

Physics Solution Paper - 01
SECTION - I
Single Correct Choice Type

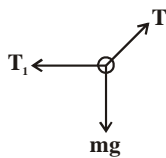
1. (a) $1 \sin 60^\circ = \mu_g \sin 35^\circ$; $1 \sin 60^\circ = \mu_w \sin 47^\circ$

$\mu_w \sin 45^\circ = \mu_g \sin \theta$;

$\mu_w \sin 47^\circ = \mu_g \sin 35^\circ$

$\frac{\sin 45^\circ}{\sin 47^\circ} \times \sin 35^\circ = \sin \theta \Rightarrow \theta < 35$

2. (a)



$T \cos 45^\circ = mg$; $T_1 = T \sin 45^\circ$,

$T_1 = mg$.

3. (c) From given curve,

Melting point for $A = 60^\circ C$

and melting point for $B = 20^\circ C$

Time taken by A for fusion = $(6 - 2) = 4$ minute

Time taken by B for fusion = $(6.5 - 4) = 2.5$ minute

Then $\frac{H_A}{H_B} = \frac{6 \times 4 \times 60}{6 \times 2.5 \times 60} = \frac{8}{5}$.

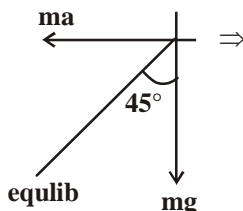
4. (c) When loop is entering in the field, magnetic flux (*i.e.* \times) linked with the loop increases so induced emf in it

$e = Bvl = 0.6 \times 10^{-2} \times 5 \times 10^{-2} = 3 \times 10^{-4} V$ (Negative)

When loop completely entered in the field (after 5 sec) flux linked with the loop remains constant so $e = 0$.

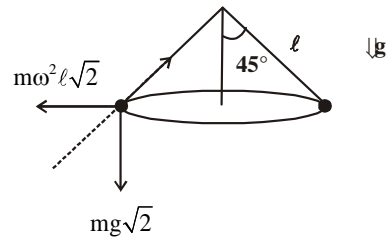
After 15 sec, loop begins to exit out, linked magnetic flux decreases so induced emf $e = 3 \times 10^{-4} V$ (Positive).

5. (c)



So geometry is like

$a = g$, $g_{\text{eff}} = g\sqrt{2}$



$\Rightarrow T \cos 45^\circ = \frac{m\omega^2 l}{\sqrt{2}}$; $T \sin 45^\circ = mg\sqrt{2}$

$1 = \frac{m\omega^2 l}{2mg} \Rightarrow \omega^2 = \frac{2g}{l} \Rightarrow \omega = \sqrt{\frac{2g}{l}}$

6. (d)

7. (b) $\frac{V}{3} = V(1 - e^{-t/RC}) \rightarrow \frac{2V}{3} = e^{-t/RC}$ (1)

$\frac{2V}{3} = V(1 - e^{-(t+T)/RC}) \rightarrow \frac{V}{3} = e^{-(t+T)/RC}$ (2)

dividing equation (2) by (1) gives $T = RC \ln 2$

8. (a) Since, $T^2 = kr^3$

Differentiating the above equation

$\Rightarrow 2 \frac{\Delta T}{T} = 3 \frac{\Delta r}{r} \Rightarrow \frac{\Delta T}{T} = \frac{3}{2} \frac{\Delta r}{r}$

Passage - 9 to 11

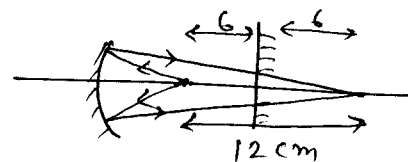
09-11 (d, c, b)

For concave mirror $\frac{1}{v} + \frac{1}{-12} = \frac{1}{-8}$

$\frac{1}{v} = -\frac{1}{8} + \frac{1}{12} = -\frac{3}{24} + \frac{2}{24} = -\frac{1}{24}$

$v = -24$

It has to double its volume to shift by 6 cm forward.



$(P_0, V_0, T_0) \rightarrow (P_0, 2V_0)$

$\frac{P_0 V_0}{T_0} = \frac{P_0 2V_0}{T} \Rightarrow (T = 2T_0)$

$Q = nC_p \Delta T$ (isobaric $P_{\text{ext}} = P_0$)

$= \frac{P_0 V_0}{T_0 R} \cdot T_0 \cdot C_p = \frac{5P_0 V_0}{2R} R = \frac{5P_0 V_0}{2}$

Passage 12 to 16

12-14 (c, a, b)

Velocity of efflux for two holes,

$$v_1 = \sqrt{2g \times \frac{H}{2}} = \sqrt{gH} \quad ; \quad v_2 = \sqrt{2gH}$$

Thrust on tank, $F = F_1 + F_2 = \rho A v_1^2 + 2\rho A v_2^2 = 5\rho A g H$
 Mass of liquids in tank $= m_1 + m_2 = 3\rho A_0 H$

$$\therefore \text{acceleration of tank} = \frac{5A}{3A_0} g$$

\therefore Correct option is (B)

Passage 15 to 16

15. (a) According to the given problem

$$\Delta Q = Q_1 + Q_2 + Q_3 + Q_4 = 5960 - 5585 - 2980 + 3645$$

$$\Delta Q = 9605 - 8565 = 1040 \text{ J}$$

$\Delta W = W_1 + W_2 + W_3 + W_4 = 2200 - 825 - 1100 + W_4 = 275 + W_4$
 and as for cyclic process
 $U_F = U_I, \quad \Delta U = U_F - U_I = 0$

So from first law of thermodynamics, i.e.,
 $\Delta Q = \Delta U + \Delta W$, we have

$$1040 = (275 + W_4) + 0, \text{ i.e. } W_4 = 765 \text{ J}$$

16. (a) As efficiency of a cycle is defined as

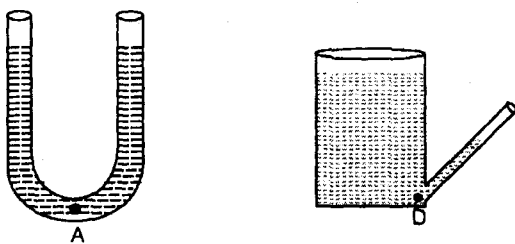
$$\eta = \frac{\text{Network}}{\text{Input heat}} = \frac{\Delta W}{(Q_1 + Q_4)} = \frac{\Delta Q}{(Q_1 + Q_4)}$$

$$\eta = \frac{1040}{9605} = 0.1082 = 10.82\%$$

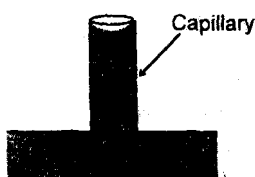
Multichoice Answer

17. (a,c,d)

The pressure at any point can never have different values. Hence (A) & (D) are not possible. (Calculate the pressure at points A & D from both their left and right)



In case of insufficient length of capillary tube the shape of meniscus is as below.



(Stationary fluid)

18.(a,c) According to Wien's law,

$$\lambda_m T = \text{constant or } = \text{constt.}$$

So, if T is doubled, λ_m is also doubled.

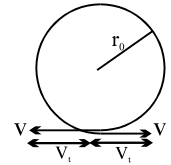
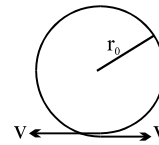
Further, according to Stefan's law,

$$E \propto T^4$$

When T is doubled, E increases by a factor of 16.

19.(a,b,d) $2\pi r_0 = 2\pi r + 2Vt$

$$\therefore r = r_0 - \frac{Vt}{\pi} \quad (a)$$



$$Q = Bpr^2$$

$$\text{emf} \therefore \frac{d\phi}{dt} = B\pi 2r \cdot \frac{dr}{dt} = B\pi 2 \left(r_0 - \frac{Vt}{\pi} \right) \cdot \frac{V}{\pi} =$$

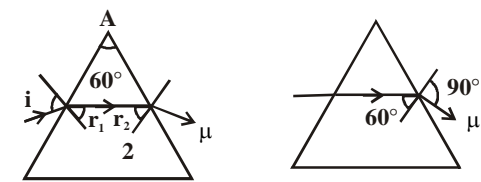
$$2BV \left(r_0 - \frac{Vt}{\pi} \right) \quad (b)$$

$$I = \frac{\text{emf}}{\lambda 2\pi r} = \frac{2BV \left(r_0 - \frac{Vt}{\pi} \right)}{\lambda \cdot 2\pi \left(r_0 - \frac{Vt}{\pi} \right)} = \frac{BV}{\lambda \pi} \quad (d)$$

20.(a,d) If ray corresponding to $r_{2\text{max}}$ pass then all r_2 will pass through prism.

$$r_{2\text{max}} \text{ when } r_1 \text{ is min i.e., } \Rightarrow i = 0 \Rightarrow r_2 = 60^\circ$$

$$2 \sin 60^\circ = \sin 90^\circ \cdot \mu$$



$$\mu = 2 \times \frac{\sqrt{3}}{2} = \sqrt{3} \text{ for all } \mu \leq \sqrt{3} \text{ ray will pass out.}$$

Matrix Match

21. (a-q), (b-p), (c-s), (d-r)

$$q_i = 2 \times 8 = 16$$

$$W_{\text{ext}} = F_{\text{m (plate)}} \times d$$

(Now work is done against the force between the plates and F is constant since charge will take time to change its value)

$$= \frac{q_i^2}{2A\epsilon_0} d = 64 \text{ J.}$$

$$U_{\text{cap}} = \frac{q^2}{2C} = \frac{16^2}{2 \times 1} = 128 \text{ J.} \quad (\text{Here } q = q_i \text{ and } C = 1)$$

$$W_{\text{ext}} + W_{\text{batt}} = \Delta U_{\text{cap}} + \text{heat} \quad ;$$

$$U_{\text{cap}_{\text{final}}} = \frac{1}{2} CV^2 = \frac{1}{2} \times 1 \times 8^2 = 32$$

$$U_{\text{cap}_{\text{final}}} = \frac{1}{2} CV^2 = \frac{1}{2} \times 1 \times 8^2 = 32$$

$$128 - 32 = \text{heat}$$

$$\text{heat} = 96 \text{ J}$$

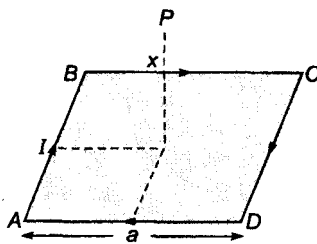
Subjective Type

22. (0125)

23. (0005)

Perpendicular distance of P from each side of loop is,

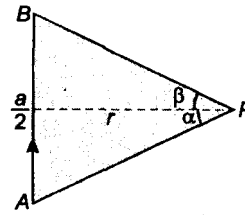
$$F = \sqrt{x^2 + \frac{a^2}{4}} = 4 \text{ cm.}$$



Due to AB, magnetic field at P is given by

$$B = \frac{\mu_0 I}{4\pi r} (\sin \alpha + \sin \beta)$$

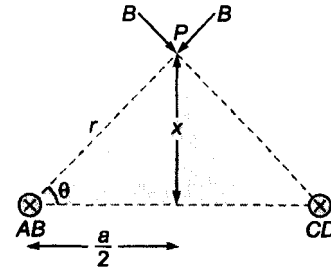
Where α and β are shown in clearly in figure.



$$\sin \alpha = \sin \beta = \frac{\frac{a}{2}}{\sqrt{r^2 + \frac{a^2}{4}}} = \frac{3}{5}$$

$$\text{So, } B = \frac{\mu_0 I}{4\pi \times (4 \text{ cm})} \times \frac{6}{5} = 9 \times 10^{-5} \text{ Tesla}$$

The magnetic field at P is vector sum of magnetic field at P due to all 4 wires. Due to AB and CD we have shown the situation in adjacent figure.



Resultant magnetic field at P is ;

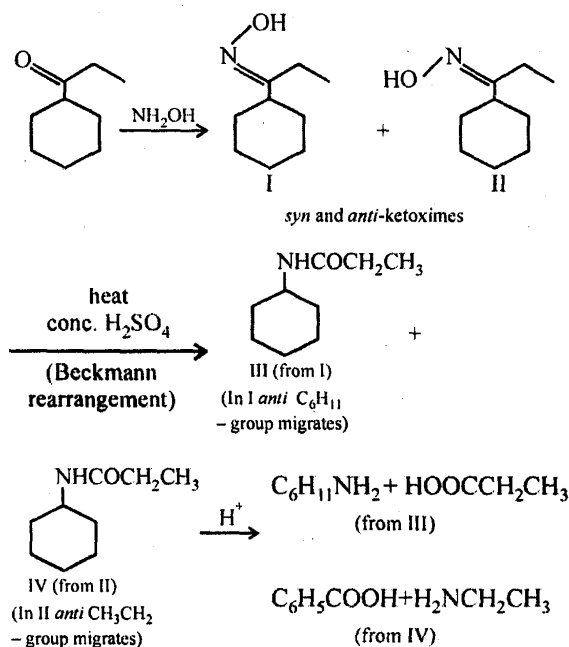
$$B_0 = 4B \cos \theta = 2.7 \times 10^{-4} \text{ Tesla} = 0.27 \text{ mT}$$

$$= 0.054 \times 5 \text{ mT}$$

$$\text{So, } K = 5$$

Single Choice Question

Sol.24 (d)



Sol.25 (d)

Sol. 26 (b) The molar conductivity of the dissociated form of crotonic acid is

$$\begin{aligned}\Lambda_m(\text{HC}) &= \Lambda_m(\text{HCl}) + \Lambda_m(\text{NaC}) - \Lambda_m(\text{NaCl}) \\ &= (426 + 83 - 126) \Omega^{-1} \text{ cm}^2 \text{ mol}^{-1} \\ &= 383 \Omega^{-1} \text{ cm}^2 \text{ mol}^{-1}\end{aligned}$$

The molar conductivity of HCl,

$$\Lambda_m(\text{HC}) = \frac{\kappa}{C} = \frac{3.83 \times 10^{-5} \Omega^{-1} \text{ cm}^{-1}}{0.001} \times 1000$$

$$= 38.3 \Omega^{-1} \text{ cm}^2 \text{ mol}^{-1}$$

The degree of dissociation,

$$\alpha = \frac{\Lambda_m(\text{HC})}{\Lambda_m^\infty(\text{HCl})} = \frac{(38.3 \Omega^{-1} \text{ cm}^2 \text{ mol}^{-1})}{(383 \Omega^{-1} \text{ cm}^2 \text{ mol}^{-1})} = 0.1$$

$$K_a = \frac{C\alpha^2}{1-\alpha} = \frac{(10^{-3})(0.1)^2}{1-0.1} = 1.11 \times 10^{-5}$$

 Sol.27 (d) $100 = P_A^0(0.5) + P_B^0(0.5)$ (i)

$$0.2 = \frac{P_A^0 \times 0.5}{100}$$

$$\Rightarrow P_A^0 = \frac{20}{0.5} = 40 \text{ torr and } P_B^0 = 160 \text{ torr}$$

 Sol.28 (d) $Ni_{0.9}O$
 $Ni^{+4} \rightarrow x$

$$Ni^{+2} \rightarrow (0.9 - x)$$

By using charge balance

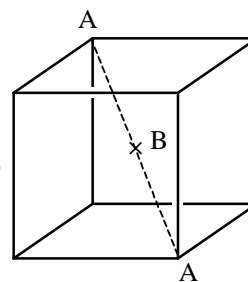
$$\Rightarrow 4x + 2(0.9 - x) = 2$$

$$\Rightarrow 2x = 0.2$$

$$\Rightarrow x = 0.1$$

$$\% \text{ of } Ni^{+4} = \frac{0.1}{0.9} \times 100\% = 11.11\%$$

Sol.29 (c)



$$A_{\frac{4}{4}}B_3 = A_{\frac{15}{4}}B_3 = A_{\frac{5}{4}}B_1 = A_5B_4$$

Sol. 30(c)

Sol. 31 (d)

Sol..32 (b)

Sol.33 (d)

 Sol.34 (c) $As_2S_3 + (NH_4)_2S_2 \rightarrow AsS_4^{3-}$

Sol.35 (b)

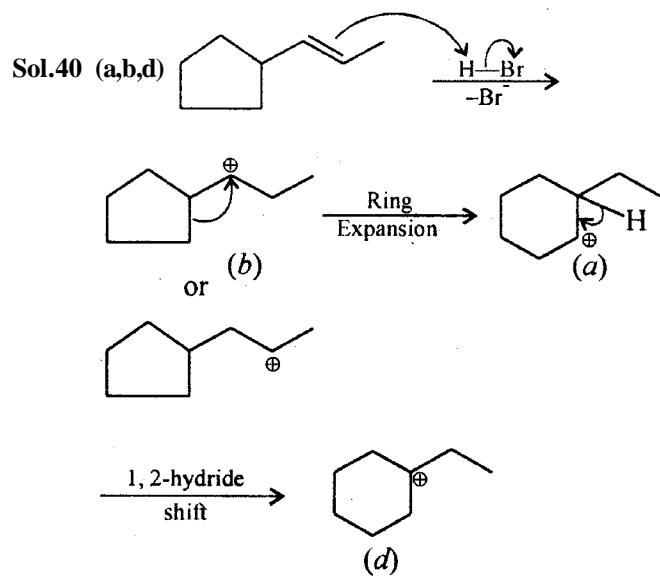
Sol.36 (c)

Sol.37 (a)

Sol.38 (b)

Sol.39 (c)

One or More than One Correct Choice Type



Sol.41 (a,c,d)

Sol.42 (d)

Sol.43. (a, b, d)

Match the Column

Sol.44 A-p,s; B-p,q,r,s; C-p,r; D-p,q,s

Subjective Type

Sol.45 (6)

Sol.46 (20)

$$x = 12, y = 8$$

$$x + y = 20$$

DETAILED SOLUTION

Single Correct Choice Type

Sol.47(d) Put $e^x = t \Rightarrow t$ varies from $\pi/6$ to $\pi/3$

(Using King)

$$I = \int_{\pi/6}^{\pi/3} \sin^2 t \, dt \quad \text{or} \quad I = \int_{\pi/6}^{\pi/3} \cos^2 t \, dt$$

$$2I = \frac{\pi}{6} \quad \Rightarrow \quad I = \frac{\pi}{12} \text{ Ans.}$$

Sol.48(d) $T_n = 1 + 2 + 2^2 + \dots + 2^{n-1}$

(G.P. with $a = 1$ and $r = 2$)

$$= (2^n - 1)$$

$$\text{Hence sum} = \sum_{n=1}^n (2^n - 1) =$$

$$= [(2 + 2^2 + 2^3 + \dots + 2^n) - n]$$

$$= 2(2^n - 1) - n = 2^{n+1} - 2 - n$$

$$= 2^{n+1} + (0)n^2 + (-1)n + (-2)$$

$$\text{Hence } R = 1; S = 0; T = -1; U = -2$$

$$R + S + T + U = -2 \text{ Ans.}$$

Sol.49(b) $m > 0; 13x + 11y = 700 \quad \dots(1)$

$$mx - y = 1 \quad \dots(2)$$

multiplying eq. (2) by 11

$$11mx - 11y = 11 \quad \dots(3)$$

add (1) and (3)

$$(13 + 11m)x = 711 = 3 \cdot 3 \cdot 79 \Rightarrow x = \frac{3 \cdot 3 \cdot 79}{13 + 11m}$$

Hence $m = 6$ (for x to be integer)

$$\therefore x = 9 \text{ and } y = 53$$

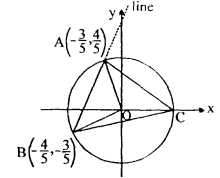
Sol.50(c) $2^y = 3^x - 1 \quad \Rightarrow \quad y \ln 2 = \ln(3^x - 1)$

$$\ln 2 \frac{dy}{dx} = \frac{3^x \cdot \ln 3}{3^x - 1} = \frac{\ln 3}{1 - 3^{-x}}$$

$$\lim_{x \rightarrow \infty} \frac{dy}{dx} = \frac{\ln 3}{\ln 2} \cdot \lim_{x \rightarrow \infty} \frac{1}{1 - 3^{-x}} = \log_2 3 \text{ Ans.}$$

Sol.51(c) Solving $y = 7x + 5$ and the circle $x^2 + y^2 = 1$

$$A\left(-\frac{3}{5}, \frac{4}{5}\right) \text{ and } B\left(-\frac{4}{5}, -\frac{3}{5}\right)$$



$$m_{OA} = -\frac{4}{3}; \quad m_{OB} = \frac{3}{4}$$

$$\text{Hence } \angle AOD = 90^\circ \Rightarrow \angle ACB = \frac{\pi}{4} = \tan^{-1}(1)$$

Sol.52(b) I. Circle on $(1, 3)$ and $(3, 1)$ as diameter

$$\text{II. } \frac{y-1}{x-3} = m, \frac{y-3}{x-1} = \frac{-1}{m}, \Rightarrow \text{eliminate } m, \text{ to get (b)}$$

Sol.53(c) $a < 0; -\frac{b}{a} < 0 \Rightarrow b < 0; \frac{c}{a} < 0 \Rightarrow c > 0$

Now $b - c = (-ve) - (+ve)$ must be negative

$bc = (-)(+ve)$ must be negative

$ab^2 = (-)(+ve)$ must be negative

$c - a = (+) - (-)$ must be positive

$$\text{Sol.54(d) } \int_{-1}^2 |e^x - 1| \, dx = \int_{-1}^0 (1 - e^x) \, dx + \int_0^2 (e^x - 1) \, dx$$

$$= x - e^x \Big|_{-1}^0 + e^x - x \Big|_0^2$$

$$= -1 + 1 + \frac{1}{e} + e^2 - 2 - 1 = e^2 + e^{-1} - 3 \text{ Ans.}$$

$$\text{Sol.55(c) } (\log_6 9 + \log_6 4) - \frac{\log_3 27}{\log_3 9} = \frac{\log_8 x}{2} - \log_8 x$$

$$2 - \frac{3}{2} = -\frac{1}{2} \log_8 x \Rightarrow \frac{1}{2} = -\frac{1}{2} \log_8 x \Rightarrow x = \frac{1}{8} \text{ Ans}$$

Sol.56(d) Let $S = 1^2 + 3^2 + 5^2 + \dots + (99)^2$

$$\text{and } x = 2^2 + 4^2 + 6^2 + \dots + (100)^2$$

$$\therefore (x - S) = (2^2 - 1^2) + (4^2 - 3^2) + \dots + (100^2 - 99^2)$$

$$= (1 + 2) + (3 + 4) + \dots + (99 + 100)$$

$$= 1 + 2 + 3 + 4 + \dots + 99 + 100 = 5050$$

$$\therefore x = S + 5050 \text{ Ans}$$

Matrix – Match Type

Sol.57(d) Note that $1/x$ is a cyclic function i.e. $\frac{1}{1/x} = x$.

∴ we substitute $1/x$ we get

$$f\left(\frac{1}{x}\right) + f(x) = \frac{1}{x}$$

Hence $x = \frac{1}{x} \Rightarrow x^2 = 1$ gives domain $\{-1, 1\}$

Sol.58(d) Family of circle

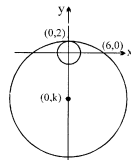
$$(x-0)^2 + (y-2)^2 + \lambda(y-2) = 0$$

Passing through $(6, 0)$

$$\Rightarrow \lambda = 20$$

∴ circle is $x^2 + y^2 + 16y - 36 = 0$

\Rightarrow centre $(0, -8)$



Assertion & Reason Type

Sol.59(a) Equation of director's circle is

$$(x-3)^2 + (y+4)^2 = (10\sqrt{2})^2$$

and point $(13, 6)$ satisfies the director circle

Sol.60(a) $AB = \sqrt{(8)^2 + (19)^2} = \sqrt{425}$;

$$AC = \sqrt{(16)^2 + (13)^2} = \sqrt{425}$$

∴ Δ is isosceles

Sol.61(b) $f(x) = \begin{cases} 1 & x = 1 \\ x & x < 1 \text{ in the immediate neighbourhood} \\ 1/x & x > 1 \text{ in the immediate neighbourhood} \end{cases}$

Hence $f(1^+) = f(1^-) \Rightarrow \lim_{x \rightarrow 1} f(x)$ exists

$$\therefore f(1^+) = f(1^-) = f(1) = 1$$

Sol.62(d) The joint equation of $y = x$

and $y = -x$ is $(x-y)(x+y) = 0$

i.e. $x^2 - y^2 = 0$

Multiple Correct Choice Type

Sol.63(a,c,d) $C_1 : (0, 0)$, radius 4, $C_2 : (6, 0)$, radius 2 circle touch externally.

Sol.64(a,c) Circles touch externally

$$C_1(2, 3); \quad r_1 = 5$$

$$C_2 = (-3, -9); \quad r_2 = 8$$

Sol.65(c, d)

Sol.66 (a, c, d)

Sol.67 A - s ; B - r ; C - p ; D - q.

$$(A) \quad \log_{1/3} \left(\log_8 \frac{x^2 - 2x}{x-3} \right) < 0;$$

$$\log_8 \left(\frac{x^2 - 2x}{x-3} \right) > 1 ; \quad \frac{x^2 - 2x}{x-3} > 8$$

$$\Rightarrow \frac{(x-6)(x-4)}{x-3} > 0$$

$$\text{also } \frac{x(x-2)}{x-3} > 0 \Rightarrow x \in (0, 2) \cup (3, \infty)$$

$$\Rightarrow x \in (3, 4) \cup (6, \infty)$$

$$\Rightarrow a_1 + a_2 + a_3 = 13 \Rightarrow (s)$$

(B) Here $a = 0$; $b = 0$; $c = -6$

$$2g = -8 ; 2f = 9, 2h = k$$

$$abc + 2fgh - af^2 - bg^2 - ch^2 = 0$$

$$2fgh = ch^2$$

$$\Rightarrow h = 0 \Rightarrow k = 0 \text{ and}$$

$$2fg = ch \Rightarrow 9(-4) = (-6) \frac{k}{2}$$

$$\Rightarrow k = 12 \text{ or } 0 \Rightarrow \text{sum} = 12 \Rightarrow (r)$$

$$(C) \quad \log\left(1 + \frac{1}{1}\right) + \log\left(1 + \frac{1}{2}\right) + \dots + \log\left(1 + \frac{1}{n}\right) = 1$$

$$\log\left(2 \cdot \frac{3}{2} \cdot \frac{4}{3} \cdot \frac{5}{4} \cdot \dots \cdot \frac{n+1}{n}\right) = 1$$

$$\log_{10}(n+1) = 1$$

$$n+1 = 10 \Rightarrow n = 9 \quad \Rightarrow (p)$$

$$(D) \quad AM = \frac{\log 1 + \log 2 + \log 2^2 + \log 2^3 + \dots + \log 2^{n-1}}{n}$$

$$= \frac{\log\left(2^{1+2+3+\dots+(n-1)}\right)}{n} = \frac{\log 2^{\frac{(n-1)n}{2}}}{n}$$

$$AM = \frac{1}{n} \log 2^{\frac{(n-1)n}{2}} = \log 2^{\frac{(n-1)}{2}}$$

$$\therefore \log_{10} 2^{\frac{(n-1)}{2}} = \log 2^5$$

$$\therefore 2^{\frac{(n-1)}{2}} = 2^5 \Rightarrow \frac{n-1}{2} = 5$$

$$\Rightarrow n = 11 \quad \Rightarrow (q)$$

SECTION - IV

Subjective Type

Sol.68[5250] $\int_0^{\pi/2} (\sin x + a \cos x)^3 dx - \frac{4a}{\pi-2} \int_0^{\pi/2} x \cos x dx = 2$

Let $I_1 = \int_0^{\pi/2} (\sin x + a \cos x)^3 dx$

$$= \int_0^{\pi/2} (\sin^2 x + a^3 \cos^3 x + 3a \sin^2 x \cos x + 3a^2 \sin x \cos^2 x) dx$$

$$= \int_0^{\pi/2} \sin^3 x dx + a^3 \int_0^{\pi/2} \cos^3 x dx + 3a \int_0^{\pi/2} \sin^2 x \cos x dx$$

$$+ 3a^2 \int_0^{\pi/2} \sin x \cos^2 x dx$$

$$= \frac{2}{3} + \frac{2a^3}{3} + 3a \left[\frac{\sin^3 x}{3} \right]_0^{\pi/2} + \frac{3a^2}{3} \left[-\cos^3 x \right]_0^{\pi/2}$$

$$= \frac{2}{3} + \frac{2a^3}{3} + a + a^2 = \frac{2a^3}{3} + a^2 + a + \frac{2}{3}$$

$$I_2 = \int_0^{\pi/2} \frac{x \cdot \cos x}{1} dx = x \sin x \Big|_0^{\pi/2} - \int_0^{\pi/2} \sin x dx$$

$$= x \sin x + \cos x \Big|_0^{\pi/2} = \frac{\pi}{2} - 1 = \frac{\pi-2}{2}$$

$$\therefore I = \frac{2a^3}{3} + a^2 + a + \frac{2}{3} - \frac{4a}{\pi-2} \cdot \frac{\pi-2}{2}$$

$$\text{or } I = \frac{2a^3}{3} + a^2 - a + \frac{2}{3} - 2a = 2$$

$$\text{or } 2a^3 + 3a^2 - 3a + 2 = 6 \Rightarrow 2a^3 + 3a^2 - 3a - 4 = 0$$

$$a_1 + a_2 + a_3 = -\frac{3}{2} \Rightarrow \sum a_1 a_2 = -\frac{3}{2}$$

$$\therefore \sum a_i^2 = a_1^2 + a_2^2 + a_3^2 = (a_1 + a_2 + a_3)^2$$

$$-2 \sum a_1 a_2 = \frac{9}{4} + 3 = \frac{21}{4}$$

$$\therefore 1000 \sum a_i^2 = 1000 \times \frac{21}{4} = 250 \times 21 = 5250$$

Sol.69[0006] $I = \int_{1/3}^1 (x - x^3)^{1/3} \cdot x^{-4} dx$

$$I = \int_{1/3}^1 x (x^2 - 1)^{1/3} \cdot x^{-4} dx$$

$$= \int_{1/3}^1 (x^2 - 1)^{1/3} \cdot x^{-3} dx$$

Put $x^2 - 1 = t^3 \Rightarrow -2x^{-3} dx = 3t^2 dt$

if $x = 1$ then $t = 0$

if $x = 1/3$ then $t = 2$

$$\therefore I = +\frac{3}{2} \int_0^2 t - t^2 dt = +\frac{3}{2} \cdot \frac{t^4}{3} \Big|_0^2$$

$$= +\frac{3}{8} [16] = +6$$