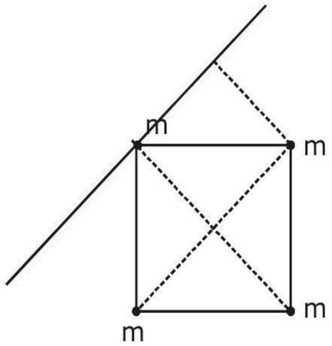
1. (c)



$L = I\omega$

$$I = m\left(\frac{a}{\sqrt{2}}\right)^2 \times 2 + m(\sqrt{2}a)^2$$

$= ma^2 + 2ma^2$

$\therefore L = I\omega = 3ml^2\omega\ (a = l)$

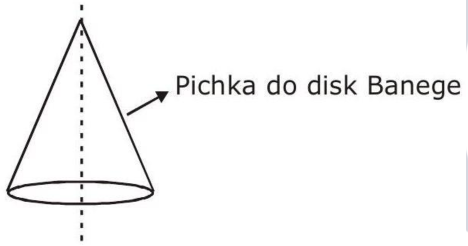
2. (c) $= \mathrm{L.C} = \frac{0.5}{50}\ \mathrm{mm} = 1 \times 10^{-5}\ \mathrm{m} = 10\mu\mathrm{m}$

3. (a)

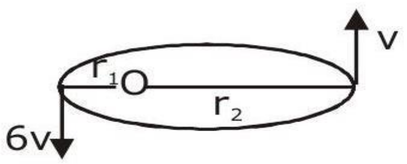
4. (b)

5. (a)

$$I = \frac{mR^2}{2}$$



6. (c)



$L_i = L_f$
$m \cdot 6vr_1 = m \cdot vr_2$
$6r_1 = r_2$
$\Rightarrow \frac{r_1}{r_2} = \frac{1}{6}$

7. (d) ${}_3^7\mathrm{Li} + {}_1\mathrm{e}^+ \rightarrow 2\,{}_2^4\mathrm{He}$

$\Delta m \Rightarrow [m_{Li} + m_H] - 2[M_{He}]$

$\rightarrow \Delta m = (7.0160 + 1.0079) - 2 \times 4.0003$

$= 0.0187$

Energy released in 1 reaction $\Rightarrow \Delta mc^2$

In use of 7.016u Li energy is Δmc^2

In use of 1gm Li energy is $\frac{\Delta mc^2}{m_{Li}}$

In use of 20gm energy is $\Rightarrow \frac{\Delta mc^2}{m_{Li}} \times 20gm$

$$\frac{0.0187 \times 931.5 \times 10^6 \times 1.6 \times 10^{-19} \times \frac{20}{7} \times 6.023 \times 10^{23}}{36 \times 10^5}$$

$= 1.33 \times 10^6$

8. (a)

$$F = \frac{-dU}{dr} = \frac{-d}{dr}(-Ar^{-6} + Br^{-12}) \text{ for equation } F = 0$$
$$= \frac{A(-6)}{r^7} + \frac{B \cdot 12}{r^{13}} = 0$$
$$\frac{12B}{r^{13}} = \frac{6A}{r^7}$$
$$r = \left(\frac{2B}{A}\right)^{1/6}$$

$$U = \frac{-A}{\frac{2B}{A}} + \frac{B}{\left(\frac{2B}{A}\right)^2}$$

$$= \frac{-A^2}{2B} + \frac{A^2}{4B} = \frac{-A^2}{4B}$$

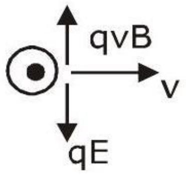
9. (a) $a = \frac{v^2}{R}$

$$v = \frac{2\pi R}{60}$$

$$= \frac{4\pi^2 \cdot R^2}{(60)^2 R} = \frac{4\pi^2 R}{(60)^2} = \frac{4}{(60)^2} \times 10 \times 0.1 \approx 10^{-3}$$

10. (d)

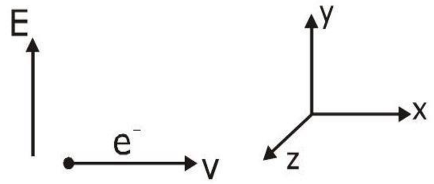
11. (c) $\vec{B}$ must be in $+z$ axis.



qE = qvB

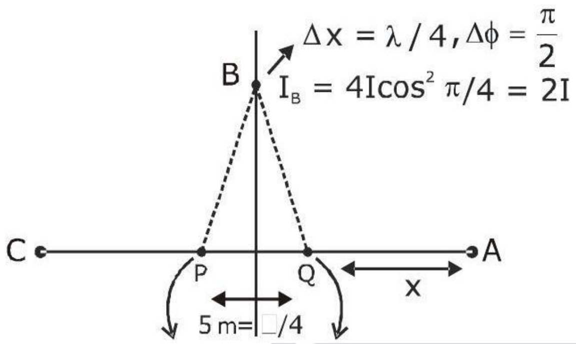
$E = 300 \dfrac{\text{v}}{10^{-2}\ \text{m}}$

$= 30000\text{v/m}$



$B = \dfrac{E}{V} = \dfrac{3 \times 10^4}{6 \times 10^6} = 5 \times 10^{-3}\ \text{T}$

12. (b)



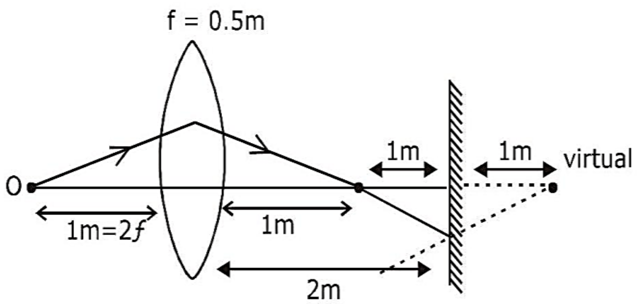
$A\sin\left(\omega t - k(x + \lambda/4) + \dfrac{\pi}{2}\right)\ A\sin(\omega t - kx)$

$A\sin\left(\omega t - kx - \dfrac{2\pi}{\lambda} \times \dfrac{\lambda}{4} + \dfrac{\pi}{2}\right)$

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

$\Delta x = \lambda/2$	$\therefore$ at $A \Delta x_{\text{effective}} = 0$ or phase difference $= 0$
$\Delta\phi = \pi$	$\therefore I_A = 4I$
$I_C = 0$	{ Same logic as A point but opposits }

13. (a b)



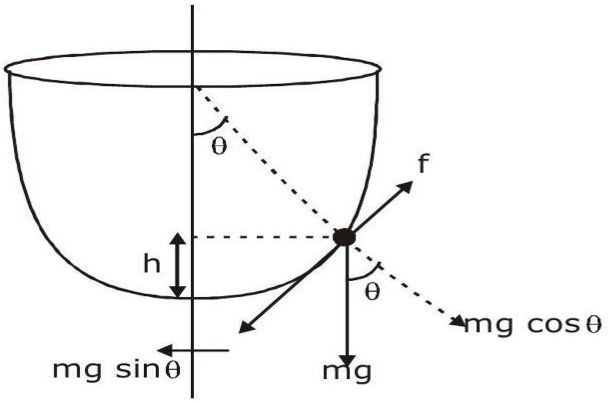
for III [rd] Refraction, $u = -3$

$\dfrac{1}{V} + \dfrac{1}{3} = \dfrac{2}{1}$

$V = \dfrac{3}{5} = 0.6$

from mirror = 2.6 m

14. (c)



$f = mg\sin\theta$

$\mathrm{f} = \mu \mathrm{mg}\cos\theta$

$\mu \mathrm{mg}\cos\theta = \mathrm{mg}\sin\theta$

$\tan\theta = \mu$

$\tan\theta = \frac{3}{4}$

$\cos\theta = \frac{4}{\sqrt{16+9}} = \frac{4}{5}$

$h = 1(1-\cos\theta) = 1 - \frac{4}{5} = \frac{1}{5}$

$\mathrm{h} = \frac{1}{5} = 0.2\ \mathrm{m}$

15. (a)

$U = \frac{f}{2}nRT = \frac{5}{2}nRT \begin{pmatrix} C_p - C_v = R \\ C_v = \frac{f}{2}R \end{pmatrix}, \gamma = \frac{C_p}{C_d} \Rightarrow 1 + \frac{2}{f} = 1 + \frac{2}{5} = \frac{7}{5}$

16. (a) $\mathrm{Y} = \frac{\mathrm{F/A}}{\Delta \mathrm{L/L}}$

$Y = \frac{FL}{A\Delta L}$

$F = \frac{YA\Delta L}{L}$

$\mathrm{f} = \frac{1}{2\pi}\sqrt{\frac{YA}{Lm}} \left(\frac{\mathrm{yA}}{\mathrm{L}} = \mathrm{k}\right) \because \mathrm{T} = 2\pi\sqrt{\frac{\mathrm{m}}{\mathrm{k}}}$

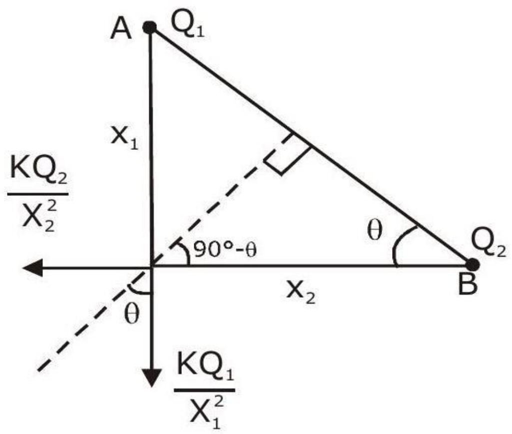
17. (b) $\mathrm{Q} = \frac{\omega \mathrm{L}}{\mathrm{R}}$

$\omega = \frac{1}{\sqrt{LC}}$

$= \frac{L}{R\sqrt{LC}} = \frac{1}{R}\sqrt{\frac{L}{C}}$

$= \frac{1}{100}\sqrt{\frac{80 \times 10^{-3}}{2 \times 10^{-6}}} = 2$

18. (d)

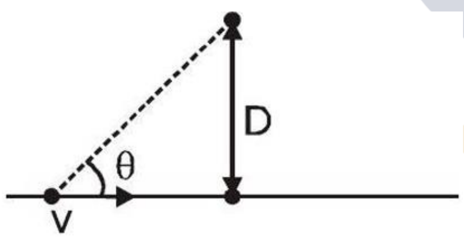


$\tan\theta = \frac{kQ_2/x_2^2}{kQ_1/x_1^2} = \frac{x_1}{x_2}$

$\frac{Q_2 \cdot x_1^2}{Q_1 \cdot x_2^2} = \frac{X_1}{X_2}$

$\frac{Q_1}{Q_2} = \frac{x_1}{X_2}$

19. (d)

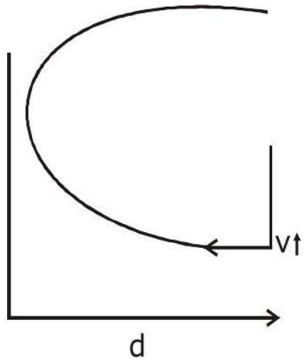


$f_{observed} \Rightarrow \left(\frac{V_{sound}}{V_{sound} - v\cos\theta}\right) f_0$

initially θ will be less $\Rightarrow \cos\theta$ more

$\therefore f_{observed}$ more, then it will decrease.

20. (a)

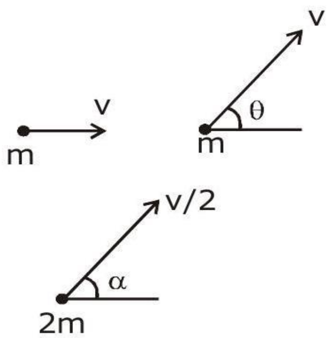


$d > R$

$d > \frac{mv}{qB_0}$

$v < \frac{qB_0 d}{m}$

21. (120)



∴ In Horizontal Direction

By Momentum conservation.

$mv + mv\cos\theta = 2m\frac{v}{2}\cos\alpha$

$1 + \cos\theta = \cos\alpha$

In vertical direction

By Momentum conservation.

$0 + mv\sin\theta = 2m\frac{v}{2}\sin\alpha$

$\sin\theta = \sin\alpha$

$1 + \cos\theta = \sqrt{1 - \sin^2\theta}$

$\theta = 120°$

22. (275)

$\mathrm{I} = \frac{1}{2}\varepsilon_0 \mathrm{CE}_{\mathrm{rms}}^2$

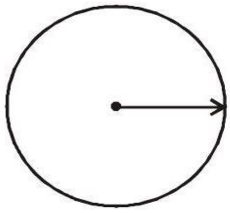
$$\frac{3.15}{\pi} = \frac{1}{2} \times 8.86 \times 10^{-12} \times 3 \times 10^{8} \times \mathrm{E}_{\mathrm{rms}}^{2}$$

$E_{ms} = 275$

23. (1050)

$$\rho = \frac{m}{\frac{4}{3}\pi\left(\frac{d}{2}\right)^{3}}$$

$$\rho = k \cdot \frac{m}{d^{3}}$$



$\log \rho = \log k^{\circ} + \log m - 3\log d$

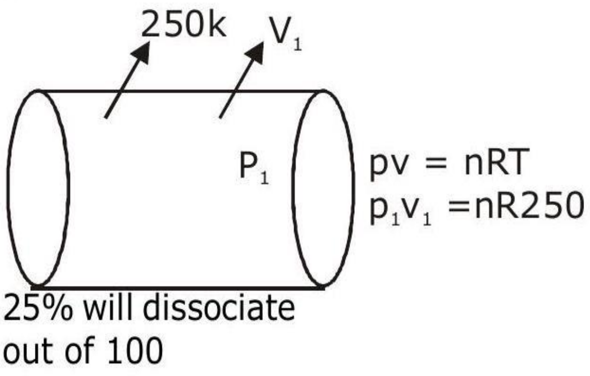
diff.

$$\frac{d\rho}{\rho} = \frac{dm}{m} - 3 \cdot \frac{dd}{d}$$

$= 6.0 + 3 \times 1.5 = 10.5\%$

$= \mathrm{x} = 1050$

24. (5)



out of 100

$\frac{3n}{4}$ molecules will remain same

S

$\frac{\mathrm{n}}{4}$ mole become $\rightarrow \frac{\mathrm{n}}{2}$

$\therefore$ Total molecules used

$\rightarrow \frac{3n}{4} + \frac{n}{2} = \frac{5n}{4}$

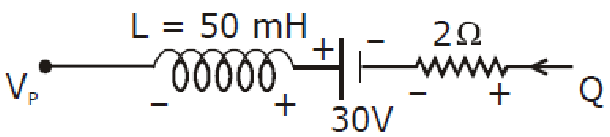
$P_2 2V_1 = \frac{5n}{4} \cdot R \cdot 2000 - \text{(ii)}$

Eq. (ii/i)

$$\frac{2p_2v_1}{p_1v_1} = \frac{5nR \times 2000}{4nR \times 250}$$

$$\frac{P_2}{P_1} = 5$$

25. (33)



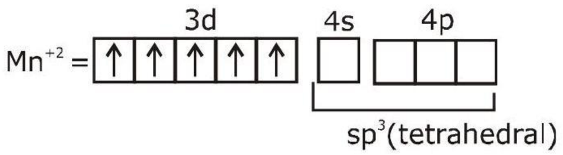
$$V_p + L \cdot \frac{di}{dt} - 30 + 2i = V_Q$$

$$V_P + 50 \times 10^{-3}(-10^2) - 30 + 2 \times 1 = v_Q$$

$$V_P - V_Q = 35 - 2 = 33$$

26. (b) Brass - (copper Zinc)
Bronze - (copper tin)

27. (c) $[MnBr_4]^{2-}$



$$\mu = \sqrt{5(5+2)} = 5.9\text{BM}$$

28. (a)

$$Fe_2\,N(s) + \frac{3}{2}H_2(g) \rightleftharpoons 2Fe(s) + NH_3(g)$$

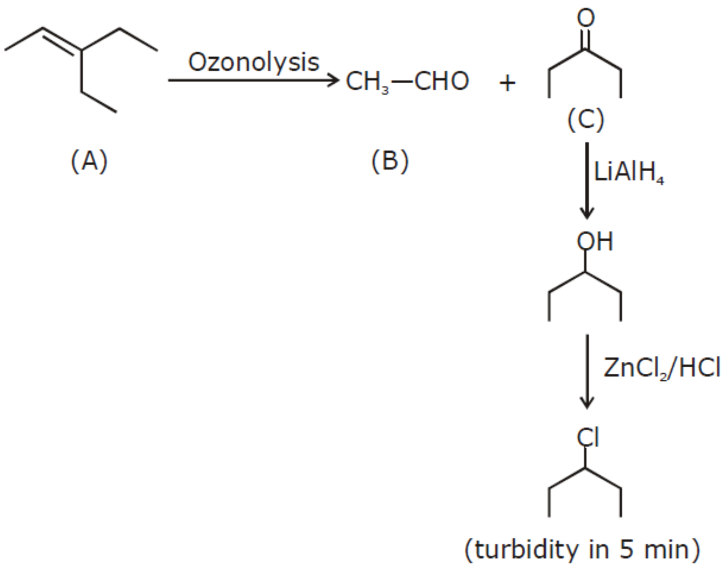
$$\Delta n_g = 1 - \frac{3}{2} = \frac{-1}{2}$$

$$\frac{K_p}{K_c} = (RT)^{\Delta n_g} = (RT)^{-1/2}$$

$$K_c = \frac{K_p}{(RT)^{-1/2}} = K_p \cdot (RT)^{1/2}$$

29. (a)

-



30. (d)

31. (c) $\ln\left[\frac{k_2}{k_1}\right] = \frac{\Delta H^\circ}{R}\left\{\frac{1}{T_1} - \frac{1}{T_2}\right\}$

$$\ln(10) = \frac{\Delta H^\circ}{R}\left\{\frac{1}{298} - \frac{1}{373}\right\}$$

$$\frac{373 \times 298 \times 8.314 \times 2.303}{75} = \Delta H^\circ = 28.37 \text{ kJ mol}^{-1}$$

$$\Delta G^\circ_{T_1} = -RT_1\ln(K_1) = -298R\ln(10) = -5.71 \text{ kJ mol}^{-1}$$

$$\Delta G^\circ_{T_2} = -RT_2\ln(K_2) = -373R\ln(100)$$

$$= -14.283 \text{ kJ/mol}$$

32. (c)

$A \rightarrow P1$ $\quad$ $B \rightarrow P2$
$C \rightarrow P3$ $\quad$ $D \rightarrow P4$

Rate $=$ K (conc.) $)^{\text{order}}$

$\log(\text{ rate }) = \log(K) + \text{order} \log(\text{ case })$

$y\ c + m \cdot x$

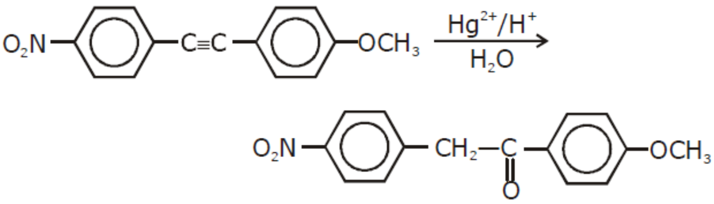
Straight line

Slope $=$ order

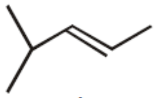
According graph

$d > b > a > c$ order of slope

33. (c)



34. (b)

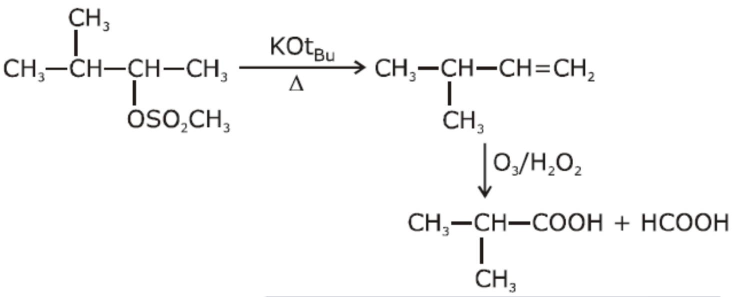


Can show G.I.

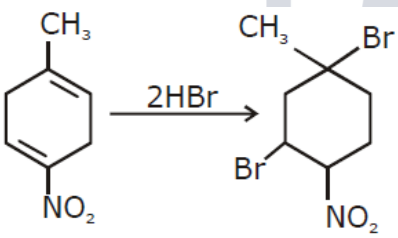
4-Methylpent-2-ene

35. (d)

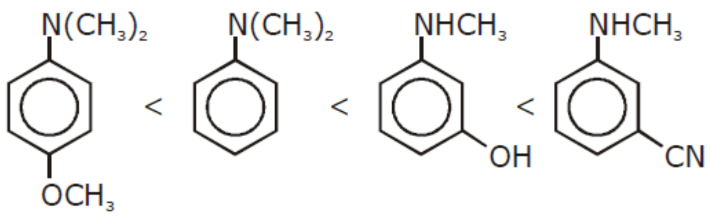
36. (a)



37. (b)



38. (c) Order of pK_b



39. (c) T_K + temp. above which formation of micelles takes place.

40. (b) Tranition elements = 21 to 30

37 to 48

57&72 to 80

41. (b) From ziegler - Natta catalyst HDPE is produced, HDPE is closely packed and are chemically inert, so used to make backet and dustbin.

42. (d)

$$C_2 = \frac{x_2}{[x_2M_1 + (1 - x_2)M_2]/d} \times 1000$$

$$C_2 = \frac{1000dx_2}{M_1 + (M_2 - M_1)x_2}$$

43. (d) (a) Liquid nitrogen is used as a refrigerant to preserve biological material food items and in cryosurgery.

(b) N_2 is diamagnetic, with no unpaired elctrons.

(c) N_2 does not combine with oxygen, hydrogen or most other elements. Nitrogen will combine with oxygen, however; in the presence of lightining or a spark.

(d) In iron and chemical Industry inert diluent for reactive chemicals.

44. (b) Order of solubility of sulphate of Alkaline earth metals

$BeSO_4 > MgSO_4 > CaSO_4 > SrSO_4 > BaSO_4$

45. (c) Environmental chemistry - safe for teeth

46. (750) moles $= \frac{48\times10^{-3}\times\frac{4}{3\pi}(3\text{ cm})^3}{R\times T}$

moles $= \frac{P\times\frac{4}{3\pi}(12\text{ cm})^3}{RT}$

$P \times 144 \times 12 = 48 \times 9 \times 3 \times 10^{-3}$

$P = \frac{27}{36} \times 10^{-3}$

$P = \frac{27000}{36} \times 10^{-6}$

$P = \frac{3000}{4} \times 10^{-6}$

$P = 750 \times 10^{-6}$ bar

47. (5) $\Delta T_b = i \times K_b \times m$

$i \times 0.1 \times K_b = 3 \times 0.05 \times K_b \times 2$

$i = 3$

$[Cr(NH_3)_5 \cdot Cl]Cl_2 \rightarrow [Cr(NH_3)_5Cl]^{+2} + 2Cl^-$

$x = 5$

48. (11)

$$\frac{10}{122} \times 6 = \frac{2 \times t(hr) \times 3600 \times 60\%}{96500}$$

$$t(hr) = \frac{96500}{122 \times 72} = 10.98hr$$

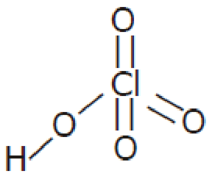
$= 11$ hours

49. **(50%)** Carius method

$$\% \text{ of Br} = \frac{\text{wt of AgBr}}{\text{wt. of organic compound}} \times 100 \times \frac{\text{molar mass of Br}}{\text{AgBr}}$$

$$= \frac{1.88}{1.6} \times \frac{80}{188} \times 100 = \frac{15040}{300.8} = 50\%$$

50. (3)



51. (a)

$\{z = x + iy \in c : |z| - \text{Re}(z) \le 1\}$

$|z| = \sqrt{x^2 + y^2}$

$\text{Rc}(z) = x$

$|z| - \text{Re}(z) \le 1$

$\Rightarrow \sqrt{x^2 + y^2} - x \le 1$

$\Rightarrow \sqrt{x^2 + y^2} \le 1 + x$

$\Rightarrow x^2 + y^2 \le 1 + x^2 + 2x$

$\Rightarrow y^2 \le 2\left(x + \frac{1}{2}\right)$

52. (d)

$p \vee (\sim p \wedge q)$

$(p \wedge \sim p) \wedge (p \vee q)$

$t \wedge (p \vee q)$

$p \vee q$

$\sim (p \vee (\sim p \wedge q)) = \sim (p \vee q)$

$= (\sim P) \wedge (\sim q)$

53. (c)

$$\sqrt{1 + x^2 + y^2 + x^2y^2} + xy\frac{dy}{dx} = 0$$

$$\sqrt{(1 + x^2)(1 + y^2)} + xy\frac{dy}{dx} = 0$$

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

Integrate the equation

$$\int \frac{\sqrt{1 + x^2}}{x}dx = -\int \frac{y}{\sqrt{1 + y^2}}dy$$

$1 + x^2 = t^2 \quad 1 + y^2 = z^2$

$2xdx = 2tdt$

$dx = \frac{t}{x} dt$

$2ydy = 2zdz$

$\int \frac{t \cdot tdt}{t^2 - 1} = -\int \frac{zdx}{z}$

$\int \frac{t^2 - 1 + 1}{t^2 - 1} dt = -z + c$

$\int 1\mathrm{dt} + \int \frac{1}{\mathrm{t}^2 - 1} \mathrm{dt} = -\mathrm{z} + \mathrm{c}$

$\mathrm{t} + \frac{1}{2} \ln\left(\frac{\mathrm{t} - 1}{\mathrm{t} + 1}\right) = -\mathrm{z} + \mathrm{c}$

$\sqrt{1 + \mathrm{x}^2} + \frac{1}{2} \ln\left(\frac{\sqrt{1 + \mathrm{x}^2} - 1}{\sqrt{1 + \mathrm{x}^2} + 1}\right) = -\sqrt{1 + \mathrm{y}^2} + \mathrm{C}$

$\sqrt{1 + y^2} + \sqrt{1 + x^2} = \frac{1}{2} \ln\left(\frac{\sqrt{x^2 + 1} + 1}{\sqrt{x^2 + 1} - 1}\right) + c$

54. (d) Let tangent of $y^2 = 4(x + 1)$

$\mathrm{L}_1 : \mathrm{t}_1 \mathrm{y} = (\mathrm{x} + 1) + \mathrm{t}_1{}^2 \ldots \ldots .. (\mathrm{i})$

and tangent of $y^2 = 8(x + 2)$

$L_2 : t_2 y = (x + 2) + 2t_2{}^2$

$\mathrm{L}_1 \perp \mathrm{L}_2$

$\frac{1}{\mathrm{t}_1} \cdot \frac{1}{\mathrm{t}_2} = -1$

$\mathrm{t}_1 \mathrm{t}_2 = -1$

t_2 (i) $-\mathrm{t}_1$ (ii)

$t_1 t_2 y = t_2(x + 1) + t_2 \cdot t_1{}^2$

$t_1 t_2 y = t_1(x + 2) + 2t_2{}^2 \cdot t_1$

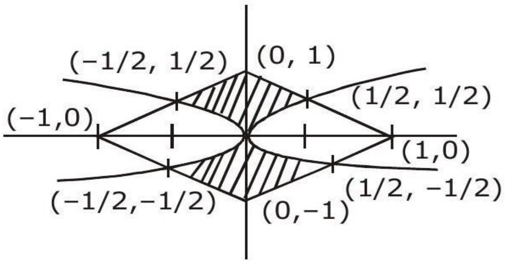
$(\mathrm{t}_2 - \mathrm{t}_1)\mathrm{x} + (\mathrm{t}_2 - 2\mathrm{t}_1) + \mathrm{t}_2 \mathrm{t}_1(\mathrm{t}_1 - 2\mathrm{t}_2) = 0$

$(\mathrm{t}_2 - \mathrm{t}_1)\mathrm{x} + (\mathrm{t}_2 - 2\mathrm{t}_1) - (\mathrm{t}_1 - 2\mathrm{t}_2) = 0$

$(\mathrm{t}_2 - \mathrm{t}_1)\mathrm{x} + 3\mathrm{t}_2 - 3\mathrm{t}_1 = 0$

$\Rightarrow \mathrm{x} + 3 = 0$

55. (b)



Total area $= 4\int_0^{1/2}\left[(1-x)-\left(\sqrt{\frac{x}{2}}\right)\right]dx$

$= 4\left[x-\frac{x^2}{2}-\frac{1}{\sqrt{2}}\frac{x^{3/2}}{3/2}\Big|_0^{1/2}\right]$

$= 4\left[\frac{1}{2}-\frac{1}{8}-\frac{\sqrt{2}}{3}\left(\frac{1}{2}\right)^{3/2}\right]$

$= 4\times\frac{5}{24}=\frac{5}{6}$

56. (c) Plane through line of intersection is

$x+y+z+1+\lambda(2x-y+z+3)=0$

It should be parallel to given line

$0(1+2\lambda)-1(1-\lambda)+1(1+\lambda)=0 \Rightarrow \lambda=0$

Plane: $x+y+z+1=0$

Shortest distance of $(1,-1,0)$ from this plane

$=\frac{|1-1+0+1|}{\sqrt{1^2+1^2+1^2}}=\frac{1}{\sqrt{3}}$

57. (b)

58. (b) $F_1 \to 3$ members

$F_2 \to 3$ members

$F_3 \to 4$ members

No. of ways can they be seated so that the same family members are not separated

$= 3!\times 3!\times 3!\times 4! = (3!)^3\cdot 4!$

59. (b)

$x+y+z=2$

$x+2y+3z=5$

$x+3y+\lambda z=\mu$

has infinitely many solutions

$$\Delta = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 3 & \lambda \end{vmatrix} = 0$$

$R_2 \to R_2 - R_1$

$R_3 \to R_3 - R_1$

$$\begin{vmatrix} 1 & 1 & 1 \\ 0 & 1 & 2 \\ 0 & 2 & \lambda - 1 \end{vmatrix} = 0$$

$(\lambda - 1 - 4) = 0$

$\Rightarrow \lambda = 5$

$$\Delta_3 = \begin{vmatrix} 1 & 1 & 2 \\ 1 & 2 & 5 \\ 1 & 3 & \mu \end{vmatrix} = 0$$

$R_2 \to R_2 - R_1$

$R_3 \to R_3 - R_1$

$$\begin{vmatrix} 1 & 1 & 2 \\ 0 & 1 & 3 \\ 0 & 2 & \mu - 2 \end{vmatrix} = 0$$

$(\mu - 2) - 6) = 0$

$\Rightarrow \mu = 8$

$\lambda = 5, \mu = 8$

60. (a)

$$\begin{vmatrix} \cos^2 x & 1 + \sin^2 x & \sin 2x \\ 1 + \cos^2 x & \sin^2 x & \sin 2x \\ \cos^2 x & \sin^2 x & 1 + \sin 2x \end{vmatrix}$$

$R_1 \to R_1 - R_2, R_3 \to R_3 - R_2$

$$\begin{vmatrix} -1 & 1 & 0 \\ 1 + \cos^2 x & \sin^2 x & \sin 2x \\ -1 & 0 & 1 \end{vmatrix}$$

$\Rightarrow -1(\sin^2 x) - 1(1 + \cos^2 x + \sin 2x)$

$\Rightarrow -\sin^2 x - \cos^2 x - 1 - \sin 2x$

$= -2 - \sin 2x$

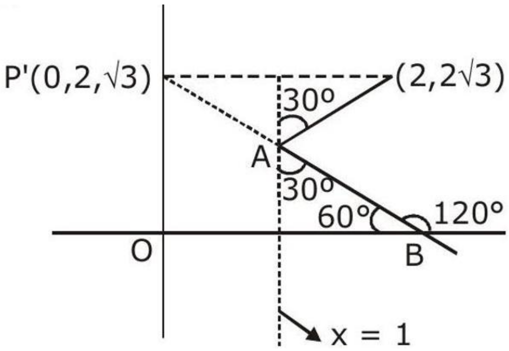
$\therefore$ minimum value when $\sin 2x = 1$

$m = -2 - 1 = -3$

$\therefore$ Maximum value when $\sin 2x = -1$

$(m, M) = (-3, -1)$

61. (c)



Equation of P′B → $y - 2\sqrt{3} = \tan 120°(x - 0)$

$\sqrt{3}x + y = 2\sqrt{3}$

$(3, -\sqrt{3})$ satisfy the line

62. (b) case I

E, O, E, O, E, O, E, O, E, O, E

$2b = a + c \rightarrow$ Even

⇒ Both a and c should be either even or odd.

$$P = \frac{{}^{6}C_2 + {}^{5}C_2}{{}^{11}C_3} = \frac{5}{33}$$

Case -2

$O, E, O, E, O, E, O, E, O, E, O$

$$P = \frac{{}^{5}C_2 + {}^{6}C_2}{{}^{11}C_3} = \frac{5}{33}$$

Total probability $= \frac{1}{2} \times \frac{5}{33} + \frac{1}{2} \times \frac{5}{33} = \frac{5}{33}$

63. (d)

64. (b)

$$\left\{\frac{3^{200}}{8}\right\}=\left\{\frac{9^{100}}{8}\right\}=\left\{\frac{(8+1)^{100}}{8}\right\}$$

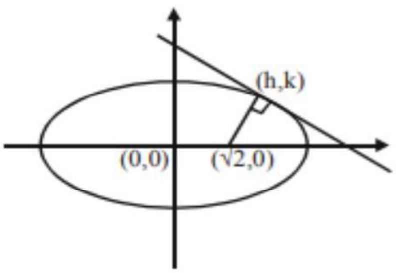
$$\left\{\frac{{}^{100}C_0 1^{100}+{}^{100}C_1(8)1^{99}+{}^{100}C_2(8^2)1^{98}+\cdots+{}^{100}C_{100}8^{100}}{8}\right\}$$

$$=\left\{\frac{{}^{100}C_0 1^{100}+8k}{8}\right\}$$

$$=\left\{\frac{1+8k}{8}\right\}=\left\{\frac{1}{8}+k\right\} K\in I$$

$$=\frac{1}{8}$$

65. (d) Let foot of perpendicular is (h,k)



$\frac{x^2}{4}+\frac{y^2}{2}=1$ (Given $)$

$a=2, b=\sqrt{2}, e=\sqrt{1-\frac{2}{4}}=\frac{1}{\sqrt{2}}$

$\therefore$ Focus (ae, 0) $=(\sqrt{2},0)$

Equation of tangent

$y=mx+\sqrt{a^2m^2+b^2}$

$y=mx+\sqrt{4m^2+2}$

Passes throguh $(h,k)(k-mh)^2=4m^2+2$

line perpendicular to tangent will have slope

$-\frac{1}{m}$

$y-0=-\frac{1}{m}(x-\sqrt{2})$

$my=-x+\sqrt{2}$

$(h+mk)^2=2$

Add equaiton (a) and (b) $k^2(1+m^2)+h^2(1+m^2)=4(1+m^2)$

$h^2+k^2=4$

$x^2 + y^2 = 4$ (Auxilary circle)
$\therefore (-1, \sqrt{3})$ lies on the locus.

66. (d) $\lim_{x\to 1}\left(\frac{\int_0^{(x-1)^2} t\cos(t^2)dt}{(x-1)\sin(x-1)}\right)$

Using L-Hopital rule

$$= \lim_{x\to 1}\frac{2(x-1)\cdot(x-1)^2\cos(x-1)^4 - 0}{(x-1)\cdot\cos(x-1)+\sin(x-1)}\left(\frac{0}{0}\right)$$

$$= \lim_{x\to 1}\frac{2(x-1)^3\cdot\cos(x-1)^4}{(x-1)\left[\cos(x-1)+\frac{\sin(x-1)}{(x-1)}\right]}$$

$$= \lim_{x\to 1}\frac{2(x-1)^2\cos(x-1)^4}{(x-1)\left[\cos(x-1)+\frac{\sin(x-1)}{(x-1)}\right]}$$

$$= \lim_{x\to 1}\frac{2(x-1)^2\cos(x-1)^4}{\cos(x-1)+\frac{\sin(x-1)}{(x-1)}}$$

on taking limit

$$= \frac{0}{1+1} = 0$$

67. (d) S.D. $= \sqrt{\frac{\Sigma(x_i-a)^2}{n} - \left(\frac{\Sigma(x_i-a)}{n}\right)^2}$

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

68. (c) $x^2 - 64x + 256 = 0$

$\alpha + \beta = 64$

$\alpha\beta = 256$

$$\left(\frac{\alpha^3}{\beta^5}\right)^{1/8} + \left(\frac{\beta^3}{\alpha^5}\right)^{1/8}$$

$$= \frac{\alpha+\beta}{(\alpha\beta)^{5/8}} = \frac{64}{(256)^{5/8}} = \frac{64}{32} = 2$$

69. (a) $f'(t) = v_{av} = \frac{f(t_2)-f(t_1)}{t_2-t_1}$

$$= \frac{a(t_2^2-t_1^2)+b(t_2-t_1)}{t_2-t_1}$$

$$= a(t_1+t_2)+b = 2at+b$$

$t = \frac{t_1 + t_2}{2}$

70. (b) $I_1 = \int_0^1 (1 - x^{50})^{100} dx$

$I_2 = \int_0^1 (1 - x^{50})(1 - x^{50})^{100} dx$

$= \int_0^1 (1 - x^{50})^{100} dx - \int_0^1 x^{50}(1 - x^{50})^{100} dx$

$I_2 = I_1 - \int_0^1 \underset{I}{x} - \underbrace{x^{49}(1 - x^{50})^{100}}_{II} dx$

By using by parts

$1 - x^{50} = t$

$\Rightarrow x^{49} dx = \frac{-dt}{50}$

$I_2 = I_1 - \left[x \left(\frac{-1}{50}\right) \frac{(1 - x^{50})^{101}}{101} \right]_0^1 + \int_0^1 \left(\frac{-1}{50}\right) \frac{(1 - x^{50})^{101}}{101}$

$I_2 = I_1 - 0 + \frac{\int_0^1 (1 - X^{50})^{101}}{(-5050)} dx$

$I_2 = I_1 - \frac{I_2}{5050}$

$\frac{5051}{5050} I_2 = I_1$

$I_2 = \frac{5050}{5051} I_1$

$\alpha = \frac{5050}{5051}$

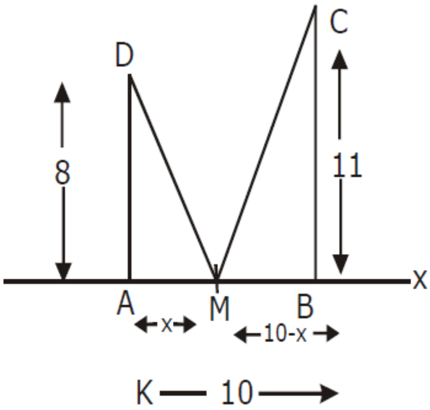
71. (4)

$\sqrt{3}|\vec{a} + \vec{b}| + |\vec{a} - \vec{b}|$
$= \sqrt{3}(\sqrt{2 + 2\cos\theta}) + \sqrt{2 - 2\cos\theta}$
$= \sqrt{6}(\sqrt{1 + \cos\theta}) + \sqrt{2}(\sqrt{1 - \cos\theta})$

$= 2\sqrt{3}\left|\cos\frac{\theta}{2}\right| + 2\left|\sin\frac{\theta}{2}\right|$

$\leq \sqrt{(2\sqrt{3})^2 + (2)^2} = 4$

72. (5)



$(MD)^2 = x^2 + 8^2 = x^2 + 64$

$(MC)^2 = (10 - x)^2 + (11)^2 = (x - 10)^2 + 121$

$f(x) = (MD)^2 + (MC)^2 = x^2 + 64 + (x - 10)^2 + (\mathrm{b})$

Differentiate

$\mathrm{f}'(\mathrm{x}) = 0$

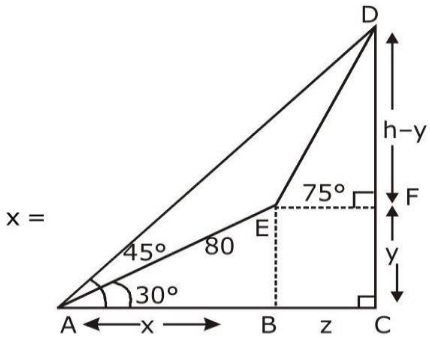
$2x + 2(x - 10) = 0$

$4x = 20 \Rightarrow x = 5$

$f''(x) = 4 > 0$

at $x = 5$ point of minima

73. (5)
74. (80)



$x = 80\cos 30^\circ = 40\sqrt{3}$

$y = 80\sin 30^\circ = 40$

$\ln\triangle$ ADC

$\tan 45^\circ = \dfrac{\mathrm{h}}{\mathrm{x}+\mathrm{z}} \Rightarrow \mathrm{h} = \mathrm{x} + \mathrm{z}$

$\Rightarrow \mathrm{h} = 40\sqrt{3} + \mathrm{z}$

In ΔEDF

$\tan 75° \dfrac{h-y}{z}$

$2+\sqrt{3}=\dfrac{h-40}{z} \Rightarrow z=\dfrac{h-40}{2+\sqrt{3}}$

Put the value of z from (i)

$h-40\sqrt{3}=\dfrac{h-40}{2+\sqrt{3}}$

$h(1+\sqrt{3})=40(2\sqrt{3}+3-1)$

$h(1+\sqrt{3})=80(1+\sqrt{3})$

$h=80$

75. (28) A & B are set

No. of subset of $A = 2^m$

No. of subset of $B = 2^n$

$2^m = 2^n + 112$

$2^m - 2^n = 112$

$2^n(2^{m-n}-1)=112$

$2^n(2^{m-n}-1)=2^4(2^3-1)$

$n=4 \quad m-n=3$

$m-4=3 \Rightarrow m=7$
$m.n=28$