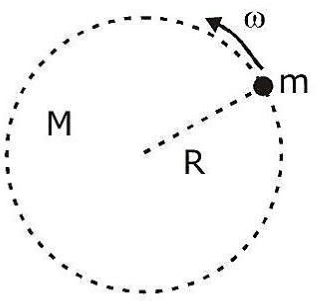
1. (a)



Mass of galaxy $= \int_0^R \rho \mathrm{dv}$

$= \int_0^R \frac{k}{r} 4\pi r^2 dr$

$= 4\pi k \int_0^R r dr$

$M = \frac{4\pi k R^2}{2} = k_1 R^2$

$\mathrm{F} = \mathrm{m}\omega^2\mathrm{R}$

$\frac{GMm}{R^2} = m\omega^2 R$

$\frac{\mathrm{Gk_1R^2}}{\mathrm{R^2}} = \omega^2\mathrm{R}$

$\therefore \omega^2 = \frac{\mathrm{k_2}}{\mathrm{R}}$

$\omega = \sqrt{\frac{\mathrm{k_2}}{\mathrm{R}}}$

$\mathrm{T} = \frac{2\pi}{\omega} = 2\pi\sqrt{\frac{\mathrm{R}}{\mathrm{k_2}}}$

$\mathrm{T} = \mathrm{k_3}\sqrt{\mathrm{R}}$

$T^2 \propto R$

2. (d) $\frac{A_m}{A_c} = 0.6$

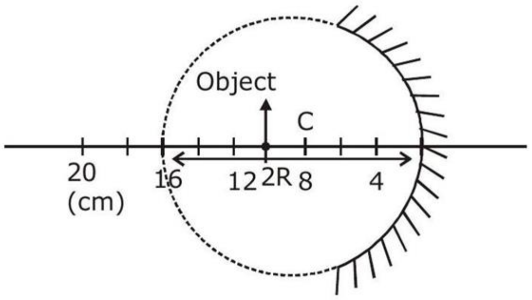
$= (5 + 3\cos 6280\mathrm{t})\sin(211 \times 10^4\mathrm{t})$

maximum Amp. $= 5 + 3 = 8$ V

minimum Amp. $= 5 - 3 = 2$ V

from the given option nearest value of minimum Amplitude $= \frac{5}{2}$ V

3. (d)

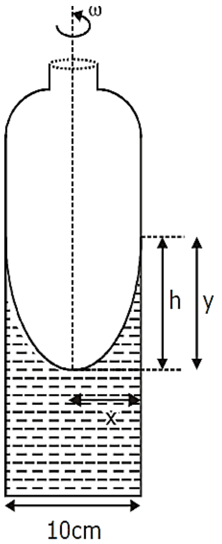


∴ beyond C i.e. $-\infty < u < C$

∴ real, inverted

and unmagnified

4. (c)



$$y = \frac{\omega^2 x^2}{2g}$$

at $x = 5$ cm, $y = h$

$$h = \frac{\omega^2 (5)^2}{2g} = \frac{25\omega^2}{2g}$$

5. (c)

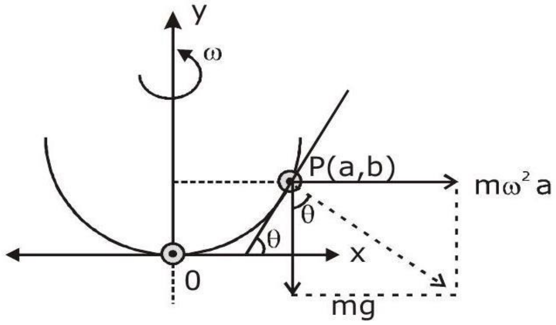
6. (d) $y = 4cx^2$

$$\frac{dy}{dx} = 8cx$$

$$\tan\theta = \frac{m\omega^2 a}{mg}$$

$$\tan\theta = \frac{dy}{dx} = 8cx$$

$8cx=\frac{\omega^2 a}{g}$



$(x=a), 8ca=\frac{\omega^2 a}{g}$

$\sqrt{8cg}=\omega$

$2\sqrt{2gc}=\omega$

7. (b) Permanent magnet must retain for long use and should not be easily demagnetised.

8. (d) given, $\mathrm{d}=1\ \mathrm{mm}$

$\lambda=632.8\ \mathrm{nm}$

$\mathrm{D}=100\ \mathrm{cm}$

$y=1.27\ \mathrm{mm}$

$\Delta \mathrm{x}=\mathrm{d}\sin\theta$

$\because(\theta=\text{small})$

$\Delta \mathrm{x}=\mathrm{d}\tan\theta$

$\Delta \mathrm{x}=\frac{\mathrm{dy}}{\mathrm{D}}=\frac{1\times10^{-3}\times1.27\times10^{-3}}{100\times10^{-2}}$

$=1.27\times10^{-6}\ \mathrm{m}$

$=1.27\mu\mathrm{m}$

9. (c) $\mathrm{U}=\mathrm{n}_1\mathrm{C}_{\mathrm{v}_1}\mathrm{T}+\mathrm{n}_2\mathrm{C}_{\mathrm{v}_2}{}^{\mathrm{T}}$

$=3\times\frac{5}{2}RT+5\times\frac{3}{2}RT$

$=\frac{30}{2}\mathrm{RT}=15\mathrm{RT}$

10. (a) energy density $=\frac{B_0^2}{2\mu_0}$

& $C=\frac{1}{\sqrt{\mu_0\epsilon_0}}$

$$\mu_0 = \frac{1}{C^2\epsilon_0}$$

$$B = \sqrt{U \times 2\mu_0}$$

$$= \sqrt{1.02 \times 10^{-8} \times 2 \times \frac{1}{9 \times 10^{16}} 4\pi \times 9 \times 10^9}$$

$$= \sqrt{25.62 \times 10^{-15}}$$

$$\cong \sqrt{25600 \times 10^{-18}}$$

$$\cong 160 \times 10^{-9}$$

$$= 160\mathrm{nT}$$

11. (d)

12. (a) pitch $= \mathrm{V}\cos 60°, T = \frac{V}{2}\frac{2\pi \mathrm{m}}{\mathrm{eB}}$

$$= 4 \times 10^5 \times \frac{1}{2} \times \frac{2\pi}{0.3}\left(\frac{\mathrm{m}}{\mathrm{e}}\right)$$

$$= \frac{4\pi \times 10^5 \times 10^{-8}}{0.3}$$

$$= \frac{4 \times 3.14 \times 10^{-3}}{3 \times 10^{-1}}$$

$$\sim 4 \times 10^{-2}\ \mathrm{m}$$

$$\approx 4\ \mathrm{cm}$$

13. (a) $f = \frac{1}{2\,\mathrm{L}}\sqrt{\frac{\mathrm{T}}{\mu}}$

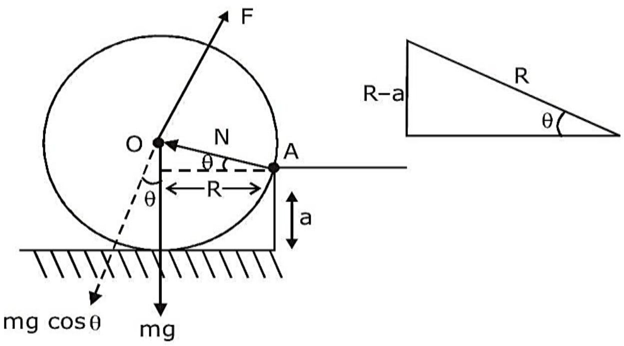
given, $\mu_x = \mu_z \& L_x = L_z$ as identical

$$\therefore f \propto \sqrt{T}$$

$$\Rightarrow \frac{\mathrm{T_x}}{\mathrm{T_z}} = \frac{f_x^2}{f_z^2} = \left(\frac{450}{300}\right)^2 = \left(\frac{3}{2}\right)^2 = \frac{9}{4}$$

$$\frac{T_x}{T_y} = 2.25$$

14. (d)



$$\cos\theta = \frac{\sqrt{R^2-(R-a)^2}}{R}$$

$$= \sqrt{\frac{R^2}{R^2}-\left(\frac{R-a}{R}\right)^2}$$

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

to pull up, $\tau_F \geq \tau_{mg}$

$FR \geq mg\cos\theta R$

for m in F, $F_{\min} = mg\cos\theta$

$$F_{\min} = mg\sqrt{1-\left(\frac{R-a}{R}\right)^2}$$

15. (a)

$$n(\text{ moles }) = \frac{2\text{ kg}}{235\text{gm}} = \frac{2000}{235}$$

no. of nucleus $= N_A \times n$

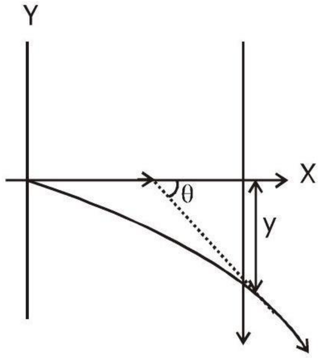
$$= 6.022 \times 10^{23} \times \frac{2000}{235}$$
$$= 51.25 \times 10^{23}$$

total energy released $= 200 \times 51.25 \times 10^{23}\text{MeV}$

$$= 102.5 \times 10^{25}\text{MeV}$$
$$= 102.5 \times 10^{25} \times 10^6 \times 1.6 \times 10^{-16}\text{ J}$$
$$= 164 \times 10^6\text{MJ}$$

$$\text{power } = \frac{164 \times 10^6\text{MJ}}{30 \times 24 \times 60 \times 60\text{ S}}$$
$$= 0.063 \times 10^3\text{MW}$$
$$\cong 60\text{MW}$$

16. (b)



$$-y = \frac{1}{2}at^2$$

$$-y = \frac{1}{2}\frac{qE}{m}t^2$$

$$X = V_o t$$

$$\Rightarrow t = \frac{x}{V_0}$$

for $x \leq d$,

$$y = -\frac{1}{2}\frac{qE}{m}\frac{x^2}{V_0^2}$$

$$\left.\frac{dy}{dx}\right|_{x=d} = -\frac{1}{2}\frac{qE}{m} \times \left.\frac{2x}{V_0^2}\right|_{x=d}$$

Slope $= m = \tan\theta = -\frac{qEd}{m_0^2}$

equation of straight line,

$$y = (\tan\theta)x + c$$

$$= -\left(\frac{qEd}{mv_0^2}\right)x + c$$

(now for C, at $x = d, y = -\frac{qEd^2}{2mv_0^2}$ put in (d)

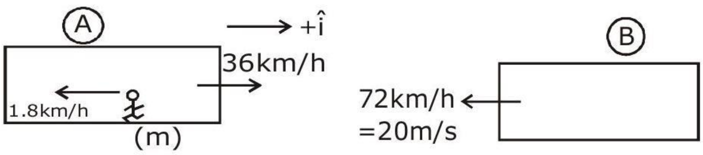
$$-\frac{qEd^2}{2mv_0^2} = -\frac{qEd^2}{mV_0^2} + c$$
$$\Rightarrow c = \frac{qEd^2}{2mvv_0^2}$$

for $x > d$, as no $\vec{E}$

$$y = -\left(\frac{qEd}{mv_0^2}\right)x + \frac{qEd^2}{2mv_0^2}$$

$$y = \frac{qEd}{mv_0^2}\left(\frac{d}{2} - x\right)$$

17. (a)



$\overrightarrow{V_m} = \overrightarrow{V_{m/A}} + \overrightarrow{V_A}$

$= (-1.8\hat{\imath} + 36\hat{\imath})\text{km/h}$

$= \left(-1.8 \times \frac{5}{18} + 36 \times \frac{5}{18}\right) \text{m/s}$

$= (-0.5\hat{\imath} + 10\hat{\imath})\text{m/s}$

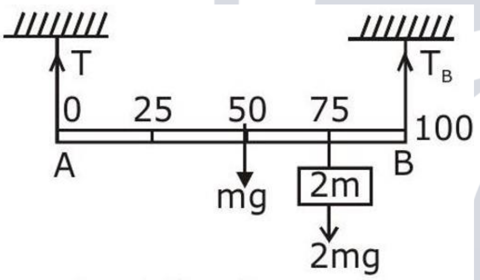
$= 9.5\hat{\imath}\ \text{m/s}$

$\overrightarrow{V_{m/B}} = \overrightarrow{V_M} - \overrightarrow{V_B}$

$= 9.5\hat{\imath} - (-20\hat{\imath})m/s$

$= 29.5\ \text{m/s}\hat{\imath}$

18. (c)



τ_{net} about $B = 0$

$\text{T} \times 100\ \text{cm} = \text{mg} \times 50\ \text{cm} + 2\text{mg} \times 25\ \text{cm}$

$\text{T} = 1\text{mg}$

19. (b) L.C. $= 1\text{MSD} - 1\text{VSD}$

L.C. $= 0.1\text{MSD}$

$1\text{MSD} = 1\ \text{mm}$

L. C. $= 0.1\ \text{mm}$

ve zero error $= +7 \times$ L.C.

$= 0.7\ \text{mm}$

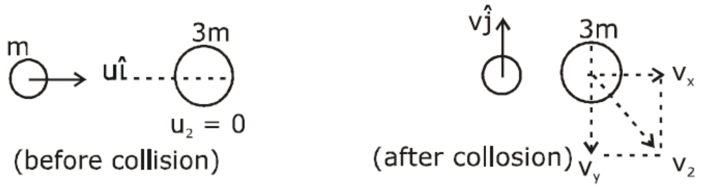
Reading $= (3.1\ \text{cm} + 4 \times \text{L.C}) -$ zero error

$= 3.1\ \text{cm} + 0.4\ \text{mm} - 0.7\ \text{mm}$

$= 3.1\text{ cm} - 0.03\text{ cm}$ (as given 1MSD = 1 mm)

$= 3.07\text{ cm}$

20. (d)



$\vec{p_i} = \vec{p_f}$

$mu\hat{i} + 0 = mv\hat{j} + 3m\vec{V_2}$

$\frac{mu\hat{i}}{3m} - \frac{mv\hat{j}}{3m} = \vec{V_2}$

$\vec{V_2} = \frac{u}{3}\hat{i} - \frac{v}{3}\hat{j}$

now, K.E conserved as elastic collision

$\Sigma KE_1 = \Sigma KE_f$

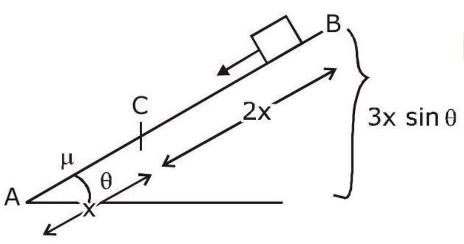
$\frac{1}{2}mu^2 = \frac{1}{2}mv^2 + \frac{1}{2}3m\left(\frac{u^2}{9} + \frac{v^2}{9}\right)$

$\Rightarrow u^2 = v^2 + \frac{u^2}{3} + \frac{v^2}{3}$

$\frac{2}{3}u^2 = \frac{4}{3}v^2$

$\Rightarrow \mathrm{v} = \frac{\mathrm{u}}{\sqrt{2}}$

21. (3)



from work energy theorem

$\mathrm{W_g} + \mathrm{W_f} = \Delta \mathrm{kE}$

$\mathrm{mg3xsin}\,\theta - \mu\mathrm{mgcos}\,\theta\mathrm{x} = 0 - 0$

$\Rightarrow \mathrm{mg3xsin}\,\theta = \mu\mathrm{mgcos}\,\theta\mathrm{x}$

$3\tan\theta = \mu$

$k = 3$

22. (46)

$$T_2\, V_2^{\gamma-1} = T_1\, V_1^{\gamma-1}$$

$$T_2 = T_1\left(\frac{V_1}{V_2}\right)^{\gamma-1}$$

$$= 293\left(\frac{V}{V/10}\right)^{\frac{7}{5}-1}$$

$$T_2 = 293 \times (10)^{2/5}$$

$$\Delta U = nC_v\Delta T = 5 \times \frac{5}{2}R\left(293 \times 10^{\frac{2}{5}} - 293\right)$$

$$= \frac{25}{2}R \times 293\left(10^{\frac{2}{5}} - 1\right) = \frac{25R}{2} \times 293(2.5 - 1)$$

$$= \frac{25 \times 8.314 \times 293 \times 1.5}{2}$$

$$= 45675\text{ J} = 46\text{ kJ}$$

23. (9)

$$\frac{hc}{\lambda} = \phi + eV$$

$$\frac{hc}{3\lambda} = \phi + \frac{eV}{4}$$

$$\frac{\text{eq.(a)}}{\text{eq.(b)}} \quad 3 = \frac{\phi + eV}{\phi + \frac{eV}{4}}$$

$$3\phi + \frac{3eV}{4} = \phi + eV$$

$$2\phi = \frac{eV}{4}$$

$$\phi = \frac{eV}{8}$$

$$\frac{hc}{\lambda} = \frac{eV}{8} + eV$$

$$= \frac{9}{8}eV$$

$$\therefore eV = \frac{8}{9}\frac{hc}{\lambda}$$

$$\text{so } \phi = \frac{hc}{\lambda} - \frac{8}{9}\frac{hc}{\lambda}$$

$$\phi = \frac{1}{9}\frac{hc}{\lambda}$$

$$\frac{hc}{\lambda_{th}} = \frac{hc}{9\lambda}$$

$\therefore \lambda_{th} = 9\lambda$

24. (15)

$\phi = BA\cos\omega t$

$$E = \frac{-d\phi}{dt} = BA\omega\sin\omega t$$

$$E_{max} = BA\omega \left(\omega = \frac{\pi}{0.2}\right)$$

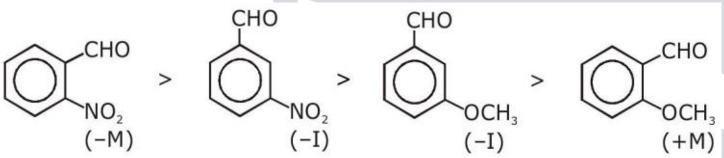
$$= 3 \times 10^{-5} \times \pi R^2 \times \frac{\pi}{0.2}$$

$= 15 \times 10^{-6}$ V

$= 15\mu$V

25. (40)

26. (a) In HCN, $CN^-$is acts as nucleophile, attack first that $-CHO$ group which has maximum positive charge. The magnitude of the (+ve) charge increases by $-M$ and $-I$ group. So reactivity order will be



27. (d) Bredig's Arc method

28. (a)

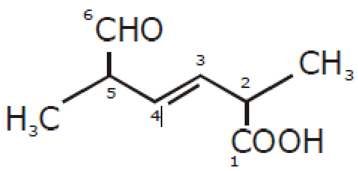
29. (b) $Mn^{2+}[Ar]3\ d^5$ it can form low spin as well as high spin complex depending upon nature of ligand same of Ni^{2+} ion with coordination no 4 . It can be dsp^2 or sp^3i : e low spin or high spin depending open nature of ligand.

30. (c) $\dot{C}l + O_3 \longrightarrow Cl\dot{O} + O_2$

Chlorine monoxide

31. (d)

32. (b)



2,5-Dimethyl-6-oxohex-3-enoic acid

33. (d)

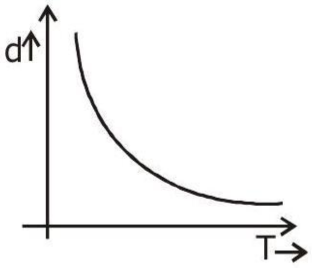
(A) is (B) true &

(R) is correct explanation of (A)

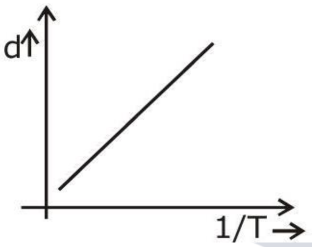
34. (d) For ideal Gas

$$d = \frac{P \times M}{RT}$$

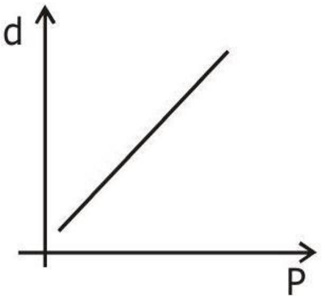
d v/s T → Hyperbolic



dv/s$\frac{1}{T}$ → St. line



dv/sp → St line



∴ 'II' Graph is incorrect

35. (a) Bunsen Burner & measuring cylinder are not Required. As titration is already on exothermic pro cess

36. (c) carius method

mass % of ' Br' $= \frac{0.08}{0.172} \times 100 = \frac{8000}{172} = 46.51\%$

option (a) mass % $= \frac{80}{95} \times 100$

(b) mass % $= \frac{2 \times 80 \times 100}{252}$

(c) mass % $= \frac{1 \times 80 \times 100}{80+72+6+14} = \frac{8000}{172}\%$

(d) mass % $= \frac{1 \times 80 \times 100}{109}\%$

37. (d) The gas (B) is N_2 which is found in air

$N_2 + 3H_2 \overset{Fe/Mo}{\rightleftharpoons} 2NH_3$ (Haber's process)

(Basic in nature)

$NH_3 + H_2O \rightarrow NH_4OH$ (weak base)

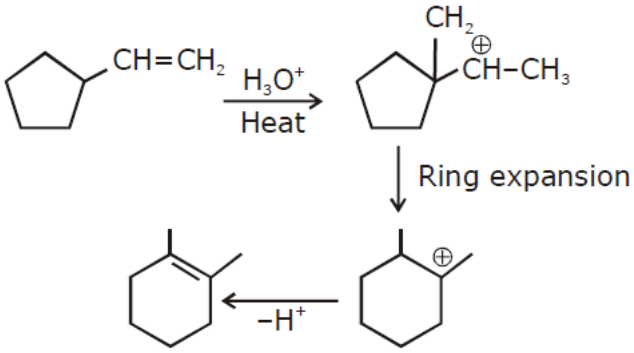
$(NH_4)_2Cr_2O_7 \longrightarrow N_2 + Cr_2O_3 + H_2O$

$NaN_3 \overset{\rightarrow}{\rightarrow} N_2 + Na$

$NH_4NO_2 \longrightarrow N_2 + H_2O$

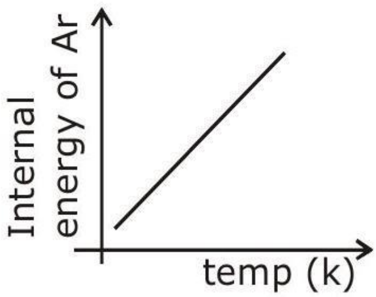
$Pb(NO_3)_2 \longrightarrow PbO + NO_2 + O_2$

38. **(c)**

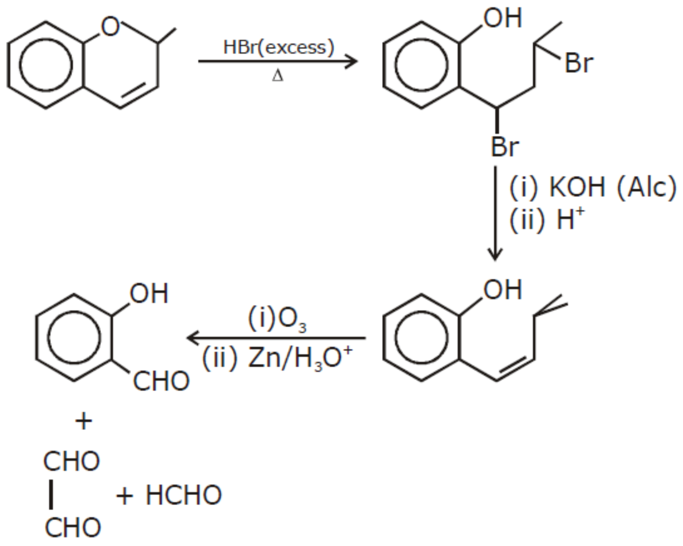


39. **(c)** Ionisation energy, electronegativity & electron gain enthalpy increase across a period but atomic radius decreases

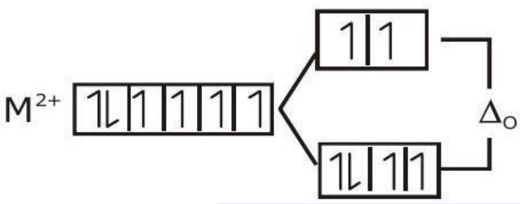
40. **(d)** Internal energy of 'Ar' or any gas, has nothing to do with Quantum nature of atom hence



41. **(c)**



42. (a)



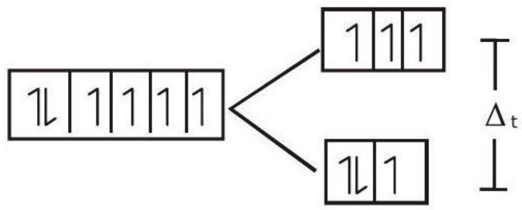
μspin $= 4.9$BM

CFSE $= -0.4 \times 4\Delta_0 + 0.6 \times 2\Delta_0$

$= [1.6 + 1.2]\Delta_0$

$= -0.4\Delta_0$

$\Rightarrow$



CFSE $= -0.6 \times 3\Delta_t + 0.4 \times 3\Delta_t$
$= -1.8\Delta_t + 1.2\Delta_t$
$= -0.6\Delta_t$

43. (a)
44. (a)
45. (b)
46. (48)

$$\frac{x}{m} = KP^{1/n}$$

$$\log(x/m) = \log_{(k)} + \frac{1}{n}\log(p)$$

$$y = c + mx$$

Intercept $C = \log_k = 0.4771$

$\text{slop} = \frac{1}{n} = 2, k = 3$

$\frac{x}{m} = k(P)^{1/n}$ at $P = 4$ atm

$\frac{x}{m} = 3 \times 16 = 48$

47. (96500)

$$\begin{aligned} &Cu(s) + Sn^{+2}(aq) \rightleftharpoons Cu^{+2}(aq) + Sn(s) \\ E^{O}_{cell} &= -0.16 - 0.34 \\ &= -0.50 \\ \Delta G^{O} &= -nFE^{O} \\ &= -2 \times 96500 \times (-0.5) \\ &= +96500 \\ \Delta G &= \Delta G^{O} + RT\ell nQ \\ &= 96500 + \frac{25}{3} \times 298 \times 2.303\log(1) \\ \Delta G &= 96500 \text{ Joules} \end{aligned}$$

48. $H_2O(\ell) \longrightarrow H_2O(g)$

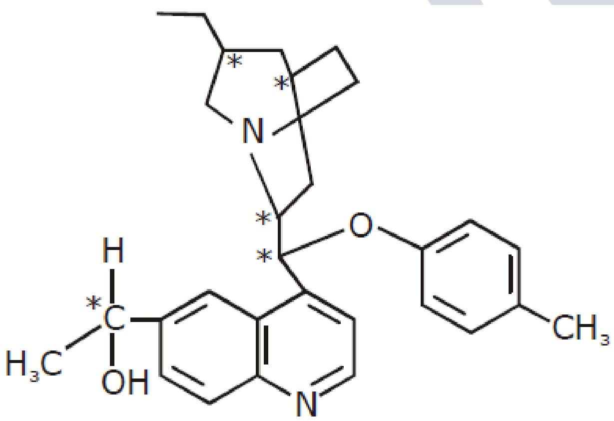
$$\begin{aligned} \Delta E_{vap} &= \Delta H_{vap} - \Delta ngRT \\ &= 41000 \times 5 - 5 \times 8.314 \times 373 \\ &= 189494.39 \end{aligned}$$

49. (6) $Na_4[Fe^{+2}(CN)_5(NOS)]$

$Na_4[Fe^{+4}O_4]$

$[Fe_2^0(CO)_9]$

50. (5)



Total chiral carbon = 5

51. (a) $T: \frac{xx_1}{4} - \frac{yy_1}{2} = 1$

$t: 2x - y = 0$ is parallel to T

$\Rightarrow T: 2x - y = \lambda$

Now compare (a) & (b)

$$\frac{x_1}{\frac{4}{2}} = \frac{y_1}{1} = \frac{1}{\lambda}$$

$x_1 = 8/\lambda \& y_1 = 2/\lambda$

(x_1, y_1) lies on hyperbola $\Rightarrow \frac{64}{4\lambda^2} - \frac{4}{2\lambda^2} = 1$

$\Rightarrow 14 = \lambda^2$

Now $= x_1^2 + 5y_1^2$

$$= \frac{64}{\lambda_2} + 5\frac{4}{\lambda_2}$$

$= \frac{84}{14}$ =6

52. (c) $-1 \le \frac{|x|+5}{x^2+1} \le 1$

$-x^2 - 1 \le |x| + 5 \le x^2 + 1$

case - I

$-x^2 - 1 \le |x| + 5$

this inequality is always right $\forall x \in R$

case - II

$|x| + 5 \le x^2 + 1$

$x^2 - |x| \ge 4$
$|x|^2 - |x| - 4 \ge 0$

$$\left(|x| - \left(\frac{1+\sqrt{17}}{2}\right)\right)\left(|x| - \left(\frac{1-\sqrt{17}}{2}\right)\right) \ge 0$$

$$|x| \le \frac{1-\sqrt{17}}{2} \cup |x| \ge \frac{1+\sqrt{17}}{2}$$

not possible

$$x \in \left(-\infty, \frac{-1-\sqrt{17}}{2}\right] \cup \left[\frac{1+\sqrt{17}}{2}, \infty\right)$$

$$a = \frac{1+\sqrt{17}}{2}$$

53. (d)

$f(x)$ is continuous

at $x=1 \Rightarrow ae+\frac{b}{e}=c$
at $x=3 \Rightarrow 9c=9a+6c \Rightarrow c=3a$
Now $f'(0)+f'(\mathrm{b})=e$
$\Rightarrow a-b+4c=e$
$\Rightarrow a-e(3a-ae)+4.3a=e$
$\Rightarrow a-3ae+ae^2+12a=e$
$\Rightarrow 13a-3ae+ae^2=e$
$\Rightarrow a=\frac{e}{13-3e+e^2}$

54. (d) $\frac{a}{r}\cdot a\cdot ar=27 \Rightarrow a=3$

$\frac{a}{r}+a+ar=s$

$\frac{1}{r}+1+r=\frac{S}{3}$

$r+\frac{1}{r}=\frac{S}{3}-1$

$r+\frac{1}{r}\geq 2$ or $r+\frac{1}{r}\leq -2$

$\frac{S}{3}\geq 3$ or $\frac{S}{3}\leq -1$

$\mathrm{S}\geq 9$ or $\mathrm{S}\leq -3$

$S\in(-\infty,-3]\cup[9,\infty)$

55. (a) $3y^2\leq 8-x^2$

$R:\{(0,1),(0,-1),(1,0),(-1,0),(1,1),(1,-1)$

$(-1,1),(-1,-1),(2,0),(-2,0),(-2,0),(2,1),(2,-1),(-2,1),(-2,-1)\}$

$\Rightarrow R:\{-2,-1,0,1,2\}\rightarrow\{-1,0,-1\}$

56. (c)

$$\left(\frac{1+\sin\frac{2\pi}{9}+i\cos\frac{2\pi}{9}}{1+\sin\frac{2\pi}{9}-i\cos\frac{2\pi}{9}}\right)^3$$
$$=\left(\frac{1+\cos\left(\frac{\pi}{2}-\frac{2\pi}{9}\right)+i\sin\left(\frac{\pi}{2}-\frac{2\pi}{9}\right)}{1+\cos\left(\frac{\pi}{2}-\frac{2\pi}{9}\right)-i\sin\left(\frac{\pi}{2}-\frac{2\pi}{9}\right)}\right)^3$$

$$= \left(\frac{1+\cos\frac{5\pi}{18}+i\sin\frac{5\pi}{18}}{1+\cos\frac{5\pi}{18}-i\sin\frac{5\pi}{18}}\right)^3$$

$$= \left(\frac{2\cos\frac{5\pi}{36}\left\{\cos\frac{5\pi}{36}+i\sin\frac{5\pi}{36}\right\}}{2\cos\frac{5\pi}{36}\left\{\cos\frac{5\pi}{36}-i\sin\frac{5\pi}{36}\right\}}\right)^3$$

$$= \left(\frac{\operatorname{cis}\left(\frac{5\pi}{36}\right)}{\operatorname{cis}\left(\frac{-5\pi}{36}\right)}\right)^3$$

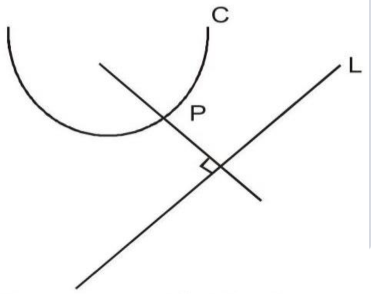
$$= \operatorname{cis}\left(\frac{5\pi}{36}\times 3+\frac{5\pi}{36}\times 3\right)$$

$$= \operatorname{cis}\left(\frac{10\pi}{12}\right)$$

$$= \operatorname{cis}\left(\frac{5\pi}{6}\right) = -\frac{\sqrt{3}}{2}+\frac{i}{2}$$

57. (d) $C: y = x^2 + 7x + 2$

Let $P: (h, k)$ lies on



Curve $= \mathrm{k} = \mathrm{h}^2 + 7\,\mathrm{h} + 2$

Now for shortest distance
$M_T|_p^c = m_L = 2h + 7 = 3$

$\mathrm{h} = -2$

$\mathrm{k} = -8$

$\mathrm{P}: (-2, -8)$

equation of normal to the curve is perpendicular to $L: 3x - y = 3$

$\mathrm{N}: \mathrm{x} + 3\mathrm{y} = \lambda$

$\downarrow$ Pass $(-2, -8)$

$\lambda = -26$

$N: x + 3y + 26 = 0$

58. (d) $P: A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} \neq I_2 \& |A| \neq 0 \& |A| = 1$ (false)

$Q: A=\begin{bmatrix}1 & 1\\ 0 & 1\end{bmatrix}=1$ then $\mathrm{Tr}(A)=2$ (true)

59. (b)

60. (b) $p'(\mathrm{a})=0\&p'(\mathrm{b})=0$

$p'(x)=a(x-1)(x-2)$

$p(x)=a\left(\frac{x^3}{3}-\frac{3x^2}{2}+2x\right)+b$

$p(\mathrm{a})=8\Rightarrow a\left(\frac{1}{3}-\frac{3}{2}+2\right)+b=8$

$\mathrm{p(b)}=4\Rightarrow \mathrm{a}\left(\frac{8}{3}-\frac{3.4}{2}+2.2\right)+\mathrm{b}=4$

from equation (i) and (ii)

$a=24\&b=-12$

$p(0)=b=-12$

61. (d) Statement p and q are true

Statement, then the contra positive of the implication

$p\rightarrow q=(\sim q)\rightarrow(\sim p)$

62. (d) $5x^2+6x-2=0<_{\beta}^{\alpha}=5\alpha^2+6\alpha=2$

$6\alpha-2=-5\alpha^2$

Simillarly

$6\beta-2=-5\beta^2$

$\mathrm{S}_6=\alpha^6+\beta^6$

$S_5=\alpha^5+\beta^5$

$\mathrm{S}_4=\alpha^4+\beta^4$

Now $6\ \mathrm{S}_5-2\ \mathrm{S}_4$

$=6\alpha^5-2\alpha^4+6\beta^5-2\beta^4$

$=a^4(6\alpha-2)+\beta^4(6\beta-2)$

$=\alpha^4(-5\alpha^2)+\beta^4(-5\beta^2)$

$=-5(\alpha^6+\beta^6)$

$=-5\ \mathrm{S}_6$

$=6\ \mathrm{S}_5+5\ \mathrm{S}_6=2\ \mathrm{S}_4$

63. (c)

$$\left.\frac{dy}{dx}\right|_{p(a,b)}^{c} = \frac{2-\frac{3}{2}}{\frac{1}{2}-0}$$

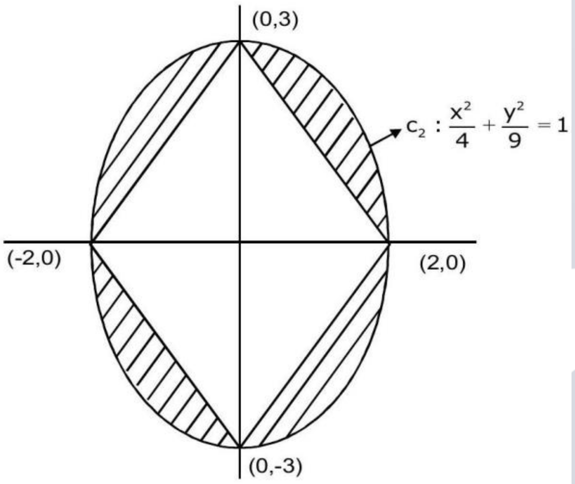
$$\begin{array}{c|c} 1+\cos b = 1 & p:(a,b) \text{ lies on curve} \\ \cos b = 0 & b = a+\sin b \end{array}$$

$b = a \pm 1$

$\mathrm{b} - \mathrm{a} = \pm 1$

$|\mathrm{b} - \mathrm{a}| = 1$

64. (b) $c_1: \frac{|x|}{2} + \frac{|y|}{3} = 1$



$A = 4\left(\frac{\pi ab}{4} - \frac{1}{2} \cdot 2 \cdot 3\right)$

$A = \pi \cdot 2.3 - 12$

$A = 6(\pi - 2)$

65. (b) $(x+y) + (x^2+xy+y^2) + (x^3+x^2y+xy^2+y^3) + \cdots \infty$

$$= \frac{1}{(x-y)}\{(x^2-y^2) + (x^3-y^3) + (x^4-y^4) + \cdots \infty\}$$

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

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

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

$= \dfrac{x+y-xy}{(1-x)(1-y)}$

66. (b) For term independent of x

$T_{r+1} = {}^{10}C_r \left(\alpha x^{\frac{1}{9}}\right)^{10-r} \cdot \left(\beta x^{-\frac{1}{6}}\right)^r$

$T_{r+1} = {}^{10}C_r \alpha^{10-r}\beta^r \cdot x^{\frac{10-r}{9}} \cdot x^{-\frac{r}{6}}$

$\because \dfrac{10-r}{9} - \dfrac{r}{6} = 0 \Rightarrow r = 4$

$\mathrm{T}_5 = {}^{10}\mathrm{C}_\mathrm{r}\alpha^6 \cdot \beta^4$

$\because$ AM $\geq$ GM

Now $\dfrac{\left(\frac{\alpha^3}{2}+\frac{\alpha^3}{2}+\frac{\beta^2}{2}+\frac{\beta^2}{2}\right)}{4} \geq \sqrt[4]{\frac{\alpha^6 \cdot \beta^4}{2^4}}$

$\left(\dfrac{4}{4}\right)^4 \geq \dfrac{\alpha^6\beta^4}{2^4}$

$\alpha^6 \cdot \beta^4 \leq 2^4$

${}^{10}\mathrm{C}_4 \cdot \alpha^6 \cdot \beta^4 \leq {}^{10}\mathrm{C}_4 2^4$

$\mathrm{T}_5 \leq {}^{10}\mathrm{C}_4 2^4$

$\mathrm{T}_5 \leq \dfrac{10!}{6!\,4!} \cdot 2^4$

$\mathrm{T}_5 \leq \dfrac{10 \cdot 9 \cdot 8 \cdot 7 \cdot 2^4}{4 \cdot 3 \cdot 2 \cdot 1}$

maximum value of $\mathrm{T}_5 = 10 \cdot 3 \cdot 7 \cdot 16 = 10\mathrm{k}$

$\mathrm{k} = 16.7.3$

$k = 336$

67. (d) For no solution

$\Delta = 0 \& \Delta_1 | \Delta_2 | \Delta_3 \neq 0$

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

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

$-4 - 2\lambda^2 + 1 - \lambda + 2\lambda + 4 = 0$

$-2\lambda^2 + \lambda + 1 = 0$

$2\lambda^2 - \lambda - 1 = 0 \Rightarrow \lambda = 1, -1/2$

Equation has exactly 2 solution

68. (c) $X:\{1,2,\ldots..17\}$

$Y:\{ax+b: x\in X \& a,b\in R, a>0\}$

Given Var(Y) $=216$

$\frac{\Sigma y_1^2}{n}-(\text{ mean })^2=216$

$\frac{\Sigma y_1^2}{17}-289=216$

$\Sigma y_1=8585$

$(a+b)^2+(2a+b)^2+\cdots.+(17a+b)^2=8585$

$105a^2+b^2+18ab=505\ldots..(a)$

Now $\sum y_1=17\times 17$

$a(17\times 9)+17\cdot b=17\times 17$

$9a+b=17\ldots.(b)$

from equation (a) & (b)

$a=3\&b=-10$

$a+b=-7$

69. (b) $\int\frac{dy}{y+1}=\int\frac{-\cos x dx}{2+\sin x}$

$\ln|y+1|=-\ln|2+\sin x|+k$

$\downarrow(0,1)$

$k=\ln 4$

Now C: $(y+1)(2+\sin x)=4$

$y(\pi)=a\Rightarrow(a+1)(2+0)=4\Rightarrow(a=1)$

$\left.\frac{dy}{dx}\right|_{x=\pi}=b\Rightarrow b=-(-1)\left(\frac{2+0}{1+1}\right)$

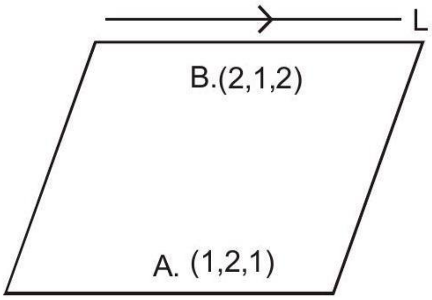
$\Rightarrow b=1$

$(a,b)=(1,1)$

70. (c)

$L:\begin{cases}2x=3y & (3,2,1)\\ z=1 & Q:(0,0,1)\end{cases}$

$\vec{V}_L$ Dr of line (3,2,0)



$\vec{n}_p = \overrightarrow{AB} \times \vec{V}_L$

$\vec{n}_p = \langle 1, -1, 1 \rangle \times \langle 3,2,0 \rangle$

$\vec{n}_p = \langle -2, +3, 5 \rangle$

Plane: $-2(x-1) + 3(y-2) + 5(z-1) = 0$

Plane: $-2x + 3y + 5z + 2 - 6 - 5 = 0$

Plane: $2x - 3y - 5z = -9$

71. (9) $c: (1,2) \& r = 1$

$|\text{cp}| < r$

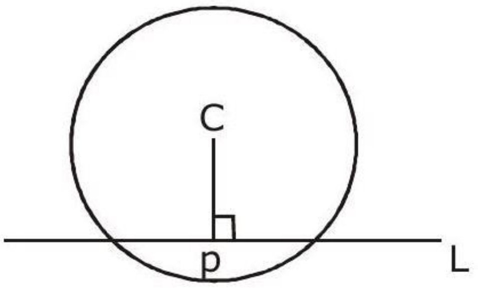
$\left|\frac{3.1 + 4.2 - \text{k}}{5}\right| < 1$

$|11 - \text{k}| < 5$

$-5 < \text{k} - 11 < 5$

$6 < \text{k} < 16$

$k = 7,8,9, \ldots \ldots .15 \Rightarrow$ total 9 value of k



72. (2)

$|\vec{a} - \vec{b}|^2 + |\vec{a} - \vec{c}|^2 = 8$

$(\vec{a} - \vec{b}) \cdot (\vec{a} - \vec{b}) + (\vec{a} - \vec{c})(\vec{a} - \vec{c}) = 8$

$a^2 + b^2 - 2a \cdot b + a^2 + c^2 - 2a \cdot c = 8$

$2a^2 + b^2 + c^2 - 2a \cdot b - 2a \cdot c = 8$

$a \cdot b + a \cdot c = -2$

Now $|\vec{a} + 2\vec{b}|^2 + |\vec{a} + 2\vec{c}|^2$

$= 2a^2 + 4b^2 + 4c^1 + 4\bar{a} \cdot \bar{b} + 4\bar{a} \cdot \bar{c}$

$= 2 + 4 + 4 + 4(-2)$

$= 2$

73. (309)
74. (40)

$\lim_{x \to 1} \dfrac{(x-1)}{x-1} + \dfrac{(x^2-1)}{x-1} + \cdots . + \dfrac{(x^n-1)}{x-1} = 820$

$\Rightarrow 1 + 2 + 3 + \cdots \ldots + n = 820$

$\Rightarrow \Sigma \mathrm{n} = 820$

$\Rightarrow \dfrac{\mathrm{n}(\mathrm{n}+1)}{2} = 820$

$\Rightarrow \mathrm{n} = 40$

75. (1.5)

$\int_0^2 ||x-1| - x| dx$

$= \int_0^1 |1 - x - x| dx + \int_1^2 |x - 1 - x| dx$

$= \int_0^1 |2x - 1| dx + \int_1^2 1 dx$

$= \int_0^{\frac{1}{2}} (1-2x) dx + \int_{\frac{1}{2}}^1 (2x-1) dx + \int_1^2 1 dx$

$= \left[\left(\frac{1}{2} - 0\right) - \left(\frac{1}{4} - 0\right)\right] + \left(1 - \frac{1}{4}\right) - \left(1 - \frac{1}{2}\right) + 1$

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

$= \frac{3}{2}$