NiCl_4]^{2-}$ are diamagnetic and $Ni(CO)_4$ is paramagnetic
- 3) $Ni(CO)_4$ and $[NiCl_4]^{2-}$ are diamagnetic and $[Ni(CN)_4]^{2-}$ is paramagnetic
- 4) $Ni(CO)_4$ and $[Ni(CN)_4]^{2-}$ are diamagnetic and $[NiCl_4]^{2-}$ is paramagnetic

key: 4

sol: $Ni(CO)_4$ is d^{10} system $[Ni(CN)_4]^{2-}$ d^8 spin paired complex, $[Ni(Cl)_4]^{2-}$ d^8 system and spin free complex.

57. An organic compound undergoes first order decomposition. The time taken for

decomposition to $\left(\frac{1}{8}\right)^{\text{th}}$ and $\left(\frac{1}{10}\right)^{\text{th}}$ of its initial concentration are $t_{1/8}$ and $t_{1/10}$

respectively. What is the value of $\frac{t_{1/8}}{t_{1/10}} \times 10$?

(log 2 = 0.3)

1) 0.9

2) 30

3) 3

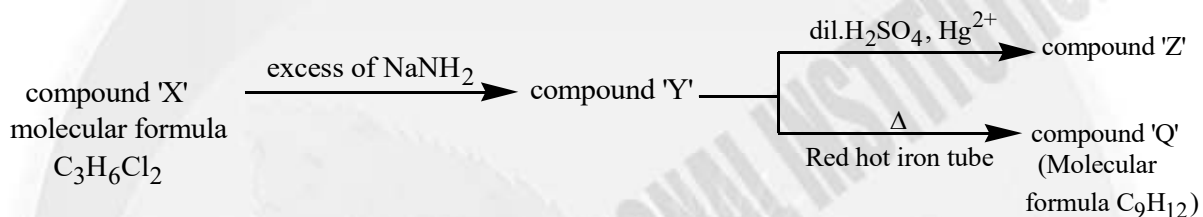
4) 9

key: 4

$$\text{sol: } \frac{t_{1/8}}{t_{1/10}} = \frac{\frac{2.303}{K} \log \frac{[A_0]}{1/8[A_0]}}{\frac{2.303}{K} \log \frac{[A_0]}{1/10[A_0]}} = 0.9$$

$$\frac{t_{1/8}}{t_{1/10}} \times 10 = 9$$

58. Given below are two statements for the following reaction sequence.



Statement I : Compound 'Z' will give yellow precipitate with NaOI.

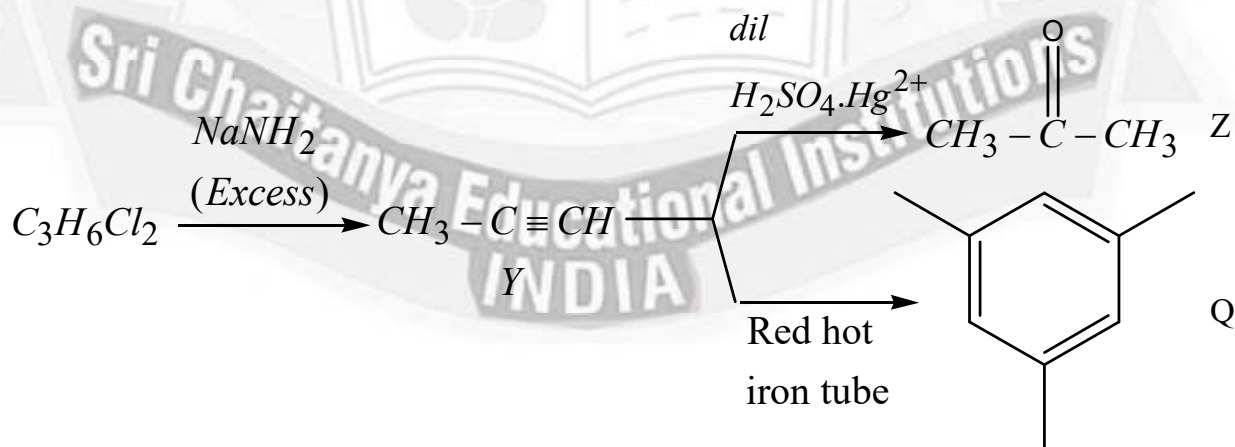
Statement II: Compound 'Q' has two different types of 'H' atoms (aromatic : aliphatic) in the ratio 1 : 3

In the light of the above statements, choose the correct answer from the options

- 1) Statement I is true but Statement II is false
- 2) Both Statement I and Statement II are false
- 3) Statement I is false but Statement II is true
- 4) Both Statement I and Statement II are true

key: 4

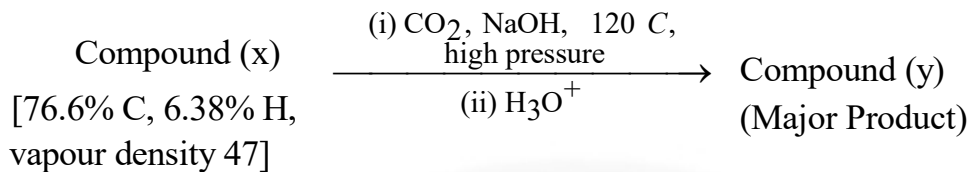
sol:



Z is methyl ketone and hence gives iodoform test

Compound Q has three aromatic and Nine Aliphatic Hydrogens

59. Consider the following reaction sequence



Compound (y) develops characteristic colour with neutral $FeCl_3$ solution.

Identify the INCORRECT statement from the following for the above sequence.

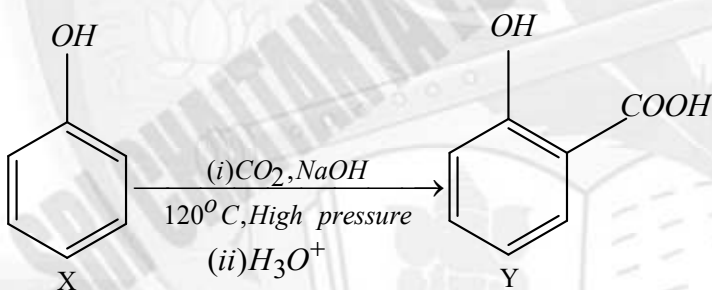
- 1) Both compounds x and y will dissolve in NaOH.
- 2) Compound y will dissolve in $NaHCO_3$ and evolve a gas.
- 3) Both compounds x and y will burn with sooty flame
- 4) Compound x is more acidic than compound y.

key: 4

sol: $2 \times V.D = \text{Molar mass}$

$$2 \times 47 = 94$$

Gives colour with neutral $FeCl_3$ \therefore Compound is phenol



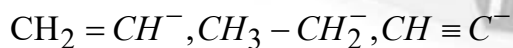
Both X & Y are soluble in NaOH

Y will dissolve in $NaHCO_3$ and evolve CO_2 gas

Both X and Y being aromatic will burn with sooty flame

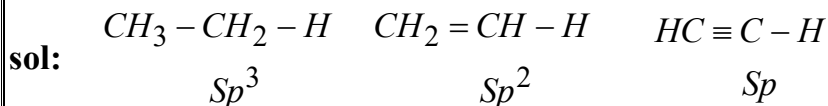
However salicylic acid is more acidic than phenol.

60. CORRECT order of stability for the following is



- 1) $CH_3 - CH_2^- > CH_2 = CH^- > CH \equiv C^-$
- 2) $CH_2 = CH^- > CH \equiv C^- > CH_3 - CH_2^-$
- 3) $CH \equiv C^- > CH_3 - CH_2^- > CH_2 = CH^-$
- 4) $CH \equiv C^- > CH_2 = CH^- > CH_3 - CH_2^-$

key:4



Higher the 's' nature, more is the stability of the conjugate base Hence stability order
 $CH_3 - \overline{CH_2} < CH_2 = \overline{CH} < HC \equiv \overline{C}$

61. The wave numbers of three spectral lines of H atom are considered. Identify the set of spectral belonging to Balmer series.
 (R = Rydberg constant)

1) $\frac{3R}{4}, \frac{3R}{16}, \frac{7R}{144}$ 2) $\frac{7R}{144}, \frac{3R}{16}, \frac{16R}{255}$ 3) $\frac{5R}{36}, \frac{8R}{9}, \frac{15R}{16}$ 4) $\frac{5R}{36}, \frac{3R}{16}, \frac{21R}{100}$

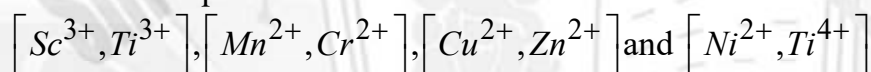
key: 4

sol: For Balmer series n_i (or) $n_f = 2$
 For absorption spectrum of H atom

n_i	n_f	
2	3	$\bar{\nu} = R \left[\frac{1}{2^2} - \frac{1}{3^2} \right] = \frac{5R}{36}$
2	4	$\bar{\nu} = R \left[\frac{1}{2^2} - \frac{1}{4^2} \right] = \frac{3R}{16}$
2	5	$\bar{\nu} = R \left[\frac{1}{2^2} - \frac{1}{5^2} \right] = \frac{21R}{100}$

62. Given below are two statements:

Statement I: The number of pairs, from the following, in which both the ions are coloured in aqueous solutions is 3.



Statement II: Th^{4+} is the strongest reducing agent among Th^{4+} , Ce^{4+} , Gd^{3+} and Eu^{2+} .
 In the light of the above statements, choose the correct answer from the options given below

- Statement I is false but Statement II is true
- Both Statement I and Statement II are true
- Both Statement I and Statement II are false
- Statement I is true but Statement II is false

key: 3

sol: Both statements are incorrect

Zn^{2+} with d^{10} configuration is colourless

Th^{4+} is has $[Rn]$ core and is not a strong oxidant

63. Given below are two statements:

Statement I: The number of species among BF_4^- , SiF_4 , XeF_4 and SF_4 , that have unequal E-F bond lengths is two. Here, E is the central atom.

Statement II: Among O_2^- , O_2^{2-} , F_2 and O_2^+ , O_2^- has the highest bond order

In the light of the above statements, choose the correct answer from the options given below

- 1) Statement I is false but Statement II is true
- 2) Both Statement I and Statement II are true
- 3) Both Statement I and Statement II are false
- 4) Statement I is true but Statement II is false

key: 2

sol: Both Statements are false

S - I BF_4^- , SiF_4 and XeF_4 with sp^3 , sp^3 and sp^3d^2 hybridisation. The shape respectively are tetrahedral, tetrahedral and square planar. All have equal E – F Bond length

S - II O_2^+ bond order is 2.5 and O_2^- 1.5

64. At T(K), 2 moles of liquid A and 3 moles of liquid B are mixed. The vapour pressure of ideal solution formed is 320 mm Hg. At this stage, one mole of A and one mole of B are added to the solution. The vapour pressure is now measured as 328.6 mm Hg. The vapour pressure (in mm Hg) of A and B are respectively:

- 1) 300, 200
- 2) 600, 400
- 3) 500, 200
- 4) 400, 300

key: 3

sol: 2 moles of A + 3 moles of B

$$X_A = 2/5, X_B = 3/5$$

$$P_s = X_A P_A^0 + X_B P_B^0$$

$$320 = P_A^0 \left(\frac{2}{5}\right) + P_B^0 \left(\frac{3}{5}\right)$$

$$2P_A^0 + 3P_B^0 = 1600 \dots\dots(1)$$

Now 1 mole of A & 1 mole of B is added

$$X'_A = \frac{3}{7}, X'_B = \frac{4}{7}$$

$$P'_S = 328.6 = P_A^0 \left(\frac{3}{7}\right) + P_B^0 \left(\frac{4}{7}\right)$$

$$3P_A^0 + 4P_B^0 = 2300 \dots\dots(II)$$

Now eq (1) x 3 – eq (II) x 2

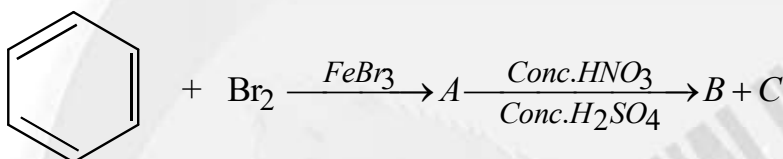
$$6P_A^0 + 9P_B^0 = 4800$$

$$6P_A^0 + 8P_B^0 = 4600$$

$$P_B^0 = 200 \text{ mm of Hg}$$

$$P_A^0 = 500 \text{ mm of Hg}$$

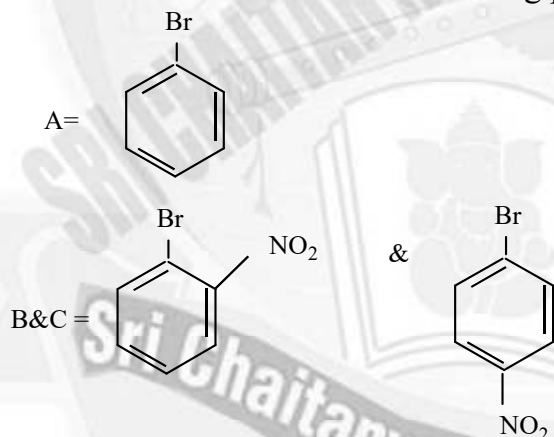
65. Method used for separation of mixture of products (B and C) obtained in the following reaction is



- 1) Fractional distillation 2) simple distillation
3) steam distillation 4) sublimation

key: 1

sol: Due to their difference in their boiling points

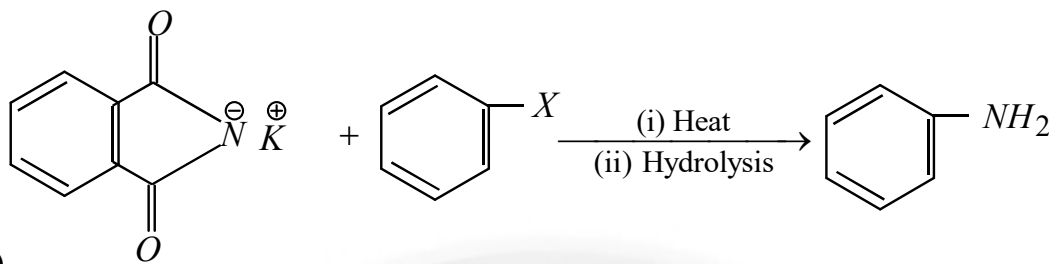


66. Regarding the hydrides of group 15 elements EH_3 ($E = \text{N}, \text{P}, \text{As}, \text{Sb}$), select the correct statement from the following:

- A) The stability of hydrides decreases down the group
B) The basicity of hydrides decreases down the group
C) The reducing character increases down the group
D) The boiling point increase down the group

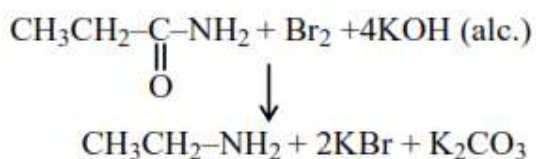
Choose the correct answer from the options given below:

- 1) A, B & C only 2) A, B, C & D
3) A & D only 4) B & C only

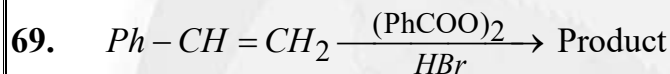


4)

key: 2
sol:



It is Hofmann bromide degradation reaction is correct.



Consider the above reaction

- A. The reaction proceeds through a more stable radical intermediate.
- B. The role of peroxide is to generate H^\cdot (hydrogen radical).
- C. During this reaction, benzene is formed as a byproduct.
- D. 1-Bromo-2-phenylethane is formed as the minor product.
- E. The same reaction in absence of peroxide proceeds via carbocation intermediate.

Identify the correct statements. Choose the correct answer from the options given below.

- 1) C, D & E only 2) A & E only
- 3) A, B & D only 4) A, C & E only

key: 4

sol: A, C and E are correct statements.

Above reaction is anti-markovnikov rule it followed by free radical intermediate

70. Given below are two statements:

Statement I: Griss-Ilosvay test is used for the detection of nitrite ion, which involves the use of sulphanilic acid and α -naphthylamine reagent.

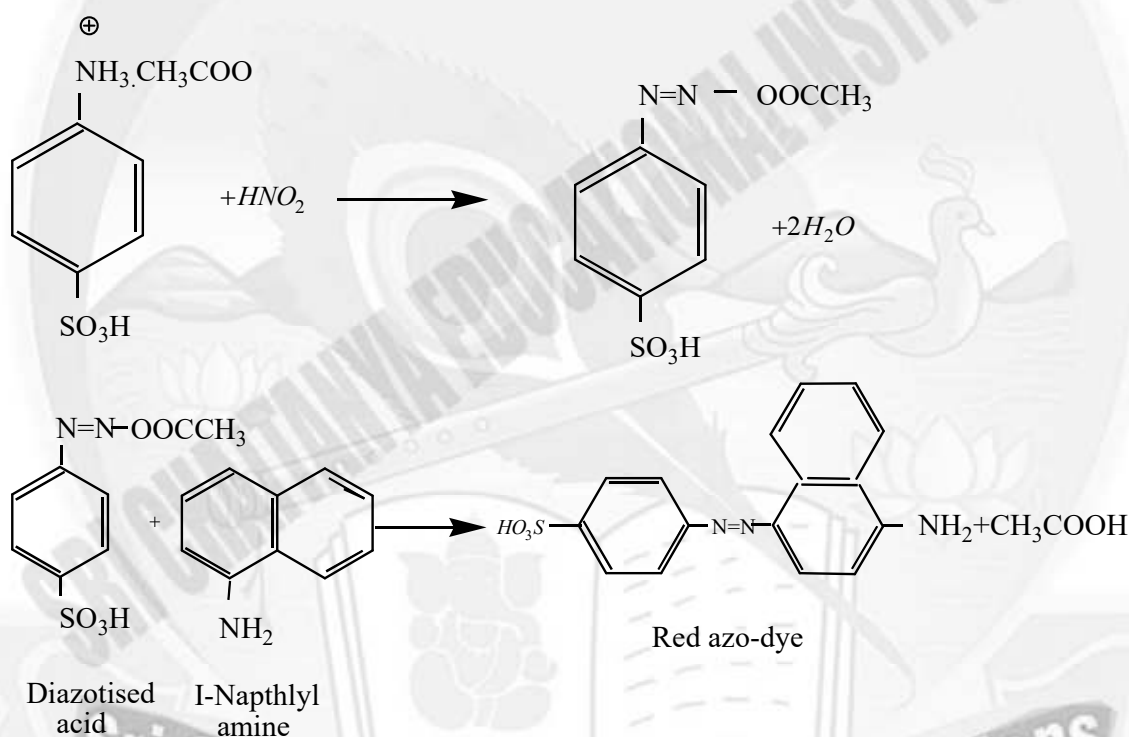
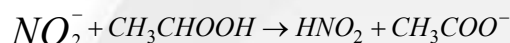
Statement II: In the above test, sulphanilic acid is diazotized by the acidified nitrite ion, which on further coupling with α -naphthylamine forms an azo-dye.

In the light of the above statements, choose the correct answer from the options given below

- 1) Statement I is false but Statement II is true
- 2) Both Statement I and Statement II are true
- 3) Both Statement I and Statement II are false
- 4) Statement I is true but Statement II is false

key: 4

sol: The Griess-Ilosvay test detects (NO_2^-) in water, soil, or biological samples by producing a distinct pink-to-red azo dye. It utilizes sulfanilic acid and α -naphthylamine in acetic acid, which diazotizes with nitrite to form a color proportional to the concentration.

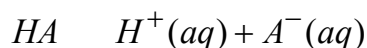


SECTION-II (NUMERICAL VALUE TYPE)

This section contains **5 Numerical Value Type Questions**. The Answer should be within **0 to 9999**. If the Answer is in **Decimal** then round off to the **Nearest Integer** value (Example i.e. If answer is above **10** and less than **10.5** round off is **10** and If answer is from **10.5** and less than **11** round off is **11**).

Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases

71. Consider the dissociation equilibrium of the following weak acid:



If the pKa of the acid is 4, then the pH of 10 mM HA solution is _____. (Nearest integer)

Given: [The degree of dissociation can be neglected with respect to unity.]

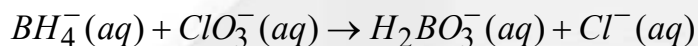
Key: 3

Sol: $pH = \frac{1}{2}[pK_a - \log c]$

$$pH = \frac{1}{2}[4 - \log 10^{-2}]$$

$$pH = 3$$

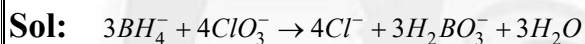
72. Consider the following redox reaction taking place in acidic medium:



If the Nernst equation for the above balanced reaction is

$$E_{cell} = E_{cell} - \frac{RT}{nF} \ln Q,$$

then the value of n is _____. (Nearest integer)

Key: 24

n-factor = 8

moles = 3

$$\therefore n = 3 \times 8 = 24$$

73. X is the number of geometrical isomers exhibited by $[Pt(NH_3)(H_2O)BrCl]$.

Y is the number of optically inactive isomer(s) exhibited by $[CrCl_2(ox)_2]^{3-}$

Z is the number of geometrical isomers exhibited by $[Co(NH_3)_3(NO_2)_3]$

The value of X+Y+Z is _____.

Key:6

Sol: Here

X = 3 (Two cis + one trans isomers)

Y = 1 (trans isomer)

Z = 2 (Fac- mer isomer)

$$X+Y+Z = 3+1+2 = 6$$

74. 0.53 g of an organic compound (x) when heated with excess of nitric acid (concentrated) and then with silver nitrate gave 0.75 g of silver bromide precipitate. 1.0 g of (x) gave 1.32 g of CO_2 gas on combustion. The percentage of hydrogen in the compound (x) is ____%. [Nearest Integer]

[Given: Molar mass in $g\ mol^{-1}$ H : 1, C : 12, Br : 80, Ag : 108, O : 16; Compound (x)



Key: 4

Sol: Mass of $C = \frac{12}{44} \times 1.32 = 0.36\text{g}$

Percentage of $C = \frac{0.36}{1.0} \times 100 = 36\%$

$$Br = \frac{80}{188} \times 0.75 \approx 0.3191\text{g}$$

$$Br = \frac{0.3191}{0.53} \times 100 \approx 60.2\%$$

Percentage of H = $100\% - (\% C + \% Br)$

Percentage of H = $100 - (36 + 60.2) = 3.8\% \approx 4$

75. 500 mL of 1.2 M KI solution is mixed with 500 mL of 0.2 M KMnO_4 solution in basic medium. The liberated iodine was titrated with standard 0.1 M $\text{Na}_2\text{S}_2\text{O}_3$ solution in the presence of starch indicator till the blue color disappeared. The volume (in L) of $\text{Na}_2\text{S}_2\text{O}_3$ consumed is _____. (Nearest integer)

Key: 3**Sol:**

gram eq of $\text{KMnO}_4 = \text{gram eq of Na}_2\text{S}_2\text{O}_3$

$$0.2 \times \frac{500}{1000} \times 3 = 0.1 \times V \times 1$$

$$V = 3\text{L}$$



TOPPERS ARE NOT BORN, THEY'RE MADE @ SRI CHAITANYA

SEIZES 3 RANKS IN TOP 10 IN JEE MAIN 2025 (ALL-INDIA OPEN CATEGORY)



1
ALL INDIA RANK
OPEN CATEGORY
Ajay Reddy Vangala
Appl. No. 25030265592
Classroom Student from Grade 10-XI



1
ALL INDIA RANK
OPEN CATEGORY
Devclutta Majhi
Appl. No. 25030001815*



10
All India Rank Open Category
295
300
Marks
Saksham Jindal
Appl. No. 250310236696*

Secured 31 ranks in Top 100 All INDIA Open Category

 12 RANK SAURAV Appl. No. 250310254844*	 22 RANK LAKSHYA SHARMA Appl. No. 250310034153*	 31 RANK BANDARI RUSHMITH Appl. No. 250310395238	 32 RANK BHAVESH JAYANTHI Appl. No. 250310269939	 33 RANK UJJWAL KESARI Appl. No. 250310008860*	 36 RANK PRADISH GANDHI S Appl. No. 250310768252*
 39 RANK S SAI RISHANTH REDDY Appl. No. 250310565519	 41 RANK PRASANNA KS Appl. No. 250310326957	 43 RANK KOLLIBONA MUNI SAI Appl. No. 250310483636	 44 RANK GORRE NITHIN REDDY Appl. No. 250310551436	 53 RANK U RAMA CHARAN REDDY Appl. No. 250310288782	 56 RANK ARNAV NIGAM Appl. No. 2503101026448
 60 RANK SAMUDRA SARKAR Appl. No. 250310179442*	 61 RANK SOHAN KALIDAS CHELEKAR Appl. No. 250310202114*	 64 RANK BUDUMURU VIKRAM RAJA Appl. No. 250310322700	 66 RANK SHAGANTI THRISHUL Appl. No. 250310500006	 70 RANK LAXIBHARGAV MENDE Appl. No. 250310248080	 71 RANK D CHETAN RAO Appl. No. 250310635984
 73 RANK V PRAVAS REDDY Appl. No. 250310253376	 75 RANK P SAI SURYA KARTHIK Appl. No. 250310407361	 76 RANK YASH KUMAR Appl. No. 250310204495*	 81 RANK P PRANAVA SAI MUKESH Appl. No. 250310500114	 89 RANK ADITYA SINGH Appl. No. 250310151728	 91 RANK JAY AGARWAL Appl. No. 250310122371*
 94 RANK V ESWAR KARTHIK Appl. No. 250310236425	 96 RANK SAKSHAM GARG Appl. No. 250310026725*	 97 RANK RANVEER SINGH VIRDE Appl. No. 250310790734			

BELOW 100

31

BELOW 500

95

BELOW 10

10

BELOW 100

98

BELOW 1000

579

TOTAL QUALIFIED RANKS FOR JEE ADVANCED-2025

22,094



LEADING BY MILES SRI CHAITANYA DOMINATES
JEE ADVANCED 2025

29 Ranks in Top 100 in All-India Open Category



4 Students in Top 11 in JEE-Advanced 2025, All India Open Category

16 RANK DEVUTTA MAJHI HT. No. 255053116*	18 RANK DHARMANA GNANA RUTVIK SAI HT. No. 256055278	19 RANK VANGALA AJAY REDDY HT. No. 256131009	23 RANK AKSH GOGI HT. No. 252071075*	26 RANK P HEMA SAI SURYA KARTHIK HT. No. 256033006	27 RANK SARKARSAMUDRA HT. No. 252071105*
30 RANK OM PRAKASH BEHERA HT. No. 252021018*	32 RANK SUNKARA SAI RISHANTH REDDY HT. No. 256165327	34 RANK DHRUBA JYOTHI PANJA HT. No. 252048248*	35 RANK BHAVESH JAYANTHI HT. No. 251043080	36 RANK ADVAY MAYANK HT. No. 252104113*	37 RANK KARMANYA GUPTA HT. No. 252061477*
42 RANK MD ANAS HT. No. 252046210*	45 RANK RAMIT GOYAL HT. No. 257001113*	52 RANK MAULIK JAIN HT. No. 252079407*	54 RANK GARV HT. No. 252056188*	59 RANK LARISSA HT. No. 252079071*	60 RANK ARYAN BALABADRULA HT. No. 256132077
63 RANK SAMYAJYOTI BISWAS HT. No. 255058456*	64 RANK AARUSH ANAND HT. No. 251998176*	72 RANK RUSHMITH BANDARI HT. No. 256163048	78 RANK KORIKANA RASAGNYA HT. No. 256057046	87 RANK LAKSHYA SHARMA HT. No. 252070079*	91 RANK AVANEESH BANSAL HT. No. 251113130*
95 RANK KAVYA AGGARWAL HT. No. 252079121*					

BELOW 100 ALL INDIA OPEN CATEGORY RANKS > **29** | BELOW 500 ALL INDIA OPEN CATEGORY RANKS > **113** | BELOW 1000 ALL INDIA OPEN CATEGORY RANKS > **205** | BELOW 1000 ALL INDIA CATEGORY RANKS COUNT > **745** | NUMBER OF QUALIFIED RANKS **4,212**