Q-1

3 Jan-2024 First shift

Solve:-

Put $x = 1$

$\therefore \quad a = 1$

$$b = \lim_{x \to 0} \frac{\int_0^x \frac{\ln(1+t)}{1+t^{2024}} dt}{x^2}$$

Using L' HOPITAL RULE

$$b = \lim_{x \to 0} \frac{\ln(1+x)}{(1+x^{2024})} \times \frac{1}{2x} = \frac{1}{2}$$

Now

$$cx^2 + dx + e = 0$$

$$x^2 + x + 4 = 0$$

$(D < 0)$

$$\therefore \frac{c}{1} = \frac{d}{1} = \frac{e}{4}$$

$$\boxed{1 : 1 : 4}$$

Q-2

Solve :-

$$\frac{10}{75} \times \frac{30}{75}$$

$$\boxed{= \frac{4}{75}}$$

Q-3

Solve

$$\{x, y \; ; \; y^2 \le 4x, \; x < 4, \; \frac{xy(x-1)(x-2)}{(x-3)(x-4)} > 0, \; x \neq 3\}$$

$$y^2 \le 4x, \; x < 4, \; \frac{xy(x-1)(x-2)}{(x-3)(x-4)} > 0$$

Case (i) $\quad y > 0 \Rightarrow \frac{x(x-1)(x-2)}{(x-3)(x-4)} > 0$

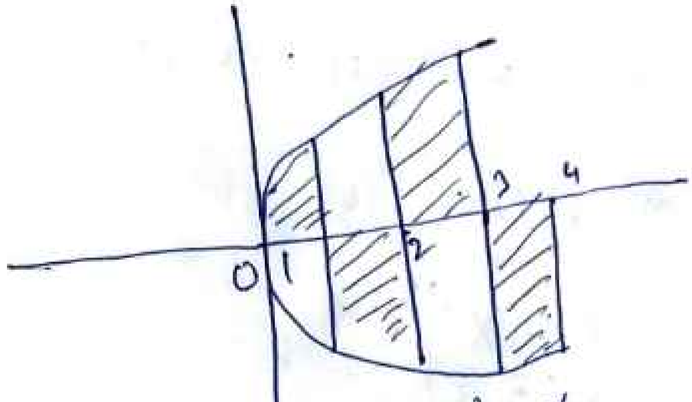
$$x \in (0,1) \cup (2,3)$$

Case (ii) $\quad y < 0 \Rightarrow \frac{x(x-1)(x-2)}{(x-3)(x-4)} < 0$

$$x \in (1,2) \cup (3,4)$$

$$\text{Area} = \int_0^1 2\sqrt{x}\,dx + \left|\int_1^2 2\sqrt{x}\,dx\right| + \int_2^3 2\sqrt{x}\,dx + \left|\int_3^4 2\sqrt{x}\,dx\right|$$

Q-3



$y^2 = 4x$

$$= \frac{4}{3}\left(\left[x^{3/2}\right]_0^1 + \left| \left[x^{3/2}\right]_1^2 \right| + \left[x^{3/2}\right]^3 + \left| \left(x^{3/2}\right)^4 \right| \right)$$

$$A = \frac{4}{3}\left(1 + 2\sqrt{2} - 1 + 3\sqrt{3} - 2\sqrt{2} + 4\sqrt{4} - 3\sqrt{3} \right)$$

$$= \frac{4}{3} \times 8 = \frac{32}{3}$$

Q-4

Solve

Let $g(x) = ax+b$

Now function $f(x)$ is continuous at $x=0$

$$\therefore \lim_{x\to 0^+} f(x) = f(0)$$

$$\Rightarrow \lim_{x\to 0}\left(\frac{1+x}{2+x}\right)^{1/x} = b$$

$$\Rightarrow 0 = b$$

$$\therefore g(x) = ax$$

Now, for $x>0$

$$f'(x) = \frac{1}{x}\cdot\left(\frac{1+x}{2+x}\right)^{\frac{1}{x}-1}\cdot\frac{1}{(2+x)^2} + \left(\frac{1+x}{2+x}\right)^{\frac{1}{x}} \ln\left(\frac{1+x}{2+x}\right)\cdot\left(-\frac{1}{x^2}\right)$$

$$\therefore f'(1) = \frac{1}{9} - \frac{2}{3}\cdot\ln\left(\frac{2}{3}\right)$$

and $f(-1) = g(-1) = -a$

$$\therefore a = \frac{2}{3}\ln\left(\frac{2}{3}\right) - \frac{1}{9}$$

$$\therefore g(3) = 2\ln\left(\frac{2}{3}\right) - \frac{1}{3}$$

$$\boxed{= \ln\left(\frac{4}{9e^{1/3}}\right)}$$

Q-5

General term of the sequence

$$T_r = \frac{r}{1-3r^2+r^4}$$

$$T_r = \frac{r}{r^4-2r^2+1-r^2}$$

$$T_r = \frac{r}{(r^2-1)^2-r^2}$$

$$T_r = \frac{r}{(r^2-r-1)(r^2+r-1)}$$

$$T_r = \frac{\frac{1}{2}\left[(r^2+r-1)-(r^2-r-1)\right]}{(r^2-r-1)(r^2+r-1)}$$

$$= \frac{1}{2}\left[\frac{1}{r^2-r-1} - \frac{1}{r^2+r-1}\right]$$

Sum of 10 terms,

$$\sum_{r=1}^{10} T_r = \frac{1}{2}\left[\frac{1}{-1} - \frac{1}{109}\right] = \frac{-55}{109}$$

Q-6

Solve:

$$f(0) = \begin{vmatrix} 0 & 1 & 1 \\ 2 & 0 & 6 \\ 0 & 4 & -2 \end{vmatrix} = 12$$

$$f'(x) = \begin{vmatrix} 3x^2 & 4x & 3 \\ 3x^2+2 & 2x & x^3+6 \\ x^3-x & 4 & x^2-2 \end{vmatrix}$$

$$+ \begin{vmatrix} x^3 & 2x^2+1 & 1+3x \\ 6x & 2 & 3x^2 \\ x^3-x & 4 & x^2-2 \end{vmatrix} + \begin{vmatrix} x^3 & 2x^2+1 & 1+3x \\ 3x^2+2 & 2x & x^3+6 \\ 3x^2-1 & 0 & 2x \end{vmatrix}$$

$$f'(0) = \begin{vmatrix} 0 & 0 & 3 \\ 2 & 0 & 6 \\ 0 & 4 & -2 \end{vmatrix} + \begin{vmatrix} 0 & 1 & 1 \\ 0 & 2 & 0 \\ 0 & 4 & -2 \end{vmatrix} + \begin{vmatrix} 0 & 1 & 1 \\ 2 & 0 & 6 \\ -1 & 0 & 0 \end{vmatrix}$$

$$= 24 - 6$$

$$= 18$$

$$\boxed{2f(0) + f'(0) = 42}$$

Q-7

Solve $y\frac{dx}{dy} = x(\log_e x - \log_e y + 1)$, $x>0, y>0$

$$\frac{dx}{dy} = \frac{x}{y}\left(\log_e\left(\frac{x}{y}\right) + 1\right)$$

Put $\frac{x}{y} = v \Rightarrow x = vy$

$$\frac{dx}{dy} = v + y\frac{dv}{dy}$$

$$v + y\frac{dv}{dy} = v(\ln v + 1)$$

$$v + y\frac{dv}{dy} = v\ln u + v$$

$$y\frac{dv}{dy} = v\ln v$$

$$\frac{1}{v\ln v}dv = \frac{dy}{y}$$

$$= \int\frac{dv}{v\ln v} = \int\frac{dy}{y}$$

$$\ln|\ln v| = \ln y + \ln c$$

$$\ln|\ln v| = \ln cy$$

$$cy = |\ln \frac{x}{y}|$$

Put $x = e$ & $y = 1$

$c = |\ln \frac{e}{1}| \Rightarrow c = 1$

Put $c=1$ in eq (1)

$y = |\ln \frac{x}{y}|$

Q-8

Solve

$$\frac{ax^2+2(a+1)x+9a+4}{x^2-8x+32} < 0$$

$D = 64 - 4 \times 32 < 0$

& $a = 1 > 0$

$\therefore\ x^2-8x+32 > 0 \quad \forall x \in R$

$ax^2+2(a+1)x+9a+4 < 0 \quad \forall x \in R$

Only possible when

$a < 0$ & $D < 0$

but we need positive integral value of a.

$\boxed{\text{So No solution}}$

Q-9

Solve

$$\lim_{x\to 0} \frac{e^{2|\sin x|} - 2|\sin x| - 1}{x^2}$$

$$\lim_{x\to 0} \frac{e^{2|\sin x|} - 2|\sin x| - 1}{|\sin x|^2} \times \frac{\sin^2 x}{x^2}$$

Let $|\sin x| = t$

$$= \lim_{t\to 0} \frac{e^{2t} - 2t - 1}{t^2} \times \lim_{x\to 0} \frac{\sin^2 x}{x^2}$$

$$= \lim_{t\to 0} \frac{2e^{2t} - 2}{2t} \times 1$$

$$= 2 \times 1$$

$$= 2$$

Q-10

Solve

$$\vec{p}\times\vec{b}-\vec{c}\times\vec{b}=0$$

$$(\vec{p}-\vec{c})\times\vec{b}=0$$

$$\vec{p}-\vec{c}=\lambda\vec{b}\Rightarrow\vec{p}=\vec{c}+\lambda\vec{b}$$

Now $\vec{p}\cdot\vec{a}=0$ (given)

So $\vec{c}\cdot\vec{a}+\lambda\vec{a}\cdot\vec{b}=0$

$$(3-3-8)+\lambda(12+1-14)=0$$

$$\lambda=-8$$

$$\vec{p}=\vec{c}-8\vec{b}$$

$$\vec{p}=-31\hat{i}-11\hat{j}-52\hat{k}$$

So $\vec{p}\cdot(\hat{i}-\hat{j}-\hat{k})$

$=-31+11+52$

$=32$

Q-11

Solve:

3 bad apples, 15 good apples

Let X be no of bad apples

Then $P(X=0) = \frac{{}^{15}C_2}{{}^{18}C_2} = \frac{105}{153}$

$P(X=1) = \frac{3_{C_1} \times {}^{15}C_1}{{}^{18}C_2} = \frac{45}{153}$

$P(X=2) = \frac{{}^{3}C_2}{{}^{18}C_2} = \frac{3}{153}$

$E(X) = 0 \times \frac{105}{153} + 1 \times \frac{45}{153} + 2 \times \frac{3}{153}$

$= \frac{51}{153}$

$= \frac{1}{3}$

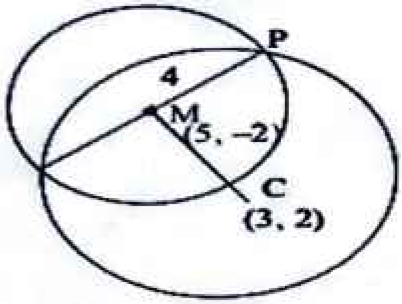
$Var(X) = E(X^2) - (E(x))^2$

$= 0 \times \frac{105}{153} + 1 \times \frac{45}{153} + 4 \times \frac{3}{153} - \left(\frac{1}{3}\right)^2$

$= \frac{57}{153} - \frac{1}{9}$

$= \frac{40}{153}$

Q.12



$2x + 3y = 12$

$3x - 2y = 5$

$13x = 39$

$x = 3, y = 2$

Center of given circle is (5, -2)

Radius $\sqrt{25 + 4 - 13} = 4$

$\therefore \text{CM} = \sqrt{4 + 16} = 5\sqrt{2}$

$\boxed{\therefore \text{CP} = \sqrt{16 + 20} = 6}$

Q.13

$$f(x) = \frac{4x+3}{6x-4}$$

$$g(x) = \frac{4\left(\frac{4x+3}{6x-4}\right)+3}{6\left(\frac{4x+3}{6x-4}\right)-4} = \frac{34x}{34} = x$$

$$g(x) = x$$

$$\boxed{\therefore g(g(g(4))) = 4}$$

Q.14

$$f(x)=(a+b-2c)x^2+(b+c-2a)x+(c+a-2b)=0$$

$$f(x)=a+b-2c+b+c-2a+c+a-2\,b=0$$

$$f(1)=0$$

$$\therefore \alpha\cdot 1=\frac{c+a-2\,b}{a+b-2c}$$

$$\alpha=\frac{c+a-2b}{a+b-2c}$$

If, $-1<\alpha<0$

$$-1<\frac{c+a-2\,b}{a+b-2c}<0$$

$$b+c<2a \text{ and } b>\frac{a+c}{2}$$

therefore, b cannot be G.M. between a and c.

If, $0<\alpha<1$

$$0<\frac{c+a-2b}{a+b-2c}<1$$

$$b>c \text{ and } b<\frac{a+c}{2}$$

Therefore, b may be the G.M. between a and c.

$\boxed{\text{Both (I) and (II) are true}}$

Q-15

Q-15

Let $\sin^{-1}\alpha = A, \sin^{-1}\beta = B, \sin^{-1}\gamma = C$

$\mathrm{A} + \mathrm{B} + \mathrm{C} = \pi$

$(\alpha + \beta)^2 - \gamma^2 = 3\alpha\beta$

$\alpha^2 + \beta^2 - \gamma^2 = \alpha\beta$

$\frac{\alpha^2+\beta^2-\gamma^2}{2\alpha\beta} = \frac{1}{2}$

$\Rightarrow \cos \mathrm{C} = \frac{1}{2}$

$\sin \mathrm{C} = \gamma$

$\cos \mathrm{C} = \sqrt{1-\gamma^2} = \frac{1}{2}$

$\boxed{\gamma = \frac{\sqrt{3}}{2}}$

Q-16

Q-16

A vector in the direction of the required line can be obtained by cross product of

$$\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 3 & 5 \\ -1 & 3 & 2 \end{vmatrix}$$

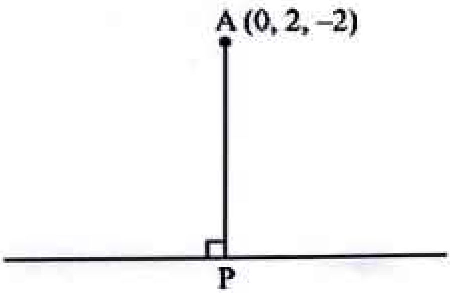
$$= -9\hat{i} - 9\hat{j} + 9\hat{k}$$

Required line,

$$\vec{r} = (5\hat{i} - 4\hat{j} + 3\hat{k}) + \lambda'(-9\hat{i} - 9\hat{j} + 9\hat{k})$$

$$\vec{r} = (5\hat{i} - 4\hat{j} + 3\hat{k}) + \lambda(\hat{i} + \hat{j} - \hat{k})$$

Now distance of $(0, 2, -2)$



P.V. of $\mathbf{P} \equiv (5 + \lambda)\hat{i} + (\lambda - 4)\hat{j} + (3 - \lambda)\hat{k}$

$$\overrightarrow{AP} = (5 + \lambda)\hat{i} + (\lambda - 6)\hat{j} + (5 - \lambda)\hat{k}$$

$$\overrightarrow{AP} \cdot (\hat{i} + \hat{j} - \hat{k}) = 0$$

$$5 + \lambda + \lambda - 6 - 5 + \lambda = 0$$

$$\lambda = 2$$

$$|\overrightarrow{AP}| = \sqrt{49 + 16 + 9}$$

$$\boxed{|\overrightarrow{AP}| = \sqrt{74}}$$

Q-17

$$\frac{dy}{dx} = \frac{\tan x + y}{\sin x(\sec x - \sin x \tan x)}$$

$$\frac{dy}{dx} = \frac{\sin x + y\cos x}{\sin x \cos x\left(\frac{1}{\cos x} - \frac{\sin^2 x}{\cos x}\right)}$$

$$\frac{dy}{dx} = \frac{\sin x + y\cos x}{\sin x(1-\sin^2 x)}$$

$$\frac{dy}{dx} = \sec^2 x + y(2\operatorname{cosec} 2x)$$

$$\frac{dy}{dx} + (-2\operatorname{cosec} 2x)y = \sec^2 x$$

Compare with $\frac{dy}{dx} + P(x)y = Q(x)$

$$\text{I.F} = e^{\int p(x)dx} = e^{\int -2\operatorname{cosec} 2x dx}$$

Put $2x = t$

$$dx = \frac{dt}{2}$$

$$= e^{-\int 2\operatorname{cosec} t \frac{dt}{2}} = e^{-\int \operatorname{cosec} t dt} = e^{-\ln\left|\tan\frac{t}{2}\right|}$$

$$= e^{-\ln|\tan x|} = \frac{1}{|\tan x|}$$

Required solution $y(IF) = \int Q(IF)dx + c$

$$\frac{y}{|\tan x|} = \int \frac{\sec^2 x}{|\tan x|}dx + c$$

$$\frac{y}{|\tan x|} = \ln|\tan x| + c$$

$$y = |\tan x|(\ln|\tan x| + c) \quad \ldots.(1)$$

Put $x = \frac{\pi}{4} \Rightarrow y = 2 \Rightarrow 2 = |1|(\ln|1| + c)$

$c = 2$

put $c = 2$ in equation (1)

then $y = |\tan x|(\ln|\tan x| + 2)$

$\boxed{\text{Now } y\left(\frac{\pi}{3}\right) = \sqrt{3}(\ln\sqrt{3} + 2)}$

Q-18

18.

$$D=\begin{vmatrix}1 & -2 & 1\\ 2 & \alpha & 3\\ 3 & -1 & \beta\end{vmatrix}$$

$=1(\alpha\beta+3)+2(2\beta-9)+1(-2-3\alpha)$

$=\alpha\beta+3+4\beta-18-2-3$

For infinite solutions $\mathbf{D}=0, \mathbf{D}_1=0, \mathbf{D}_2=0$ and $\mathbf{D}_3=0$

$\mathbf{D}=0$

$\alpha\beta-3\alpha+4\beta=17$

$$\mathbf{D}_1=\begin{vmatrix}-4 & -2 & 1\\ 5 & \alpha & 3\\ 3 & -1 & \beta\end{vmatrix}=0$$

$$\mathbf{D}_2=\begin{vmatrix}1 & -4 & 1\\ 2 & 5 & 3\\ 3 & 3 & \beta\end{vmatrix}=0$$

$\Rightarrow 1(5\beta-9)+4(2\beta-9)+1(6-15)=0$

$13\beta-9-36-9=0$

$13\beta=54, \beta=\frac{54}{13}$

Put in (1)

$\frac{54}{13}\alpha-3\alpha+4\left(\frac{54}{13}\right)=17$

$54\alpha-39\alpha+216=221$

$15\alpha=5$

$\alpha=\frac{1}{3}$

Now, $12\alpha+13\beta=12\cdot\frac{1}{3}+13\cdot\frac{54}{13}$

$=4+54$

$\boxed{=58}$

19.

$\frac{x^2}{9}+\frac{y^2}{25}=1$

$\mathbf{a=3,\ b=5}$

$\mathbf{e}=\sqrt{1-\frac{9}{25}}=\frac{4}{5}$

$\therefore$ foci $=(0,\pm be)=(0,\pm 4)$

$\therefore e_H=\frac{4}{5}\times\frac{15}{8}=\frac{3}{2}$

Let equation hyperbola

$\frac{x^2}{A^2}-\frac{y^2}{B^2}=-1$

$\therefore B\cdot e_H=4 \quad \therefore B=\frac{8}{3}$

$\therefore A^2=B^2\left(e_H^2-1\right)$

$=\frac{64}{9}\left(\frac{9}{4}-1\right)$

$\therefore A^2=\frac{80}{9}$

$\therefore \frac{x^2}{\frac{80}{9}}-\frac{y^2}{\frac{64}{9}}=-1$

Directrix: $y=\pm\frac{B}{e_H}=\pm\frac{16}{9}$

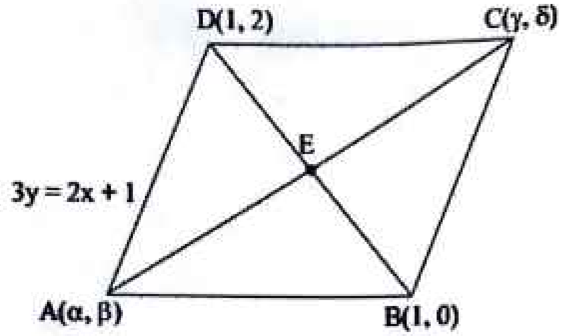
$\mathbf{PS=e\cdot PM}$

$=\frac{3}{2}\left|\frac{14}{3}\cdot\sqrt{\frac{2}{5}}-\frac{16}{9}\right|$

$\boxed{=7\sqrt{\frac{2}{5}}-\frac{8}{3}}$

20.

E is mid point at both diagonal



$$\left(\frac{\alpha+\gamma}{2}, \frac{\beta+\delta}{2}\right) = (1,1)$$

$\alpha + \gamma = 2 \quad .....(i)$

$\beta + \delta = 2 \quad ....(ii)$

$\alpha + \beta + \gamma + \delta = 4$

$$\boxed{2(\alpha + \beta + \gamma + \delta) = 8}$$

21.

$\frac{x}{1} = \frac{y}{1} = \frac{z-1}{0} = r \rightarrow Q(r, r, 1)$

$\frac{x}{1} = \frac{y}{-1} = \frac{z+1}{0} = k \rightarrow R(k, -k, -1)$

$\overline{PQ} = (a - r)\hat{i} + (a - r)\hat{j} + (a - 1)\hat{k}$

$a = r + a - r = 0$

$2a = 2r \rightarrow a = r$

$\overrightarrow{PR} = (a - k)i + (a + k)\hat{j} + (a + 1)\hat{k}$

$a - k - a - k = 0 \Rightarrow k = 0$

As, $PQ \perp PR$

$(a - r)(a - k) + (a - r)(a + k) + (a - 1)(a + 1) = 0$

$a = 1 \text{ or } -1$

$\boxed{12a^2 = 12}$

22.

$$f(x) = \int_{-1}^{x} \left(\left(e^t - 1\right)^{11} (2t - 1)^5 (t - 2)^7 (t - 3)^{12} (2t - 10)^{61} \right) dt$$

Using Lebnitz

$$f'(x) = \left(e^x - 1\right)^{11} (2x - 1)^5 (x - 2)^7 (x - 3)^{12} (2x - 10)^{61}$$

Point of maxima at $\mathbf{x = 0, 2}$

Point of minima at $\mathbf{x = \frac{1}{2}, 5}$

$\mathbf{p = 0^2 + 2^2 = 4}$

$\mathbf{q = \frac{1}{2} + 5 = \frac{11}{2}}$

$\boxed{\mathbf{p^2 + 2q = 16 + 11 = 27}}$

Q-27

$\because f(x) = \frac{4^x}{4^x+2}$

$f(1-x) = \frac{4^{1-x}}{4^{1-x}+2}$

$f(x) + f(1-x) = 1$

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

$$M = \int_{f(a)}^{f(1-a)} x \sin^4(x(1-x))dx$$

$M = \frac{1}{2} \int_{f(a)}^{f(1-a)} \sin^4(x(1-x))dx$ (Using elimination of x)

$M = \frac{N}{2} \Rightarrow 2M = N$

$\alpha M = \beta N$

$\alpha = 2 \ \& \ \beta = 1$

$\boxed{\alpha^2 + \beta^2 = 4 + 1 = 5}$

Q.24

$$\text{Foci} = (\pm 5, 0), \frac{2b^2}{a} = \sqrt{50}$$

$$ae = 5, \quad b^2 = \frac{5\sqrt{2}a}{2}$$

$$\because b^2 = a^2\left(1 - e^2\right) = \frac{5\sqrt{2}a}{2}$$

$$a\left(1 - e^2\right) = \frac{5\sqrt{2}}{2}$$

$$\frac{5}{e}\left(1 - e^2\right) = \frac{5\sqrt{2}}{2}$$

$$\sqrt{2} - \sqrt{2}e^2 = e$$

$$\sqrt{2}e^2 + e - \sqrt{2} = 0$$

$$(e + \sqrt{2})(\sqrt{2}e - 1) = 0$$

$$e = -\sqrt{2}, \frac{1}{\sqrt{2}},$$

$$e = -\sqrt{2} \text{ (Rejected)}$$

$$\text{Hyperbola } \frac{x^2}{b^2} - \frac{y^2}{a^2b^2} = 1$$

$$a = 5\sqrt{2}, b = 5$$

$$\boxed{(e_H)^2 = 1 + \frac{a^2b^2}{b^2} = 1 + a^2 = 51}$$

Q.24

$$\text{Foci} = (\pm 5, 0), \frac{2b^2}{a} = \sqrt{50}$$

$$ae = 5, \quad b^2 = \frac{5\sqrt{2}a}{2}$$

$$\because b^2 = a^2\left(1 - e^2\right) = \frac{5\sqrt{2}a}{2}$$

$$a\left(1 - e^2\right) = \frac{5\sqrt{2}}{2}$$

$$\frac{5}{e}\left(1 - e^2\right) = \frac{5\sqrt{2}}{2}$$

$$\sqrt{2} - \sqrt{2}e^2 = e$$

$$\sqrt{2}e^2 + e - \sqrt{2} = 0$$

$$(e + \sqrt{2})(\sqrt{2}\text{e} - 1) = 0$$

$$e = -\sqrt{2}, \frac{1}{\sqrt{2}},$$

$$\text{e} = -\sqrt{2} \text{ (Rejected)}$$

$$\text{Hyperbola } \frac{x^2}{b^2} - \frac{y^2}{a^2b^2} = 1$$

$$a = 5\sqrt{2}, b = 5$$

$$\boxed{(e_H)^2 = 1 + \frac{a^2b^2}{b^2} = 1 + a^2 = 51}$$

Q.25

A = {1, 2, 3, 4}

R = {(1, 2) (2, 3) (1, 4)}

For equivalence relation, relation must be reflexive, symmetric & transitive

R = {(1, 1) (2, 2) (3, 3)(4, 4) (1, 2) (2,1) (2,3)

(3, 2) (1, 4) (4, 1) (1, 3) (3, 1) (2, 4) (4, 2) (4, 3) (3, 4)}

All elements are included

$\boxed{\therefore \text{Answer is 16.}}$

Q. 26

We have III, TT, D, S, R, B, U, O, N

Number of words with selection (a, a, a, b)

$$= {}^{8}C_1 \times \frac{4!}{3!} = 32$$

Number of words with selection (a, a, b, b)

$$= \frac{4!}{2!2!} = 6$$

Number of words with selection (a, a, b, c)

$$= {}^{2}C_1 \times {}^{8}C_2 \times \frac{4!}{2!} = 672$$

Number of words with selection (a, b, c, d)

$$= {}^{9}C_4 \times 4! = 3024$$

$$\boxed{\therefore \text{Total} = 3024 + 672 + 6 + 32 = 3734}$$

Q-27

$(\sqrt{2})^x = 2^x \Rightarrow x = 0 \Rightarrow \alpha = 1$

$z = \frac{\pi}{4}(1+i)^4\left[\frac{\sqrt{\pi}-\pi i-i-\sqrt{\pi}}{\pi+1} + \frac{\sqrt{\pi}-i-\pi i-\sqrt{\pi}}{1+\pi}\right]$

$= -\frac{\pi i}{2}\left(1 + 4i + 6i^2 + 4i^3 + 1\right)$

$= 2\pi i$

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

Distance from $(1, 4)$ to $4x - 3y = 7$

Will be $\frac{15}{5} = 3$

Q.28

$$\vec{b} \cdot \vec{c} = (2\vec{a} \times \vec{b}) \cdot \vec{b} - 3|b|^2$$

$$|\mathrm{b}||\mathrm{c}| \cos \alpha = -3|\ \mathrm{b}|^2$$

$$|c| \cos \alpha = -12, \text{ as } |b| = 4$$

$$\vec{a} \cdot \vec{b} = 2$$

$$\cos \theta = \frac{1}{2} \Rightarrow \theta = \frac{\pi}{3}$$

$$|c|^2 = |(2\vec{a} \times \vec{b}) - 3\vec{b}|^2$$

$$= 64 \times \frac{3}{4} + 144 = 192$$

$$|c|^2 \cos^2 \alpha = 144$$

$$192 \cos^2 \alpha = 144$$

$$\boxed{192 \sin^2 \alpha = 48}$$

Q.24

$$(1+x)\left(1-x^2\right)\left(1+\frac{3}{x}+\frac{3}{x^2}+\frac{1}{x^3}\right)^5$$

$$=(1+x)\left(1-x^2\right)\left(\left(1+\frac{1}{x}\right)^3\right)^5$$

$$=\frac{(1+x)^2(1-x)(1+x)^{15}}{x^{15}}$$

$$=\frac{(1+x)^{17}-x(1+x)^{17}}{x^{15}}$$

$\text{coeff}\left(x^3\right)$ in the expansion $\approx \text{coeff}\left(x^{18}\right)$ in $(1+x)^{17}-x(1+x)^{17}$

$$=0-1$$

$$=-1$$

$\text{coeff}\left(x^{-13}\right)$ in the expansion $\approx \text{coeff}\left(x^2\right)$ in $(1+x)^{17}-x(1+x)^{17}$

$$=\binom{17}{2}-\binom{17}{1}$$

$$=17\times 8-17$$

$$=17\times 7$$

$$=119$$

$$\boxed{\text{Hence Answer}=119-1=118}$$

Q-30

$$I=\int_0^{\frac{\pi}{2}} \sin 2x\cdot(\cos x)^{\frac{11}{2}}\left(1+(\cos x)^{\frac{5}{2}}\right)^{\frac{1}{2}}dx$$

Put $\cos x=t^2 \Rightarrow \sin x dx=-2tdt$

$$\therefore I=4\int_0^1 t^2\cdot t^{11}\sqrt{(1+t^5)}(t)dt$$

$$I=4\int_0^1 t^{14}\sqrt{1+t^5}dt$$

Put $1+t^5=k^2$

$\Rightarrow 5t^4dt=2kdk$

$$\therefore I=4\cdot\int_1^{\sqrt{2}}\left(k^2-1\right)^2\cdot k\frac{2k}{5}dk$$

$$I=\frac{8}{5}\int_1^{\sqrt{2}} k^6-2k^4+k^2dk$$

$$I=\frac{8}{5}\left[\frac{k^7}{7}-\frac{2k^5}{5}+\frac{k^3}{3}\right]_1^{\sqrt{2}}$$

$$I=\frac{8}{5}\left[\frac{8\sqrt{2}}{7}-\frac{8\sqrt{2}}{5}+\frac{2\sqrt{2}}{3}-\frac{1}{7}+\frac{2}{5}-\frac{1}{3}\right]$$

$$I=\frac{8}{5}\left[\frac{22\sqrt{2}}{105}-\frac{8}{105}\right]$$

$$\boxed{\therefore 525\cdot I=176\sqrt{2}-64}$$

JEE - Main solution

Physics Date - 31/01/24 Shift-I

Ans-31

$$\mu = \frac{\sin\left(\frac{A+\delta m}{2}\right)}{\sin\frac{A}{2}}$$

$$\cot A/2 = \frac{\sin\left(\frac{A+\delta m}{2}\right)}{\sin A/2}$$

$$\frac{\cos\frac{A}{2}}{\cancel{\sin A/2}} = \frac{\sin\left(\frac{A+\delta m}{2}\right)}{\cancel{\sin\frac{A}{2}}}$$

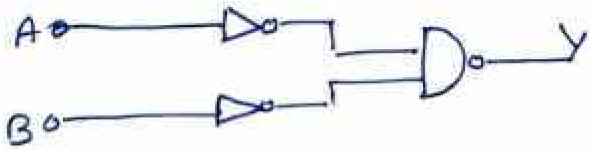
$$\cos\frac{A}{2} = \sin\left(\frac{A+\delta m}{2}\right)$$

$$\frac{A+\delta m}{2} = \frac{\pi}{2} - \frac{A}{2}$$

$$\boxed{\delta m = \pi - 2A}$$

option (3) is correct

Ans-32



A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

This is the truth table of OR gate

option (2) is Correct

$\boxed{\text{Ans-33}}$

$$t = \alpha x^2 + \beta x$$

$$1 = 2\alpha x \frac{dx}{dt} + \beta \frac{dx}{dt} \qquad \left(\frac{dx}{dt} = v\right)$$

$$v = \frac{1}{(2\alpha x + \beta)}$$

$$\frac{dv}{dt} = \frac{(2\alpha x + \beta) \times 0 - (2\alpha \cdot v)}{(2\alpha x + \beta)^2}$$

$$a = -\frac{2\alpha \cdot v}{\frac{1}{v^2}} = -2\alpha v^3$$

$$\boxed{a = -2\alpha v^3}$$

$\boxed{\text{option (4) is correct}}$

$\boxed{\text{Ans-34}}$

$$\frac{\Delta l}{l} \times 100 = 0.1\ \%$$

$$\frac{\Delta d}{d} = 0.1\ \%$$

$$R = \rho \frac{l}{A} = \frac{\rho\ l}{\frac{\pi}{4} d^2}$$

$$\frac{\Delta R}{R} \times 100 = \frac{\Delta l}{l} \times 100 + 2 \frac{\Delta d}{d} \times 100$$

% error in resistance $= 0.1 + 2 \times 0.1$

$= 0.3\ \%$

$\boxed{\text{option (2) is correct}}$

$\boxed{\text{Ans - 35}}$ $R_t = R + \alpha R \Delta T$ $R_1 = R_2 = R$

$R_{eq} = R_1 + R_2$ $R_{eq_t} = R_{1_t} + R_{2_t}$

$= 2R$ $R_{eq} + R_{eq} \alpha_{eq} \Delta T$

$= R_1 + \alpha_1 R \Delta T$

$+ R + \alpha_2 R \Delta T$

$R_{eq} \alpha_{eq} = \alpha_1 R + \alpha_2 R$

For series $\boxed{\alpha_{eq} = \frac{\alpha_1 + \alpha_2}{2}}$

For parallel $R_{eq} = \frac{R \times R}{R + R} = \frac{R}{2}$

$(R_{eq} + \alpha R_{eq} \Delta T) = \frac{(R + \alpha_1 \Delta T R)(R + \alpha_2 R \Delta T)}{(R + \alpha_1 \Delta T R) + (R + \alpha_2 \Delta T R)}$

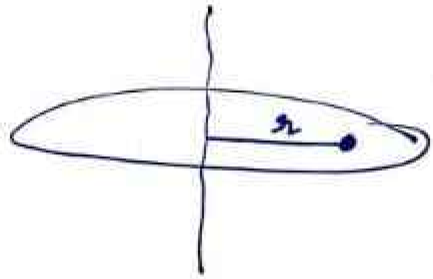
on solving $\boxed{\alpha_{eq} = \frac{\alpha_1 + \alpha_2}{2}}$

| option (2) is correct |

$\boxed{\text{Ans-36}}$ Kinetic energy of molecules of all Gases at same temp. remains same.

| option (2) is Correct |

Ans - 37



Maximum angular velocity of the disc when centrifugal force should be equal to static friction force

$$\cancel{m} r \omega^2 = \mu \cancel{m} g$$

$$\omega^2 = \frac{\mu g}{r}$$

$$\boxed{\omega = \sqrt{\frac{\mu g}{r}}}$$

option (3) is correct

Ans-38

$$|\varepsilon| = N \frac{d\phi}{dt}$$

$$22 = \frac{N (B_1 - B_2) \frac{\pi}{4} d^2}{2}$$

$$\cancel{22} \times 2 = \frac{N (5000 - 3000) \cancel{22} \times 0.02 \times 0.02}{7 \times 4}$$

$$N = \frac{7 \times \cancel{2} \times \cancel{4} \times 10}{\cancel{2000} \times 0.0\cancel{2} \times 0.0\cancel{2}}$$

$$\boxed{N = 70}$$

$\boxed{\text{Ans-39}}$ $\frac{1}{\lambda} = R\left[\frac{1}{1^2} - \frac{1}{n^2}\right]$ Lyman series

For first member $n = 2$

$$\frac{1}{\lambda} = R\left[1 - \frac{1}{4}\right] = \frac{3R}{4}$$

$$\lambda = \frac{4}{3R} \quad -(1)$$

For second member $n = 3$

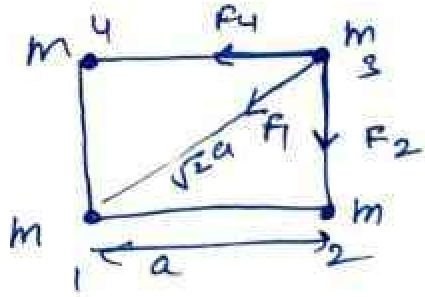
$$\frac{1}{\lambda'} = R\left[1 - \frac{1}{9}\right] = \frac{R \times 8}{9}$$

$$\lambda' = \frac{9}{8R} \quad -(2)$$

(2)/(1) $$\frac{\lambda'}{\lambda} = \frac{\frac{9}{8R}}{\frac{4}{3R}} \qquad \boxed{\lambda' = \frac{27}{32}\lambda}$$

$\boxed{\text{option (2) is Correct}}$

$\boxed{\text{Ans-40}}$ Force on 3 by 1 or 2



$$F_2 = F_4 = \frac{Gm^2}{a^2}$$

$$F_3 = \frac{Gm^2}{2a^2}$$

Net force $= \sqrt{F_2^2 + F_4^2} + F_3 = \sqrt{2}\frac{Gm^2}{a^2} + \frac{Gm^2}{2a^2}$

$$= \frac{Gm^2}{a^2}\left[\sqrt{2} + \frac{1}{2}\right]$$

$$= \frac{Gm^2}{a^2}\left[\frac{2\sqrt{2}+1}{2}\right]$$

compari4

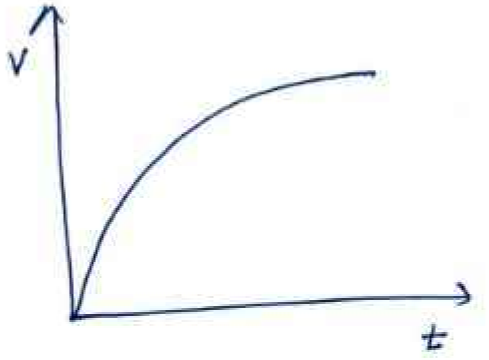
$\cancel{2}a^2 = \overset{16}{\cancel{32}}L^2$

$\boxed{a = 4L}$

$\boxed{\text{Option (2) is correct}}$

$\boxed{\text{Ans - 41}}$ velocity time graph of terminal velocity.

$\boxed{\text{option (2) is correct}}$



$\boxed{\text{Ans - 42}}$

$$F = ax^2 + bt^{\frac{1}{2}}$$

$$[a] = \frac{[F]}{[x^2]}$$

$$[b] = \frac{[F]}{[t^{\frac{1}{2}}]}$$

$$\left[\frac{b^2}{a}\right] = \frac{\frac{F^2}{t}}{\frac{F}{x^2}} = \frac{F \cdot x^2}{t}$$

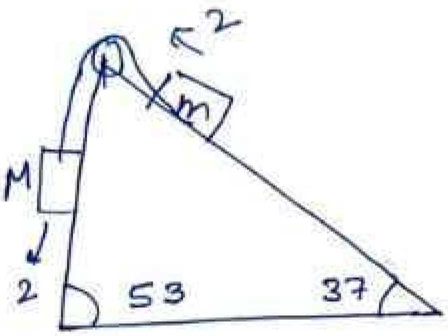
$$= \frac{[MLT^{-2}][L^2]}{[T]}$$

$$= [ML^3T^{-3}]$$

$\boxed{\text{option (1) is correct}}$

$\boxed{\text{Ans- 43}}$

eqn of M



$Mg\sin 53 - T = M \times 2$
$\quad - \mu Mg\cos 53$

$\cancel{10}^{2} \times 10 \times \frac{4}{\cancel{5}} - T = 10 \times 2$
$- \; 0.25 \times \cancel{10}^{2} \times \cancel{10} \times \frac{3}{\cancel{5}}$

$80 - 15 - T = 20$

$T = 80 - 35 = 45\,N$

For m $\quad T - mg\sin 37 - \mu mg\cos 37 = m \times 2$

$45 - mg \times \frac{3}{5} - 0.25\, mg \times \frac{4}{5} = 2m$

$45 - 4m \times \frac{\cancel{10}^{2}}{\cancel{5}} = 2m$

$45 = 10m$

$\boxed{m = 4.5\,kg}$

$\boxed{\text{Option (1) is Correct}}$

$\boxed{\text{Ans- 44}}$ First overtone or second harmonic frequency in ~~closed~~ open organ pipe

$f = \frac{V}{L}$

For closed organ pipe fundamental frequency $f = \frac{V}{4L'}$ $\quad 4L' = L$

$L' = \frac{L}{4} = \frac{60}{4} = 15\,cm$

$\boxed{\text{Option (2) is Correct}}$

$\boxed{\text{Ans-45}}$

$$eV_0 = \frac{hc}{\lambda} - \frac{hc}{\lambda_0}$$

$$e \times 8 = \frac{hc}{\lambda} - \frac{hc}{\lambda_0} \quad \text{— ①}$$

$$e \times 2 = \frac{hc}{3\lambda} - \frac{hc}{\lambda_0} \quad \text{— ②}$$

①/②

$$\frac{4}{1} = \frac{\frac{\cancel{hc}}{\lambda} - \frac{\cancel{hc}}{\lambda_0}}{\frac{\cancel{hc}}{3\lambda} - \frac{\cancel{hc}}{\lambda_0}}$$

$$\frac{4}{3\lambda} - \frac{4}{\lambda_0} = \frac{1}{\lambda} - \frac{1}{\lambda_0}$$

$$\frac{4}{3\lambda} - \frac{1}{\lambda} = \frac{4}{\lambda_0} - \frac{1}{\lambda_0}$$

$$\frac{4-3}{3\lambda} = \frac{3}{\lambda_0}$$

$\boxed{\lambda_0 = 9\lambda}$ $\boxed{\text{option (1) is correct}}$

$\boxed{\text{Ans-46}}$

$$E_0 = 50 \text{ V/m}$$

$$\varepsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{N-m}^2$$

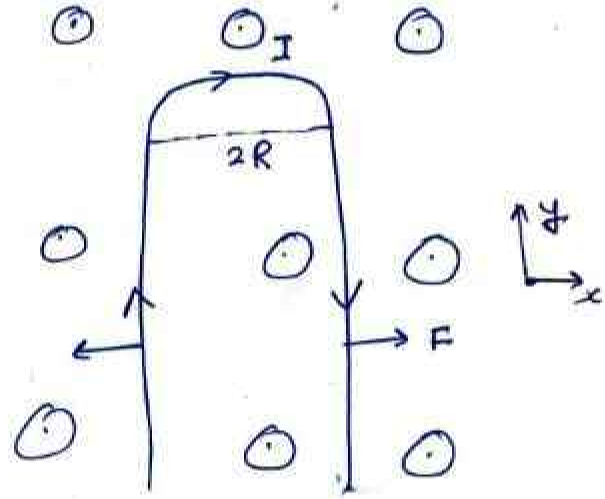
$$\text{Energy density} = \frac{1}{2} \varepsilon_0 E_0^2$$

$$= \frac{1}{2} \times 8.85 \times 10^{-12} \times 50 \times 50$$

$$= 1.106 \times 10^{-8} \text{ J/m}^3$$

$\boxed{\text{option (4) is correct}}$

$\boxed{\text{Ans- 47}}$



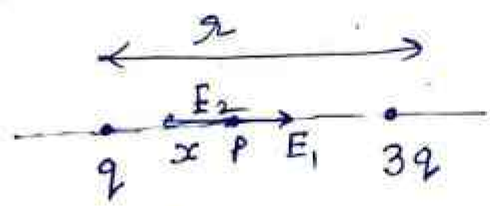
Due to straight segment forces are equal and opposite and cancel each other. For semicircular segment force

$|\vec{F}| = I(2R)B$, It applies in negative y- direction

$$\boxed{\vec{F} = -2IRB\,\hat{j}}$$

$\boxed{\text{option (4) is Correct}}$

$\boxed{\text{Ans - 48}}$



net electric field at P is Zero hence

$E_1 = E_2 \qquad \frac{K.q}{x^2} = \frac{K.3q}{(r-x)^2}$

$3x^2 = (r-x)^2$

$\sqrt{3}x = r - x$

$$\boxed{x = \frac{r}{1+\sqrt{3}}}$$

$\boxed{\text{option (1) is correct}}$

$\boxed{\text{Ans - 49}}$ From law of conservation of momentum

$$M_1 V_1 = M_2 V_2$$

$$V_2 = \frac{M_1 V_1}{M_2}$$

$$(K.E.)_1 = \frac{1}{2} M_1 V_1^2$$

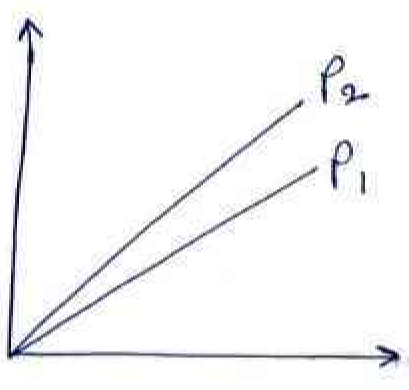
$$(KE)_2 = \frac{1}{2} M_2 V_2^2 = \frac{1}{2} M_2 \left(\frac{M_1^2 V_1^2}{M_2^2} \right)$$

$$= \frac{\frac{1}{2} M_1^2 V_1^2}{M_2}$$

$$\frac{(KE)_1}{(KE)_2} = \frac{\cancel{\frac{1}{2}} \cancel{M_1} \cancel{V_1^2}}{\frac{\cancel{\frac{1}{2}} M_1^{\cancel{2}} \cancel{V_1^2}}{M_2}} = \frac{M_2}{M_1}$$

$\boxed{\text{option (1) is correct}}$

$\boxed{\text{Ans - 50}}$



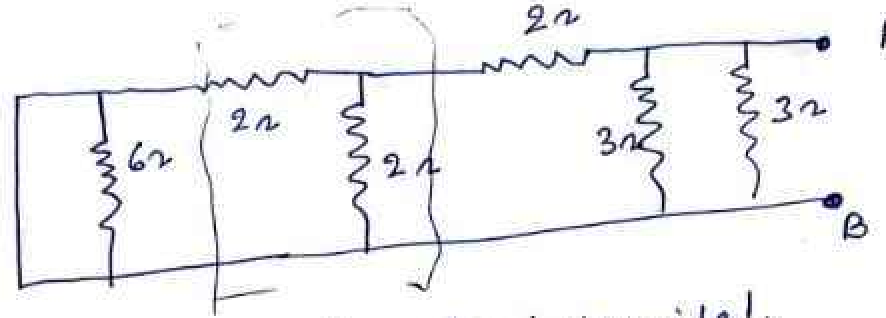
$$PV = nRT$$

$$\boxed{V = \left(\frac{nR}{P} \right) T}$$

Slope is inversely proportional to pressure, Hence $\boxed{P_1 > P_2}$

$\boxed{\text{option (3) is correct}}$

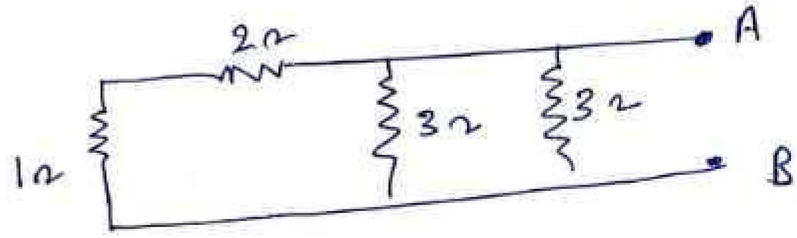
Ans-51



6Ω Resistance is short circuited.

2Ω and 2Ω are in parallel

$R_{eq} = \frac{2\times2}{2+2} = 1\Omega$



all three Ω resistance in parallel

$$\frac{1}{R_{eq}} = \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{3}{3}$$

$\boxed{R_{eq} = 1}$

Ans-52

$$C_1 = \frac{\varepsilon_0 A}{d}$$

$$C_2 = \frac{\varepsilon_0 A}{(d-t) + \frac{t}{K}}$$

$$Q_2 = Q_1 \times 1.25$$

$$\left(\frac{\cancel{\varepsilon_0 A}}{(d-t)+\frac{t}{K}}\right)\cancel{V} = 1.25 \times \frac{\cancel{\varepsilon_0 A}}{d}\cancel{V}$$

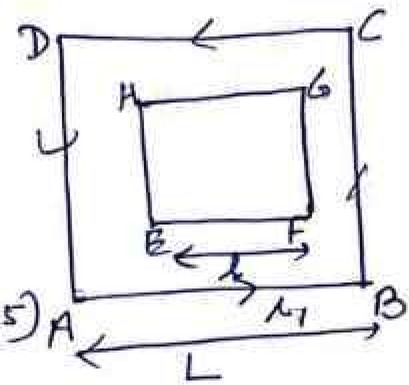
$$(d-t) + \frac{t}{K} = \frac{d}{1.25}$$

$$(5-2) + \frac{2}{K} = \frac{5}{1.25}$$

$$\frac{2}{K} = 4-3$$

$\boxed{K = 2}$

$\boxed{\text{Ans-53}}$ $\boxed{l^2 = L}$



Magnetic field due to larger loop

$$= 4 \times \frac{\mu_0 I}{4\pi \frac{L}{2}} (\sin 45 + \sin 45)$$

$$B = \frac{8\sqrt{2}\, \mu_0 I_1}{4\pi L}$$

Flux of this field through smaller loop

$$\phi_2 = \vec{B}\cdot\vec{A} = \frac{8\sqrt{2}\, \mu_0 I_1}{4\pi L} \times l^2 = \frac{8\sqrt{2}\, \mu_0 I_1}{4\pi}$$

$$\phi_2 = M I_1 \quad \text{on comparing}$$

$$M = 8\sqrt{2}\, \frac{\mu_0}{4\pi} = \sqrt{128} \times 10^{-7}\ \text{H}$$

$$\boxed{x = 128}$$

$\boxed{\text{Ans-54}}$

$$V = W\sqrt{A^2 - x^2} \qquad x = \frac{2A}{3}$$

$$V = W\sqrt{A^2 - \frac{4A^2}{9}} = \frac{\sqrt{5}AW}{3}$$

Now speed increased to three times

$$V' = \frac{\sqrt{5}AW}{3} \times 3 = \sqrt{5}AW$$

For this speed new amplitude

$$V' = \cancel{W}\sqrt{(A')^2 - \frac{4A^2}{9}} = \sqrt{5}A\cancel{W}$$

$$(A')^2 = 5A^2 + \frac{4A^2}{9} = \frac{49A^2}{9} \qquad \boxed{n = 7}$$

$$\boxed{A' = \frac{7A}{3}}$$

$\boxed{\text{Ans-55}}$

Initial K.E of disc

= Translational + Rotation

$= \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$

$= \frac{1}{2}mv^2 + \frac{1}{2}\left[\frac{1}{2}m\cancel{r^2} \times \frac{v^2}{\cancel{r^2}}\right]$

$= \left(\frac{1}{2}+\frac{1}{4}\right)mv^2 = \frac{3}{4}mv^2$

$= \frac{3}{\cancel{4}} \times 5\cancel{0} \times 0.4 \times 0.4$

$= 6\ J$

Work done to stop the disc

= change in KE

$\boxed{\text{Work done} = 6 - 0 = 6\ J}$

$\boxed{\text{Ans- 56}}$

$E = mc^2$

$= 0.4 \times 10^{-3} \times 9 \times 10^{16}$

$= 3.6 \times 10^{13}\ J$

$1\ KWH = 3.6 \times 10^{6}\ J$

F

Energy in KWH

$= \frac{3.6 \times 10^{13}}{3.6 \times 10^{6}} = 1 \times 10^{7}\ KWH$

$\boxed{n = 1}$

$\boxed{\text{Ans - 57}}$ time required for falling height $(H-h) = \sqrt{\dfrac{2(H-h)}{g}}$

Now after Impact vertical velocity is again zero

Time required for falling height $h = \sqrt{\dfrac{2h}{g}}$

total time $= T = \sqrt{\dfrac{2(H-h)}{g}} + \sqrt{\dfrac{2h}{g}}$

for min time $\dfrac{dT}{dh} = 0$

$$\sqrt{2(H-h)} = \sqrt{2h}$$

$$H-h = h$$

$$H = 2h \qquad \boxed{\frac{H}{h} = 2}$$

$$\boxed{Ans = 2}$$

$\boxed{\text{Ans - 58}}$

$$\vec{F} = q(\vec{V} \times \vec{B})$$

$$= e(3\hat{i} + 5\hat{j}) \times (B_0\hat{i} + 2B_0\hat{j})$$

$$= e[6B_0\hat{k} - 5B_0\hat{k}]$$

$$\vec{F} = eB_0\hat{k} \qquad \vec{F} = 5e\hat{k}$$

on comparing

$$\boxed{B_0 = 5}$$

$\boxed{\text{Ans- 59}}$

$I_1 = I$

$I_2 = 9I$

In case of Incoherent source
resultant intensity $i_1 = I_1 + I_2$

$= 10I$

In case of coherent source
and $\phi = 60°$

$i_2 = I + 9I + 2 \cdot 3I \cdot \cos 60$

$= 13I$

$$\frac{i_1}{i_2} = \frac{10I}{13I} = \frac{10}{13}$$

on comparing $\boxed{x = 13}$

$\boxed{\text{Ans- 60}}$

$$|B| = \frac{\Delta P}{\frac{\Delta V}{V}}$$

×

$$9 \times 10^8 = \frac{\rho g h}{\frac{0.02}{100}}$$

$9 \times \cancel{10^8} \times 2 \times 10^{-4} = \cancel{10^3} \times 1.6 \times h$

$\boxed{h = 18\,m}$

NTA - JEE - SOLUTION (31st JAN, 24 SHIFT-1)

A-1 Option - 1 (Adsorption) - ased upon < Rate of Adsorbtion / Solubility in the Solvent.

A 2 Option - 4 (B, D & E)
$$\left[\begin{array}{l} \underline{B} - 2Na_2CrO_4 + 2H^+ \rightarrow Na_2Cr_2O_7 + H_2O + 2Na^+ \\ \underline{D} - 3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O \end{array}\right]$$

A-3 Option - 1
$$\left[\begin{array}{l} \text{Interaction b/w } A\text{-}B < A\text{-}A \\ \qquad\qquad\qquad\quad A\text{-}B < B\text{-}B \\ \Delta H_{mix} > 0,\ \Delta V_{mix} > 0 \end{array}\right]$$

A-4 Correct option-(2) Statement -1 is correct & Statement-II is false

A-5 Correct option-(1)

Glucose —
- $\xrightarrow{Br_2\text{-water}}$ Gluconic Acid
- $\xrightarrow{\text{Conc } HNO_3}$ saccharic Acid
- $\xrightarrow[\Delta]{\text{Red } P^4 / HI}$ n-hexane
- $\xrightarrow{NaHCO_3}$ no reaction

A-6 Correct option (1) The nature of electrode does not affect the eletrolytic conductance

A-7 Correct option (2) Carbocation

A-8 Correct option (4) "B" and "C"

A-9 Correct option (4) both Statements are wrong

A-10 Correct option (1) $\because K_c = \dfrac{[\text{conc. of Product}]}{[\text{conc. of Reactent}]}$

A-11 Correct option (4)

A-12 Correct option (1), i.e; B, C and E

A-13 Correct option (4), Propan-2-ol

A-15 Correct option (2) because electron gain enthalpy includes both sign and magnitude.

A-16 $$\boxed{K = \frac{2.303}{t} \log \frac{P_i}{2P_i - P_t}}$$ w.r.t. Partial Pressure of gas.

A-17 Correct option is (4) Statement 'A' is correct but Reason is false

A-18 Correct option is (3) because SnO_2 and PbO_2 are amphoteric in nature

A-19 Correct option is (4)

A-20 Correct option is (3) Statement "A" & "R". both are correct but 'R" is not the correct Explanation of A

A-21 Total = 4, NH_3, SiO_2, CH_4 and water

A-22

$[Ni(NH_3)_6]^{2+}$

$\rightarrow$ O N of Ni = +2

$\rightarrow$ E.C of Ni^{2+} (26) = $3d^8, 4s^0$

No. of unpairing of electrons = 2

Magnetic moment $\mu = \sqrt{2(2+2)}$ B.M

$= 2\sqrt{2}$ B.M.

$= 2 \times 1.414$ B.M $= 2.828$ B.M

$= \frac{28\,28}{10} = \underline{28.28 \times 10^{-1}}$ B.M.

comparing with $x \times 10^{-1}$ B M,

Now, $\boxed{x = 28.28}$

A

F

$$w = \frac{E_{Cu^{2+}}}{\cancel{F}} \times 2\cancel{F} \Rightarrow w = \frac{64}{\cancel{2}} \times \cancel{2}\ gm$$

$$\boxed{w = 64\ gm}$$

$$w = \frac{64 \times 10}{10} = 640 \times 10^{-1}\ gm$$

on comparing with $x \times 10^{-1}$ gm

$\boxed{x = 640\ gm}$ cu deposits.

A-24

$$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$$

1 mole $\longleftarrow$ 44 gm

0.5 mole $\longleftarrow$ 22 gm

$= 50 \times 10^{-2}$ mole of CH_4

comparing with $x \times 10^{-2}$ then $\boxed{x = 50}$

Ans-25

$$\Delta_r G^\circ = -2.303 RT \log K_P$$

$$= \frac{-2.303 \times 8.314 \times 298 \times \log 2.47 \times 10^{-29}}{1000}$$

$$= \frac{-2.303 \times 8.314 \times 298 (0.392 - 29)}{1000}$$

$$= \frac{+2.303 \times 8.314 \times 298 \times 28.60}{1000}$$

$$\boxed{\Delta_r G^\circ = 163.187\ kJ}$$

A-26 CaF_2 does not give gas on heating with sulphuric acid.

mm of CaF_2 = 40 + 19 × 2 = 78.

A-27 Total no of alkene are formed is 3

A-28 hydrogen in "A" = 4

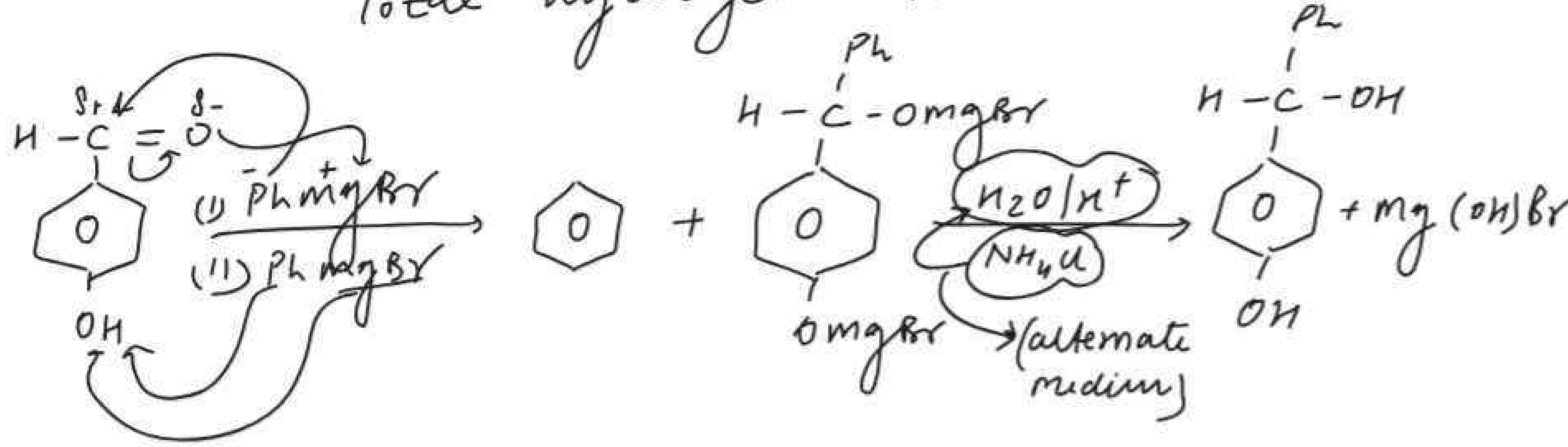
hydrogen in "B" = 6

Total hydrogen = 10

01.

PTO

Total hydrogen = 10

A-29 

Total number of -OH group is 3

A-30

$$E = \frac{hc}{\lambda} = \frac{6.626 \times 10^{-34} \times 3 \times 10^{8}}{242 \times 10^{-9}}$$

$$= 8.21 \times 10^{-19} \text{ Joule}$$

Energy per mole is

$$E_n = 8.21 \times 10^{-19} \times 6.023 \times 10^{23}$$

$$= 494000 \text{ J}$$

$$\boxed{E_n = \frac{494000}{1000} \text{ kJ} = 494 \text{ kJ}}$$