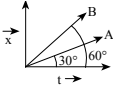


Section - I

- 1.(d) $\frac{v_A}{v_B} = \frac{\tan 30}{\tan 60} = \frac{1}{\sqrt{3} \times \sqrt{3}} = \frac{1}{3}$ 
- 2.(b) $E = \frac{1}{2} \mu v^2$
 At highest point $KE' = \frac{1}{2} \mu v^2 \cos^2 45^\circ$
 $= \frac{E}{2}$
- 3.(a) $R = m(g + a)$ i.e. increases
- 4.(b) $PE = -\frac{GMm}{r} = -\frac{GMm}{R+R} = -\frac{gR^2m}{2R}$
 $= -\frac{mgR}{2}$
- 5.(d) $\frac{s'}{s} = \left(\frac{2R}{R}\right)^2 \left(\frac{2T}{T}\right)^4 = 64:1$
- 6.(b) Heat lost by water = Heat gained by ice
 or, $40 \times (90 - \theta) = 40 \times 80 + 40\theta$
 or, $3600 - 40\theta = 3200 + 40\theta$
 or, $\theta = \frac{400}{80} = 5^\circ\text{C}$
- 7.(b) First case
 $f = \frac{v}{2l}$
 2nd case
 $f' = \frac{v}{4\left(\frac{3l}{4}\right)} = \frac{2f}{3}$
- 8.(c)
- 9.(d) $\frac{w_1}{w_2} = \frac{1}{25} = \frac{a_1^2}{a_2^2}$
 $\therefore \frac{a_1}{a_2} = \frac{1}{5}$
 $\frac{I_{\max}}{I_{\min}} = \left(\frac{a_1 + a_2}{a_2 - a_1}\right)^2 = \left(\frac{1+5}{5-1}\right)^2 = \frac{9}{4}$
- 10.(c) $F = E_e = m_p a_p = m_e a_e$
 or, $\frac{a_e}{a_p} = \frac{m_p}{m_e}$
- 11.(c) Charge will not flow if they are at same potential.
- 12.(b) $\frac{R'}{R} = \left(\frac{l + \frac{l}{10}}{l}\right)^2 = (1.1)^2 = 1.21$
 $\therefore R' = 12.1 \Omega$
- 13.(c) $\theta_1 - \theta_n = \theta_n - \theta_0$
 or, $\theta_n = \frac{\theta_1 + \theta_0}{2} = \frac{530 + 10}{2} = 270^\circ\text{C}$
- 14.(a) $W = MH(\cos 0^\circ - \cos 60^\circ) = MH\left(1 - \frac{1}{2}\right)$
 $\therefore MH = 2W$
 Again $\tau = MH \sin \theta = 2W \times \frac{\sqrt{3}}{2} = \sqrt{3} W$
- 15.(b)
- 16.(a) Work function depends on nature of metal.

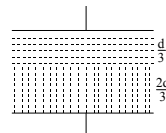
- 17.(c) Voltage gain $= \frac{V_{\text{out}}}{V_{\text{in}}}$
 $= \frac{I_c R_{\text{out}}}{I_b R_{\text{in}}}$
 $= \beta \times \frac{5000}{500}$
 $= 60 \times 10 = 600$
- 18.(a) $(A+B)(A-B) = A^2 - B^2$
 i.e. $A^2 - AB + BA - B^2 = A^2 - B^2$ which is possible only if $AB = BA$
- 19.(b) $|(4+3i)(x+iy)| = |3-4i|$
 $\Rightarrow \sqrt{4^2+3^2} \cdot \sqrt{x^2+y^2} = \sqrt{3^2+(-4)^2}$
 $\Rightarrow 5 \cdot \sqrt{x^2+y^2} = 5$
 $\Rightarrow x^2+y^2 = 1$
- 20.(b) $\lim_{x \rightarrow 0} \frac{\sin 4x}{\tan x} = \lim_{x \rightarrow 0} \frac{\frac{\sin 4x}{4x} \times 4}{\frac{\tan x}{ax} \cdot a}$
 $\Rightarrow \frac{4}{a} = 5 \Rightarrow a = \frac{4}{5}$
- 21.(c) a, b, c are in AP $\Rightarrow 2b = a + c \Rightarrow 3^{2b} = 3^{a+c}$
 $\Rightarrow (3^b)^2 = 3^a \cdot 3^c \Rightarrow 3^a, 3^b, 3^c$ are in G.P.
- 22.(a) The product $\sin^7 x \cos^5 x$ is an odd function
 So $\int_{-1}^1 \sin^7 x \cos^5 x \, dx = 0$
- 23.(d) $y^2 + 2y + x = 0 \Rightarrow y^2 + 2y + 1 = -x + 1$
 $\Rightarrow (y+1)^2 = -(x-1)$
 $\Rightarrow \{y - (-1)\}^2 = 4 \cdot \left(-\frac{1}{4}\right) \cdot (x-1)$
 $\Rightarrow \text{Vertex} = (1, -1)$, lies in 4th quadrant.
- 24.(d) As $b > a$ i.e. $\frac{1}{a} > \frac{1}{b}$ i.e. $\frac{1}{a} - \frac{1}{b} > 0$
- 25.(b) We have $(1+x)^n = C_0 + C_1x + C_2x^2 + \dots + C_nx^n$
 Putting $x = 2$, $3^n = C_0 + 2C_1 + 2^2C_2 + \dots + 2^nC_n$
- 26.(c) If the line $lx + my + n = 0$ is normal then it passes through the centre of the circle.
 So $l \cdot 0 + m \cdot 0 + n = 0 \Rightarrow n = 0$
- 27.(d) Eq^n is $\frac{x^2}{25} + \frac{y^2}{9} = 1$
 So length of latus rectum $= \frac{2b^2}{a} = 2 \cdot \frac{9}{5} = \frac{18}{5}$
- 28.(c) By definition $\vec{a} \times \vec{b}$ is perpendicular to both $\vec{a}$ and $\vec{b}$.
- 29.(b) $\frac{\cos C + \cos A}{c+a} + \frac{\cos B}{b}$
 $= \frac{b \cos C + b \cos A + c \cos B + a \cos B}{b(a+c)}$
 $= \frac{(a+b)}{b(a+c)} = \frac{1}{b}$
- 30.(b) For minimum value is $2x - 4 = 0 \Rightarrow x = 2$
- 31.(c) $3 \operatorname{cosec}^2 x - 4 = 0 \Rightarrow \sin^2 x = \frac{3}{4} \Rightarrow \sin^2 x = \left(\frac{\sqrt{3}}{2}\right)^2$
 $\Rightarrow \sin^2 x = \sin^2 \frac{2\pi}{3} \Rightarrow x = n\pi \pm \frac{\pi}{3}$

- 32.(b) $\sin^{-1}x + \sin^{-1}y = \frac{2\pi}{3} \Rightarrow \frac{\pi}{2} - \cos^{-1}x + \frac{\pi}{2} - \cos^{-1}y = \frac{2\pi}{3} \Rightarrow$
 $\cos^{-1}x + \cos^{-1}y = \pi - \frac{2\pi}{3} = \frac{\pi}{3}$
- 33.(c) As the vertices right angled Δ so circumcentre = midpoint of hypotenous
 $= \left(\frac{3+0}{2}, \frac{0+4}{2} \right) = \left(\frac{3}{2}, 2 \right)$
- 34.(a) $\sin^2\alpha + \sin^2\beta + \sin^2\gamma = 1 - \cos^2\alpha + \cos^2\beta + 1 - \cos^2\gamma =$
 $3 - (\cos^2\alpha + \cos^2\beta + \cos^2\gamma) = 3 - 1 = 2$
- 35.(c) $x^2 - y^2 = \left(\frac{e^t + e^{-t}}{2} \right)^2 - \left(\frac{e^t - e^{-t}}{2} \right)^2 = \frac{1}{4} 4 e^t \cdot e^{-t} = 1$
- 36.(b) For roots equal in magnitude but opposite in sign, we must have coefficient of $x = 0$
 $\Rightarrow 5 + k = 0 \Rightarrow k = -5$
- 37.(a) $n!, (n+1)! = (n+1)n!, (n+2)! = (n+2)(n+1)n!$
 So their HCF = $n!$
38. (a) 22400 ml of CO = 6.02×10^{23} no. of C atoms
 112 ml of CO = $\frac{6.02 \times 10^{23} \times 112}{22400}$
 $= 3.01 \times 10^{21}$
- 39.(c) $200 \times 0.12 = (200 + x) \times 0.1$
 $x = \frac{200 \times 0.12}{0.1} - 200 = 40 \text{ ml}$
- 40.(b) $4\text{gm He} = 2N_A$
 $1\text{gm He} = \frac{2N_A}{4} = 0.5 N_A$
- 41.(c) 44gm of CO_2 at STP = 22.4 litre
 $4.4\text{gm of STP} = \frac{22.4}{44} \times 4.4 = 2.24 \text{ litre}$
- 43.(c) Cu + Zn = Brass
 Cu + Sn = Bronze, Cu + Mn = No. any alloy
 Cu + Ni = Constant
- 44.(d) $\text{HgCl}_2 + 2\text{KI} \rightarrow \text{HgI}_2 + 2\text{KCl}$
 $\text{HgI}_2 + 2\text{KI} \rightarrow \text{K}_2[\text{HgI}_4]$
 $2\text{K}^+ + [\text{HgI}_4]^{2-}$
- 45.(b) $\text{H}_2\text{S} + (\text{CH}_3\text{COO})_2\text{Pb} \rightarrow \text{PbS} \downarrow + 2\text{CH}_3\text{COOH}$
 black ppt
- 46.(b) $\text{NH}_4\text{Cl} + \text{KNO}_2 \rightarrow \text{NH}_4\text{NO}_2 + \text{HCl}$
 $\text{NH}_4\text{NO}_2 \rightarrow \text{N}_2 + 2\text{H}_2\text{O}$
- 47.(c) Na is highly electropositive metal which is extracted by electrometallurgy.
- 48.(b)
- 49.(b) 50.(c) 51.(b) 52.(c) 53.(c) 54.(c)
- 55.(a) 56.(a) 57.(c) 58.(a) 59.(c) 60.(b)

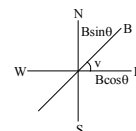
Section - II

- 61.(a) $h = h_1 - h_2$
 $= \frac{1}{2} g \times 3^2 - \frac{1}{2} g (2)^2$
 $= 5 \times 5 = 25 \text{ m}$
- 62.(d) $R = 3H$
 or, $\frac{u^2 \sin 2\theta}{g} = \frac{3 \times u^2 \sin^2 \theta}{2g}$

- or, $2\sin\theta \cdot \cos\theta = \frac{3\sin^2\theta}{2}$
 or, $\tan\theta = \frac{4}{3}$
 $\theta = \tan^{-1}\left(\frac{4}{3}\right)$
- 63.(b) Ap. wt of first = Ap. wt of 2nd
 $32 - \frac{32}{8} \times \sigma_w = x - \frac{x}{5} \sigma_w$
 or, $28 = x\left(\frac{4}{5}\right)$
 or, $x = 35\text{g}$
- 64.(c) $\eta = \left\{ 1 - \left(\frac{1}{5}\right)^{n-1} \right\} \times 100\%$
 $= \left\{ 1 - \left(\frac{1}{5}\right)^{5/3-1} \right\} \times 100\%$
 $= \left\{ 1 - (0.5)^{2/3} \right\} \times 100\%$
 $= 37\%$
- 65.(c) $\frac{t_2}{t_1} = \frac{x_2^2 - x_1^2}{x_1^2 - x_0^2} = \frac{2^2 - 1^2}{1^2 - 0^2}$
 or, $t_2 = 3 \times 7 = 21 \text{ hrs.}$
- 66.(a) $f = \frac{1}{2l} \sqrt{\frac{T}{m}} = \frac{1}{2l} \sqrt{\frac{T-U}{m}}$
 or, $\frac{1}{l} \sqrt{v\rho g} = \frac{1}{l} \sqrt{v(\rho - \sigma)g}$
 or, $\frac{l}{l} = \sqrt{\frac{\rho - \sigma}{\rho}} = \sqrt{\frac{8-1}{8}}$
 $\therefore l = 0.4\sqrt{\frac{7}{8}} = 0.37 \text{ m}$
- 67.(c) $c = \frac{\epsilon_0 A}{d} = 9 \dots (i)$
 $c_1 = \frac{\epsilon_0 \epsilon_r A}{d} = 3 \times 3 \times 9$
 $= 81 \mu\text{F}$
 $c_2 = \frac{\epsilon_0 \epsilon_r A}{\frac{2d}{3}} = \frac{3}{2} \times 6 \times 9 = 81 \mu\text{F}$
 $c_{eq} = \frac{81}{2} = 40.5 \mu\text{F}$



- 68.(d) $n = \frac{250}{25} = 10$
 $R = (n-1)G = (10-1)100 = 900\Omega$
- 69.(c) When plane is NS direction
 $\tau_1 = B \cos\theta I N A$
 or, $0.04 = B I N A \cos\theta \dots (1)$
 When plane is EW direction
 $\tau_2 = B \sin\theta I N A$
 or, $0.03 = B I N A \sin\theta \dots (2)$
 Squaring & adding
 $0.04^2 + 0.03^2 = B^2 I^2 N^2 A^2 (\cos^2\theta + \sin^2\theta)$
 or, $B = \sqrt{\frac{0.04^2 + 0.03^2}{2^2 \times 50^2 \times (1.25 \times 10^{-3})^2}} = 0.4\text{T}$



$$70.(a) \quad I = \frac{E}{R} = -\left(\frac{d\phi}{dt}\right) \frac{1}{R}$$

$$= -\frac{(12t-5)}{10}$$

$$= -\frac{(12 \times 0.25 - 5)}{10} = 0.2A$$

$$71.(b) \quad \text{For near object}$$

$$u = ? \quad v = -25 \text{ cm} \quad f = \frac{1}{p} = 25 \text{ cm}$$

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$$

$$\text{or, } \frac{1}{25} = \frac{1}{u} - \frac{1}{25}$$

$$\text{or, } \frac{1}{u} = \frac{2}{25} \Rightarrow u = 12.5 \text{ cm}$$

For distant object

$$u = ? \quad v = \infty, f = 25 \text{ cm}$$

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$$

$$\text{or, } \frac{1}{25} = \frac{1}{u} + \frac{1}{\infty}$$

$$\text{or, } u = 25 \text{ cm}$$

$$\therefore \text{Range} = 12.5 \text{ cm to } 25 \text{ cm}$$

$$72.(c) \quad \beta = \frac{3D \times 3\lambda}{d} = \frac{27 D\lambda}{d}$$

$$\text{No of fringes (n)} = \frac{\frac{1}{\beta}}{\frac{1}{3} \times \frac{d}{27D\lambda}} = \frac{d}{81D\lambda}$$

$$73.(a) \quad E = \frac{hc}{\lambda} = \frac{6.62 \times 10^{-34} \times 3 \times 10^8}{975 \times 10^{-10}} = 12.73 \text{ eV}$$

$$E_f = E_1 + E = -13.6 + 12.73 = -0.87 \text{ eV} = -\frac{13.6}{n^2}$$

$$\therefore n = 4$$

$$E_4 - E_3 = \frac{hc}{\lambda}$$

$$\lambda = \frac{6.62 \times 10^{-34} \times 3 \times 10^8}{(-0.85 + 1.51) \times 1.6 \times 10^{-19}}$$

$$= 18806 \times 10^{-10} \text{ m} = 18806 \text{ \AA}$$

$$74.(d) \quad m = m_0 \left(\frac{1}{2}\right)^{t/T_{1/2}} = m_0' \left(\frac{1}{2}\right)^{t/T_{1/2}}$$

$$\text{or, } 40 \left(\frac{1}{2}\right)^{t/20} = 160 \left(\frac{1}{2}\right)^{t/10}$$

$$\text{or, } \left(\frac{1}{2}\right)^{t/20+2} = \left(\frac{1}{2}\right)^{t/10}$$

$$\text{or, } \frac{t}{20} + 2 = \frac{t}{10}$$

$$\text{or, } \frac{t}{10} - \frac{t}{20} = 2$$

$$\text{or, } t = 40 \text{ s}$$

$$75.(d) \quad \int \frac{x^4}{x+x^5} dx = \int \frac{1+x^4-1}{x(1+x^4)} dx$$

$$= \int \frac{1}{x} dx - \int \frac{dx}{x(1+x^4)}$$

$$= \log_e x - f(x) - c' + k = \log_e x - f(x) + c$$

$$76.(c) \quad y = c_1 e^{nx} + c_2 e^{-nx}, \text{ So } \frac{dy}{dx} = nc_1 e^{nx} - nc_2 e^{-nx}, \frac{d^2y}{dx^2} = n^2 c_1 e^{nx}$$

$$+ n^2 c_2 e^{-nx}$$

$$= n^2 (c_1 e^{nx} + c_2 e^{-nx}) = n^2 y$$

$$77.(d) \quad \sin^{-1}x + \sin^{-1}y + \sin^{-1}z = \pi$$

$$\Rightarrow \sin^{-1}(x\sqrt{1-y^2} + y\sqrt{1-x^2}) = \pi - \sin^{-1}z$$

$$\Rightarrow x\sqrt{1-y^2} + y\sqrt{1-x^2} = \sin(\pi - \sin^{-1}z) = \sin \sin^{-1}z = z$$

$$78.(a) \quad A, B, C \text{ are in AP} \Rightarrow 2B = A + C \Rightarrow B = 60^\circ,$$

$$a, b, c \text{ are in GP} \Rightarrow b^2 = ac$$

$$\text{So, } \cos 60^\circ = \frac{c^2 + a^2 - b^2}{2ca} \Rightarrow \frac{1}{2} = \frac{c^2 + a^2 - b^2}{2b^2}$$

$$\Rightarrow b^2 = c^2 + a^2 - b^2$$

$$\Rightarrow 2b^2 = c^2 + a^2$$

$$\Rightarrow a^2, b^2, c^2 \text{ are in A.P.}$$

$$79.(c) \quad x + iy = k + 3 + i\sqrt{5-k^2} \Rightarrow x = k + 3,$$

$$y = \sqrt{5-k^2}$$

$$\Rightarrow (x-3)^2 = k^2, y^2 = 5-k^2$$

$$\Rightarrow (x-3)^2 + y^2 = 5, \text{ a circle}$$

$$80.(d) \quad \alpha \text{ and } \beta \text{ are the roots of } x^2 + px + q = 0$$

$$\alpha' \text{ and } \beta' \text{ are the roots of } x^2 + 9x + p = 0$$

$$\text{So, } \alpha + \beta = -p, \alpha\beta = q$$

$$\text{So } \alpha' + \beta' = -9, \alpha'\beta' = p$$

$$\text{Now, } \alpha - \beta = \alpha' - \beta'$$

$$\Rightarrow (\alpha + \beta)^2 - 4\alpha\beta = (\alpha' + \beta')^2 - 4\alpha'\beta'$$

$$\Rightarrow p^2 - 4q = 81 - 4p$$

$$\Rightarrow (p^2 - q^2) + 4(p - q) = 0$$

$$\Rightarrow (p - q)(p + q + 4) = 0$$

$$\Rightarrow p + q = -4$$

$$81.(b) \quad x = a + \frac{a}{r} + \frac{a}{r^2} + \dots$$

$$\Rightarrow x = a \left(1 + \frac{1}{r} + \frac{1}{r^2} + \dots \right) = a \frac{1}{1 - \frac{1}{r}} = a \frac{r}{r-1}$$

$$y = b - \frac{b}{r} + \frac{b}{r^2} \dots \Rightarrow y = b \left(1 - \frac{1}{r} + \frac{1}{r^2} - \dots \right)$$

$$= b \cdot \frac{1}{1 + \frac{1}{r}} = b \cdot \frac{r}{r+1}$$

$$z = c + \frac{c}{r^2} + \frac{c}{r^4} + \dots \Rightarrow z = c \left(1 + \frac{1}{r^2} + \frac{1}{r^4} + \dots \right)$$

$$= c \cdot \frac{1}{1 - \frac{1}{r^2}} = c \cdot \frac{r^2}{r^2 - 1}$$

$$\text{So, } \frac{xy}{z} = \frac{ab \frac{r^2}{r^2 - 1}}{c \frac{r^2}{r^2 - 1}} = \frac{ab}{c}$$

$$82.(d) \quad \text{The function is not defined if } 3 - \cos 2x = 0$$

$$\Rightarrow \cos 2x = 3, \text{ impossible.}$$

$$\text{So domain} = \mathbb{R}. \text{ Also, } -1 \leq \cos 2x \leq 1$$

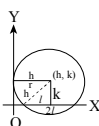
$$\text{So range} = \left[\frac{1}{3 - (-1)}, \frac{1}{3 - 1} \right] = \left[\frac{1}{4}, \frac{1}{2} \right]$$

83.(c) $|\vec{a}| = |\vec{b}| = |\vec{c}| = 1, \quad \vec{a} + \vec{b} + \vec{c} = 0$
 $\Rightarrow \vec{a} + \vec{b} = -\vec{c} \Rightarrow (\vec{a} + \vec{b})^2 = (-\vec{c})^2$
 $\Rightarrow |\vec{a}|^2 + |\vec{b}|^2 + 2\vec{a} \cdot \vec{b} = |\vec{c}|^2$
 $\Rightarrow 1 + 1 + 2|\vec{a}||\vec{b}| \cos \theta = 1$
 $\Rightarrow 2 \cos \theta = -1 \Rightarrow \cos \theta = -\frac{1}{2} \Rightarrow \theta = 120^\circ$

84.(c) $y = x - \frac{x^2}{2!} + \frac{y^3}{3!} - \frac{x^4}{4} + \dots \Rightarrow y = \log_e(1+x)$
 $\Rightarrow 1+x = e^y \Rightarrow x = e^y - 1$
 Also, $\frac{y}{1!} + \frac{y^2}{2!} + \frac{y^3}{3!} + \dots = e^y - 1 = x$

85.(a) Given eqⁿ is $x^2 + y^2 + 2gx + 2fy + 1 = 0$
 On comparison, we have
 $a = 1, b = 1, h = 0, g = g, f = f, c = 1$
 So condition to represent a pair of line is $abc + 2fgh - af^2 - bg^2 - ch^2 = 0$
 $\Rightarrow 1.1.1 + 0 - 1.f^2 - 1.g^2 - 1.0 = 0$
 $\Rightarrow 1 = f^2 + g^2$

86.(b) Let (b, k) be centre. As it touches y-axis
 So r = h. Then from figure, we have



$h^2 = k^2 + r^2$. So locus is $x^2 = y^2 + r^2$
 i.e. $x^2 - y^2 = r^2$

87.(c) Eqⁿ of planes are $2x - 2y + z + 1 = 0$
 i.e. $4x - 4y + 2z + 2 = 0$
 $= 0$ and $4x - 4y + 2z + 3 = 0$

So the distance between them $= \frac{3-2}{\sqrt{4^2 + (-4)^2 + 2^2}} =$

$\frac{1}{\sqrt{36}} = \frac{1}{6}$

88.(b) Solving the curves $y = x$ and $y = x^3$,
 we get $x = 0, 1, -1$

$\therefore$ Required area $= \int_0^1 (x - x^3) dx = \left[\frac{x^2}{2} - \frac{x^4}{4} \right]_0^1$
 $= \frac{1}{2} - \frac{1}{4} = \frac{1}{4}$ sq. units

89.(c) Let a be the length of the cube. Then

$\frac{dv}{dt} = K$
 $\Rightarrow \frac{da^3}{dt} = K \Rightarrow 3a^2 \frac{da}{dt} = K \Rightarrow \frac{da}{dt} = \frac{K}{3a^2}$

Also, we have, $s = 6a^2$

$\therefore \frac{ds}{dt} = 6 \frac{da^2}{dt} = 6.2a \frac{da}{dt} = 12a \cdot \frac{K}{3a^2} = \frac{4K}{a}$

i.e. $\frac{ds}{dt} \propto \frac{1}{a}$

90.(d) An alkene 'x' ozonolysis gave acetone acid
 acetaldehyde. The product formed by reacting x with
 HBr in presence of peroxide is 2-bromopentane.

91.(c) $W = \text{Zit}$

$W = \frac{E}{F} \times I \times t$

$2 = \frac{108}{96500} \times 2 \times 35 \times 60$

$I = \frac{2 \times 96500}{108 \times 35 \times 60} = \frac{193000}{226800} = 0.85 \text{ A}$
 $= 0.85 \times 100 = 85\%$

92.(a) $10 \times N_1 = 8 \times 0.625$

$N_1 = \frac{8 \times 0.625}{10} = 0.5 \text{ N}$

$\frac{W}{E} = \frac{N_p}{1000}$

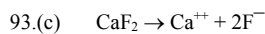
$\frac{3.55}{E} = \frac{0.5 \times 100}{1000}$

$E = 71$

E or $M_2CO_3 \cdot xH_2O = 71$

$2 \times 23 + 60 + 18x = 2 \times 71$

$x = \frac{142 - 106}{18} = \frac{36}{18} = 2$



$K_{sp} \quad x \quad 2x$

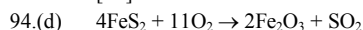
$x \times (2x)^2 = K_{sp}$

$x \times 4x^2 = 3.95 \times 10^{-11}$

$4x^3 = 3.95 \times 10^{-11}$

$x = 3\sqrt{\frac{3.95 \times 10^{-11}}{4}} = 2.145 \times 10^{-4}$

$[F^{-}] = 2x = 2 \times 2.145 \times 10^{-4} = 4.29 \times 10^{-4}$



SO_2 acts oxidand, reductant as well as bleachant.

95.(a) $\frac{3}{4}$ of 100 ml = 75 ml

$V_{mix} M_{mix} = V_a M_a - V_b M_b$

$(100 + 75) \times M_{mix} = 100 \times 0.1 - 75 \times 0.1$

$M_{mix} = \frac{10 - 75}{175}$

$M_{mix} = 0.0142857 \text{ M of HCl}$

$pH = -\log[H^+] = -\log[0.0142857] = 1.84$

96.(b)

97.(b)

98.(b)

99.(c)

100.(d)

...Best of Luck...