HINTS & SOLUTION

PHYSICS

Q.1 $RP = \dfrac{D}{1.22\delta\lambda}$

Q.2 Transmission range of TV tower $d = \sqrt{2hR}$

If height is increased by 21%, new height

$h' = h + \dfrac{21}{100}h = 1.21h$

Q- 3If d' is the new average range, then $\dfrac{d'}{d} = \sqrt{\dfrac{h'}{h}} =$ 1.1

% increase in range $\dfrac{\Delta d}{d} \times 100\% = \left(\dfrac{d'-d}{d}\right) \times 100\%$

$= \left(\dfrac{d'}{d} - 1\right) \times 100\%$

$= (1 \cdot 1 - 1) \times 100\% = 10\%$

Q.4 Energy of photon

$= \dfrac{hc}{\lambda} = hcR\left(\dfrac{1}{1^2} - \dfrac{1}{5^2}\right) = \dfrac{24hcR}{25}$

Momentum of photon $= \dfrac{E}{c} = \dfrac{24hR}{25}$

= Momentum of atom

Velocity of atom $= \dfrac{24hR}{25m}$ where m = mass of atom.

Q.5 $\phi = (B)(\pi r^2) \Rightarrow e = \dfrac{d\phi}{dt} = (B)(2\pi r)\left(\dfrac{dr}{dt}\right)$

$= (0.025)(2\pi)(2 \times 10^{-2})(10^{-3}) = \pi\mu V$

Q.6 The amplitude, a, at time t is given by

$a = a_0 \exp(-\alpha t)$

$a_{50} = a_0 \exp(-\alpha \times 50T) = 0.80\, a_0$

where T is the period of oscillation

$a_{150} = a_0 \exp(-a \times 150T) = a_0 (0.8)^3 = 0.512\, a_0$

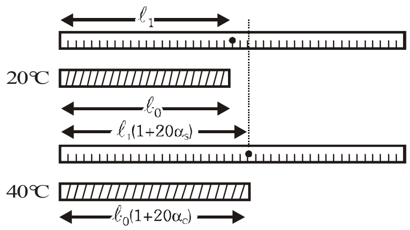
Q.7 On connecting voltmeter equivalent resistance of the circuit decreases.
Therefore current in circuit increases ($I > I_0$)
$\therefore$ Potential drop across ammeter + Potential drop across R = E.M.F. of cell .
In second case due in increases in current through ammeter, potential drop across ammeter increases.
Hence potential drop across R decreases.

Q.8 $\tan\phi_1 = \dfrac{X_L}{R}, \tan\phi_2 = \dfrac{X_C}{R}$

But $\tan\phi_1 = -\tan\phi_2$

so $X_C = X_L$

Q.9



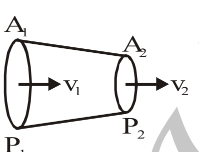
$\ell_0\,(1+20\,\alpha_C) = \ell_1\,(1+20\alpha_S) \Rightarrow \ell_1 = \left(\dfrac{1+20\alpha_C}{1+20\alpha_S}\right)\ell_0$

Q.10 $I = \dfrac{I_0}{2} \times \cos^2 45° = \dfrac{I_0}{4}$

Q.11 dipole short circuits 2Ω.

$$V_1 = \frac{\frac{2}{3}}{\frac{2}{3}+2} \times V = \frac{V}{4}$$

Q.12



Here $\dfrac{v_2}{v_1} = \dfrac{A_1}{A_2} = \dfrac{25}{4}$ ....(i)

Also $P_1 + ½\rho v_1^2 = P_2 + ½\rho v_2^2$ .e. $v_2^2 - v_1^2 = 16 \times 10^{-3}$ ...(ii)

Now, using equation (i) & (ii)

$(6.25v_1)^2 - v_1^2 = 16 \times 10^{-3}$

$\Rightarrow v_1 \approx 0.0205$ m/s

So rate of flow $R = A_1v_1 = A_2v_2$

$= \pi(0.1)^2 \times 0.02 = 6.28 \times 10^{-4}\ m^3/s$

Q.13 Heat liberated by water to attain
0°C = cosθ = $10 \times 1 \times 40 = 400$ cal

Amount of ice melted = $\dfrac{400}{800} = 5$ g

$\therefore$ Total amount of water = 10 + 5 = 15 gm

Q.15 Active fraction at instant t_2, $\dfrac{1}{2^{t_2/T_{1/2}}} = \dfrac{1}{3}$

Active fraction at instant t_1, $\dfrac{1}{2^{t_1/T_{1/2}}} = \dfrac{2}{3}$

$\Rightarrow \dfrac{2^{t_2/T_{1/2}}}{2^{t_1/T_{1/2}}} = 2 \Rightarrow 2^{\frac{t_2-t_1}{T_{1/2}}} = 2^1$

$\Rightarrow t_2 - t_1 = T_{1/2} = 50$ days

Q.16 Let velocity of car = v

$n' = n\left[\dfrac{v}{v-v_S}\right]$ ...(i)

$n'' = n'\left[\dfrac{v+v_S}{v}\right]$ ...(ii)

from (i) & (ii) $n'' = n\left[\dfrac{v+v_S}{v-v_S}\right]$

Now $\dfrac{n''}{n} = 2 \Rightarrow \left(\dfrac{v+v_S}{v-v_S}\right) = 2$

$\Rightarrow v + v_S = 2v - 2v_S \Rightarrow 3v_S = v \Rightarrow v_S = \dfrac{v}{3}$

Q.17 Above curie temperature, ferromagnetic material behaves as paramegnetic material.

Q.18 In equilibrium $dVg = d_2\left(\dfrac{V}{2}\right)g + d_1\left(\dfrac{V}{2}\right)g$

In displaced condition

$$F = -\left[d_2\left(\frac{a}{2}+x\right)Ag + d_1\left(\frac{a}{2}-x\right)Ag\right] - dVg$$

$$= -(d_2 - d_1)gAx \Rightarrow F \propto -x$$

Q.19 Black bulb absorbs more heat in comparison with painted bulb. so air in black bulb expands more. Hence the level of alcohol in limb X falls while that in limb Y rises.

Q.20 From Kepler's law $T \propto r^{3/2}$;

$$T_2 = T_1\left(\frac{r_2}{r_1}\right)^{3/2} = (24\text{ hrs})\left(\frac{3R}{6R}\right)^{3/2}$$

$$= \frac{24\text{ hrs}}{2\sqrt{2}} = \frac{24\text{ hrs}}{2\sqrt{2}} = 6\sqrt{2}\text{ hrs}$$

Q.21 Work done = $U_f - U_i = (-\vec{p}.\vec{E})_f - (-\vec{p}.\vec{E})_i$

$= -\left(-16\times10^{-27}\right) - \left(-12\times10^{-27}\right)$

$= 2.8\times10^{-26}$ J

Q.22 $A_r = \left(\frac{v_1 - v_2}{v_1 + v_2}\right)A_i$; $v_2 = \frac{v_1}{2}$

$\therefore$ energy reflected $= \frac{1}{9}\times$ energy incident

Q.23 $P = \frac{P_0}{1+\left(\frac{V}{V_0}\right)^3} = \frac{P_0}{2} \Rightarrow T = \frac{P_0V_0}{2R}$

$\therefore$ Translational kinetic energy is equal to

$\frac{3}{2}RT = \frac{3R}{2}\frac{P_0V_0}{2R} = \frac{3P_0V_0}{4}$

Q.24 $Y = \frac{F/A}{\Delta\ell/\ell} = \frac{W\ell}{A\Delta\ell} \Rightarrow \frac{W}{\Delta\ell} = \frac{YA}{\ell} =$ slope

$\Rightarrow Y = \frac{\ell}{A}(\text{slope}) = \frac{1}{10^{-6}}\left(\frac{40-20}{(2-1)\times10^{-3}}\right)$

$= 2\times10^{10}\,\text{Nm}^{-2}$

Q.25 Impulse = Change in momentum

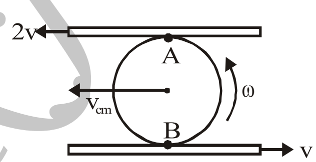
$= 1(4\hat{i}+\hat{j}) - 1(6\hat{i}+\hat{j}) = -2\hat{i}$

Which is perpendicular to the wall.

Component of initial velocity along $\hat{i} = 6\hat{i}$

$\Rightarrow$ Speed of approach = 6 m/s and speed of seperation = 4 m/s Therefore $e = \frac{4}{6} = \frac{2}{3}$

Q.26 Let angular velocity and linear velocity of centre of mass of disc



be ω and v_{cm} then $v_{cm} + \omega R = 2v$ and

$\omega R - v_{cm} = v \Rightarrow 2\omega R = 3v \Rightarrow \omega = \frac{3v}{2R}$

Q.27 (1)

Q.28 (1)

Q.30 Velocity of ball w.r.t. balloon = v + u; Time of flight $= \frac{2(u+v)}{g}$

CHEMISTRY

Q.31 $\frac{r_{H_2}}{r_{O_2}} = \sqrt{\frac{M_{av.}}{M_{H_2}}}$

$$\frac{1}{t_{H_2}} / \frac{1}{t_{mix.}} = \sqrt{\frac{M_{av.}}{2}}$$

$$\frac{246}{60} = \sqrt{\frac{M_{av.}}{2}}$$

$$\left(\frac{246}{60}\right)^2 = \frac{M_{mix.}}{2}$$

$$M_{mix.} = \frac{246 \times 246 \times 2}{60 \times 60} = 33.62$$

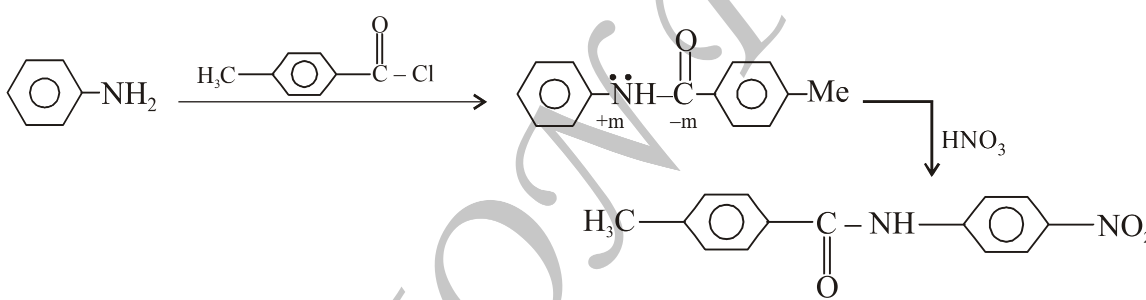
$100 \times 33.62 = x \times 32 + (100 - x)\, 48$

$x = 89.87\%$

Q.32 Mn exhibits the largest number of oxidation states because it has electronic configuration ($Ar = 3d^5\, 4s^2$)

Maximum oxidation state of Mn is +7

Q.33



Q.34 $2\,A(g) \longrightarrow 3B(g) + 2C\,(g)$

$1 - \alpha \qquad \frac{3\alpha}{2} \qquad \alpha \qquad n_{total}$

$$= (1 - \alpha) + \frac{3\alpha}{2} + \alpha$$

$$= 1 + \frac{3\alpha}{2} = 1 + 3 \times \frac{0.4}{2} = 1.6$$

$PV = nRT$

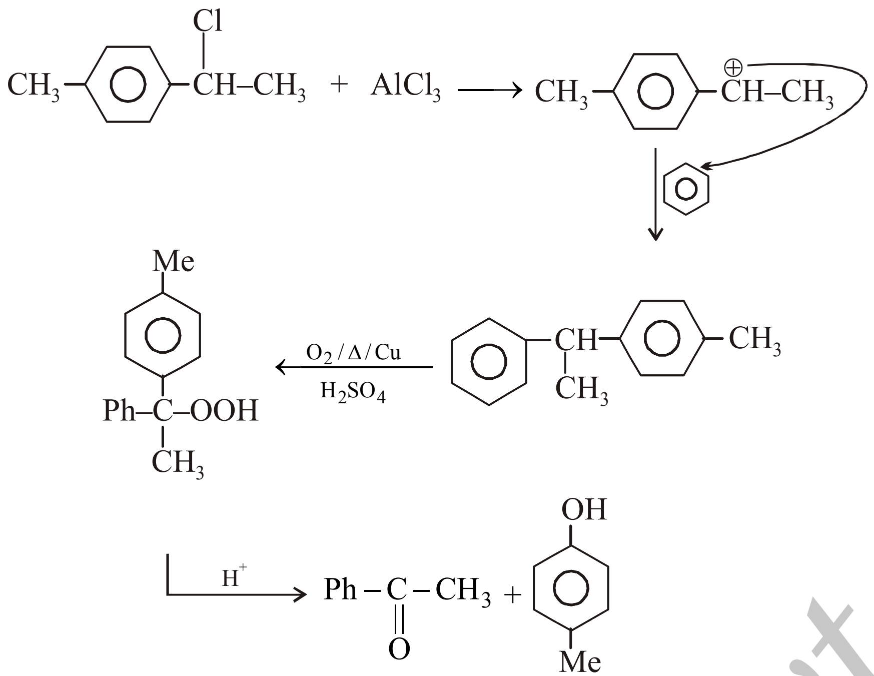
$$\frac{P}{T} = \frac{nR}{V} = \frac{1.6 \times 0.08}{0.16} = 0.8$$

Q.35 Oxidation number $\alpha \frac{1}{\text{Basic nature}}$

$$V_2O_5 < V_2O_4 < V_2O_3$$

$\xrightarrow{\hspace{3cm}}$ Basic nature

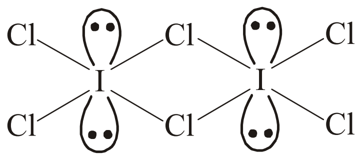
Q.36



Q.37 $eV = \frac{hC}{\lambda} \Rightarrow e \times V = \frac{1240}{310} eV$

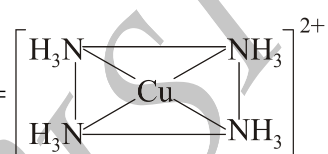
$\Rightarrow e \times V = 4eV \Rightarrow V = 4$ volts

Q.38 I_2Cl_6 =



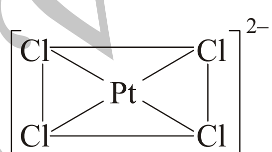
Planar

$[Cu(NH_3)_4]^{2+}$ =



Planar

$[PtCl_4]^{2-}$ =



Planar

Q.39 In osazone formation only C_1 and C_2 carbon react remaining carbon configuration will be same.

Q.41 Microcosmic salt $(Na(NH_4)\,HPO_4.4H_2O)$ is used for bead test.

Q.42 $CH_3-\underset{\underset{O}{\|}}{C}-H + CH_3-CH_2-CH_2-\underset{\underset{O}{\|}}{C}-H \xrightarrow{OH^-}$

Product possible : (i) $CH_3-CH(OH)-CH_2-C(=O)-H$

(ii) $CH_3-CH_2-CH_2-CH(OH)-CH(Et)-C(=O)-H$

(iii) $CH_3-CH_2-CH_2-CH(OH)-CH_2-C(=O)-H$

(iv) $CH_3-CH(OH)-CH(Et)-CHO$

Q.43 $W_{O_2} = 64$ gm $n_{O_2} = 2$

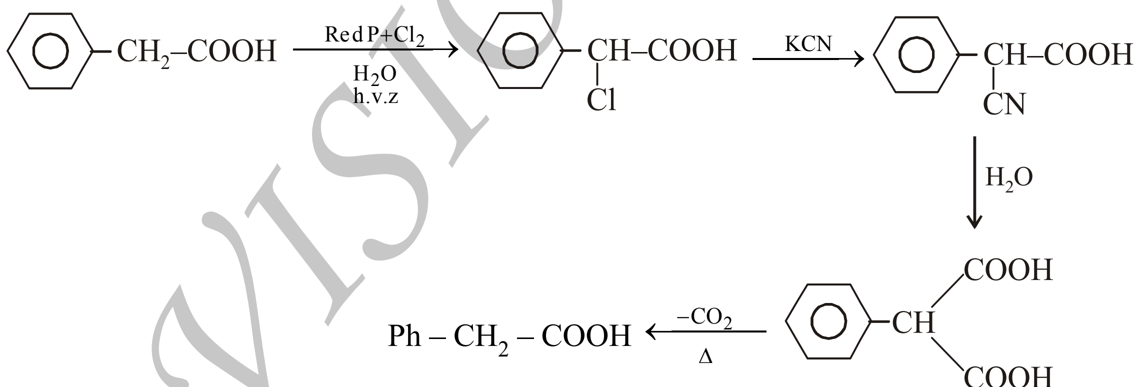
$W_{H_2} = 16$ gm $n_{H_2} = 8$

$P_{O_2} = \frac{2}{10} \times 50 = 10$ atm

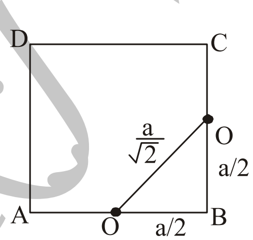
$P_{H_2} = \frac{8}{10} \times 50 = 40$ atm

Q.44 $AlCl_3$, $SnCl_4$, $TiCl_4$ = Fumes in moist air

Q.45



Q.46 $\frac{a}{\sqrt{2}}$



Q.47 $I_2O_5 + 5CO\ (X) \longrightarrow I_2$ Violet (Y) $+ 5CO_2\uparrow$

$2Na_2S_2O_3\ I_2 \longrightarrow \underbrace{2NaI + Na_2S_4O_6}_{\text{Colourless}}$

Q.49 $\lambda_m = \dfrac{K}{M \times 1000} = \dfrac{0.2}{0.2 \times 1000} = 10^{-3}\ S\ m^2\ mol^{-1}$

$K = \dfrac{1}{R} \times \dfrac{l}{A}$

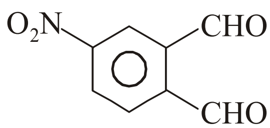
$0.14 \times 250 = \dfrac{l}{A}$

for 0.2 M solution

$K = \dfrac{1}{175} \times 250 \times 0.14 = 0.2$

Q.50 Concentrated HCl does not dissolve boron. Because concentrated HCl is a reducing agent.

Q.51 Cannizaro reaction



Due to $-NO_2$, electron density is less on para position so addition of OH^- takes place.

Q.52
$Fe^{3+} + 1e^- \rightarrow Fe^{2+}$ $E^0 = 0.76V$
$Fe^{2+} + 2e^- \rightarrow Fe(s)$ $E^0 = -0.44V$

$Fe^{3+} + 3e^- \rightarrow Fe(s)$ $3E = 0.76 - 2 \times 0.44V$

$E = \dfrac{0.76 - 0.88}{3} = -0.04V$

$E = E^o_{Sn/Sn^{+2}} + E^o_{Fe^{3+}/Fe}$
$= 0.14 + (-0.04) = 0.1\ V$

Q.53 In GeH_4, Ge–H bond is non-polar.

Q.54 $CHCl_3 \xrightarrow{OH^- / H_2O} {}^{\ominus}C(Cl)_3 \longrightarrow \ddot{C}Cl_2 \xrightarrow{OH^-} H-\underset{\underset{O}{\parallel}}{C}-O^-$

Q.55

	A(g) ⟶	2B(g) +	C(s)
t = 0	400	0	0
t = t	(400 - P')	2p'	0

Since the reaction is of first order

$k = \dfrac{2.303}{t} \log \dfrac{400}{(400 - p')}$

$\dfrac{0.6932}{24} = \dfrac{2.303}{48} \log \dfrac{400}{(400 - p')}$

On solving p'= 300

After 48 minimum the pressure of the reaction vessel is $(400 + p') = 700$ mm Hg.

Q.56 $FeCl_3 + K_3[Fe(CN)_6] \longrightarrow Fe[Fe(CN)_6] + 3KCl$

$FeCl_3 + K_3[Fe(CN)_6]$

↓

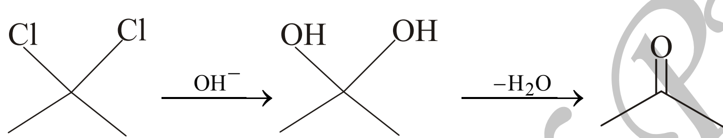
$Fe[Fe(CN)_6]$
Brown precipitate

$\xrightarrow{Sn^{2+}}$ (X) $Fe_4[Fe(CN)_6]_3$ Blue $+Sn^{4+}$

$\xrightarrow{H_2O_2}$ (Y) $Fe_4[Fe(CN)_6]_3$ Blue $+ H_2O + O_2\uparrow$

Q.57 (2) $H_3C{-}C{\equiv}N \xrightarrow{(i)MeMgX} CH_3-\underset{}{\overset{Me}{C}}=\overset{\square}{N}MgX \xrightarrow{(ii)H^+/H_2O} CH_3-\overset{CH_3}{C}=O$

(3) $H_3C-\underset{\underset{O}{\|}}{C}-Cl \xrightarrow{(CH_3)_2Cd} CH_3-\underset{\underset{O}{\|}}{C}-CH_3$

(4) 

Q.58

	A(g) + 2B(g)	⇌	2C(g) + D(g)
	A(g)	2B(g)	2C(g)	D(g)

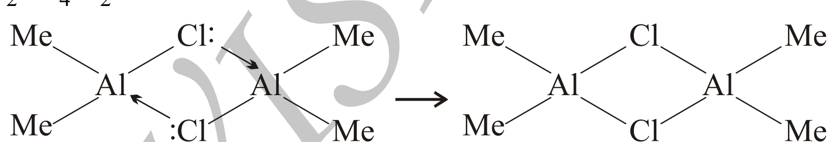
$A(g) + 2B(g) \rightleftharpoons 2C(g) + D(g)$

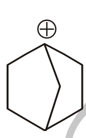
	A	B	C	D
Initial conc.	x	1.5x	0	0
At equilibrium	x – y	1.5x – 2y	2y	y

Given: $x - y = 1.5x - 2y$; $y = 0.5x$. Thus, [A] = 0.5x [B] = 0.5x [C] = x [D] = 0.5x

$$K_c = K_p = \frac{(x^2)(0.5x)}{(0.5x)(0.5x)^2} = 4.$$

Q.59 $Al_2Me_4Cl_2$ form 3 center – 4 electrons.



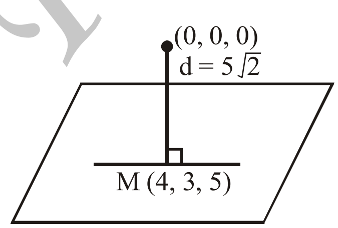
Q.60  is highly unstable.

MATHEMATICS

Q.61 ∴ Equation of plane is

$4(x - 4) + 3(y - 3) + 5(z - 5) = 0$

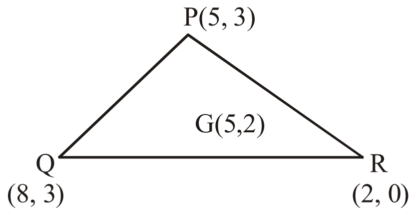
$\Rightarrow \vec{r}\cdot(4\hat{i}+3\hat{j}+5\hat{k}) = 50$



Q.62 $P(A \cup B) = P(A \cap B)$

$\Rightarrow P(A) = P(B) = P(A \cup B) = P(A \cap B)$

Q.63



Q.64 Put $2x = \tan\theta$;

$$I = \frac{1}{2}\int_{0}^{\pi/4} \ell n(1+\tan\theta)\, d\theta$$

$\therefore\ I = \frac{\pi}{16}\ell n2$ (using king property)

Q.65 $M^2 = \mathbf{O}$

$\therefore\ (I + M)^{50} - 50\,M = I$

(Expanding binomially)

Q.66 $f(-1) = f(1) \Rightarrow\ b = -2$ (Using Rolle's theorem)

Also, $f'\left(\frac{1}{2}\right) = 0 \Rightarrow a = \frac{1}{2}$.

$\therefore\ 2a + b = 2\left(\frac{1}{2}\right) + (-2) = -1$

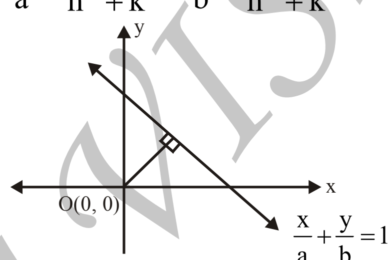
Q.67 $\frac{x}{a} + \frac{y}{b} = 1$ ... (1)

$\therefore$ Equation of line is

$hx + ky = h^2 + k^2$ ... (2)

So, on comparing (1) and (2), we get

$$\frac{1}{a} = \frac{h}{h^2+k^2};\ \frac{1}{b} = \frac{k}{h^2+k^2}$$



As, $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{4}$

$\Rightarrow\ h^2 + k^2 = 4$, which is circle of radius 2.

Q.68 $\Delta = \frac{1}{2}\left(\frac{a}{\cos\theta}\right)\left(\frac{b}{\sin\theta}\right) = \frac{ab}{\sin 2\theta} \geq ab$

$\therefore\ \Delta_{min.} = (4)\,(9) = 36$

Q.69 $G = \sqrt{ab}$;

$$M = \left(\frac{\frac{1}{a}+\frac{1}{b}}{2}\right) \Rightarrow \frac{1}{M} = \left(\frac{2}{\frac{1}{a}+\frac{1}{b}}\right)$$

Now, $\frac{1}{M} \div G = 4 : 5$

$$\Rightarrow \sqrt{\frac{a}{b}} + \sqrt{\frac{b}{a}} = \frac{5}{2}$$

$$\Rightarrow \sqrt{\frac{a}{b}} = \frac{2}{1} \text{ or } \frac{1}{2}$$

$\Rightarrow a : b = 4 : 1$ or $1 : 4$

Q.70 We get

$$\begin{bmatrix} 3x+y \\ -x+3y+2 \end{bmatrix} = \begin{bmatrix} 6 \\ 8 \end{bmatrix}$$

$\Rightarrow 3x + y = -x + 3y$

$\Rightarrow 4x = 2y \Rightarrow 2x = y$

Q.71 Put $1 + x = y$, we get

$$1 + (y-1)^4 + (y-1)^5 = \sum_{i=0}^{5} a_i y^i$$

$\therefore$ Equate coefficient of y^2 on both sides, we get

$a_2 = {}^4C_2 - {}^5C_3 = 6 - 10 = -4$

Q.72 $\frac{dy}{dx} + \left(\frac{-1}{\sin 2x}\right)y = \sqrt{\tan x}$ (Linear differential equation)

$\therefore$ General solution is, $y\sqrt{\cot x} = x + C$

Q.73 Probability $= \frac{71}{100} = 0.71$ Ans.

Q.74 In L.H.S., apply $R_2 \to R_2 - R_3$,

$$D_1 = 4\lambda^3 \begin{vmatrix} a^2 & b^2 & c^2 \\ a & b & c \\ 1 & 1 & 1 \end{vmatrix}$$

So, on comparing, we get $k = 4\lambda^2$

Q.75 $\arg\left(\frac{z_1}{z_4}\right) + \arg\left(\frac{z_2}{z_3}\right)$

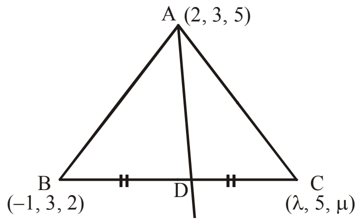
$= \arg\left(\frac{z_1 z_2}{z_3 z_4}\right) = \arg(\text{some positive real no.})$

$= 0$ Ans.

Q.76 $P_n = \int_1^e \underset{(I)}{(\ln x)^n} \underset{(II)}{1} \cdot dx$

$\Rightarrow P_n = e - n P_{n-1}$

Q.77 We have , $\dfrac{\frac{\lambda-5}{2}}{1} = \dfrac{1}{1} = \dfrac{\mu-8}{2}$



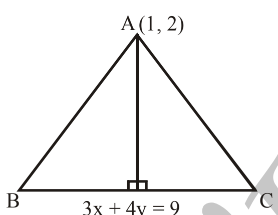
$\Rightarrow \lambda = 7, \mu = 10$

Q.78

$$\lim_{x\to 2} \frac{\tan(x-2)\cdot\left(x^2+(k-2)x-2k\right)}{(x^2-4x+4)} = 4 \quad \left(\frac{0}{0}\right)$$

$\Rightarrow k + 2 = 5 \Rightarrow k = 3$

Q.79 As, $h = \frac{\sqrt{3}}{2}a \Rightarrow \frac{2}{5} = \frac{\sqrt{3}}{2}a$



$\Rightarrow a = \frac{4}{15}\sqrt{3}$ Ans.

Q.80 $x = e^\theta.\sin\theta$

$\Rightarrow \frac{dx}{d\theta} = e^\theta(\sin\theta + \cos\theta)$

$y = 3\sin\theta.\cos\theta$

$\Rightarrow \frac{dy}{d\theta} = 3\cos 2\theta$

$\therefore \frac{dy}{dx} = \frac{3\cos 2\theta}{e^\theta.(\sin\theta + \cos\theta)}$

$\Rightarrow \frac{dy}{dx} = 0$, when $\theta = \frac{\pi}{4}$

Q.81 We have,

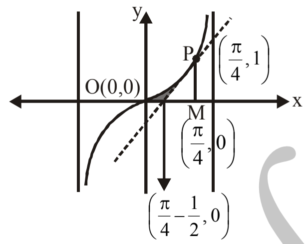
$3x\cos\theta + 2y\cot\theta = 13$ ... (1)

$3x\sin\theta + 2y\tan\theta = 13$ ... (2)

$\therefore$ On solving (1) and (2), we get

$y = \frac{-13}{2}$

Q.82



$P\left(\frac{\pi}{4}, 1\right)$, $M\left(\frac{\pi}{4}, 0\right)$, $\left(\frac{\pi}{4} - \frac{1}{2}, 0\right)$

$\text{Area} = \int_0^{\frac{\pi}{4}} (\tan x)dx - \frac{1}{2}\left(\frac{1}{2}\right)(1)$

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

Q.83 $z = 1 + i\alpha, \alpha \in R$

Now, $z^2 = x + iy$

$\Rightarrow (1 + i\alpha)^2 = x + iy$

$\Rightarrow x = 1 - \alpha^2, y = 2\alpha$

$\therefore$ On eleminating α,

we get

$y^2 + 4x - 4 = 0$ Ans.

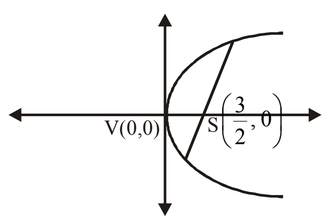
Q.84 We have

$2c^2 - b^2 > b^2 + c^2$

$\Rightarrow c^2 > 2b^2 \Rightarrow \left|\frac{c}{b}\right| > \sqrt{2}$

Q.85 Let equation of line is

$(y - 0) = m\left(x - \frac{3}{2}\right)$



$S\left(\frac{3}{2}, 0\right)$

$\Rightarrow 2mx - 2y - 3m = 0$

Now,

$\frac{|3m|}{2\sqrt{1+m^2}} = \frac{\sqrt{5}}{2}$

$\Rightarrow 9m^2 = 5m^2 + 5$

$\Rightarrow 4m^2 = 5$

$\Rightarrow \quad m = \pm \dfrac{\sqrt{5}}{2}$

Q.86 $V = \dfrac{4}{3}\pi r^3$

Now,

$$\frac{dV}{dt} = 4\pi r^2 \frac{dr}{dt}$$

$$\Rightarrow \quad 4\pi = 4\pi r^2 \frac{dr}{dt}$$

$$\therefore \quad \frac{dr}{dt} = \frac{1}{r^2} = \frac{1}{36} \qquad \text{Ans.}$$

As $\quad V = 288\pi \Rightarrow r = 6$

Q.87 Let $I = \displaystyle\int \frac{(x^{5m-1} + 2x^{4m-1})\,dx}{x^{6m}(1 + x^{-m} + x^{-2m})^3}$

$$= \int \frac{x^{-(m+1)} + 2\cdot x^{-(2m+1)}}{(1 + x^{-m} + x^{-2m})^3}dx\,;$$

Put $\quad (1 + x^{-m} + x^{-2m}) = t$

$$I = \frac{-1}{m}\int \frac{dt}{t^3} = \frac{1}{2mt^2} + C$$

$$= \frac{x^{4m}}{2m(x^{2m} + x^m + 1)^2} + C \quad \textbf{Ans.}$$

Q.88 {16, 18, ..., 30} $\rightarrow$ 8 numbers

{17, 19, ...,29} $\rightarrow$ 7 numbers

8 = (a + b + c) is even

P(E) = P(all 3 even or 2 odd and even)

$$= \frac{{}^8C_3 + {}^7C_2 \cdot {}^8C_1}{{}^{15}C_3}$$

$$= \frac{8\cdot 7\cdot 6}{15\cdot 14\cdot 13} + \frac{21\cdot 8\cdot 6}{15\cdot 14\cdot 13}$$

$$= \frac{8}{65} + \frac{24}{65} = \frac{32}{65} \text{ Ans.}$$

Q.89 $1 = b_1 + b_2 = b_1 + b_1 r = b_1(1 + r)$

$\Rightarrow b_1 = \dfrac{1}{1+r}$,

so $\displaystyle\sum_{k=1}^{\infty} b_k = \frac{1}{(1+r)(1-r)} = \frac{1}{1-r^2}$

$1 - r^2 = \dfrac{1}{2} \Rightarrow r^2 = \dfrac{1}{2}$

$\Rightarrow r = \pm\dfrac{\sqrt{2}}{2}$.

If $b_1 < 0$, then the sum would be negative, so $b_1 > 0 \Rightarrow r = 0$

$$\Rightarrow b_1 = \frac{1}{1+r} = \frac{1}{1 - \frac{\sqrt{2}}{2}} = \frac{2}{2-\sqrt{2}} = 2 + \sqrt{2}\,.$$

Ans.

Q.90 This function has a = 2 relative minima at the x-intercepts, (– 5, 0) and (1, 0), b = 1 relative minima at (–2, 3) and the product of the zeros is c = (– 5) (1) = – 5. Thus a + 2b – c = 9. **Ans.**