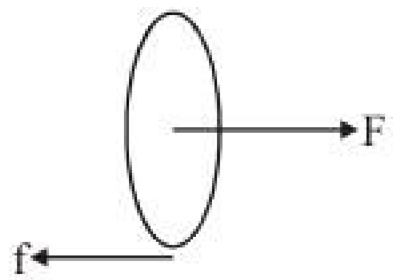
PHYSICS

1. $F - f = ma$

and $fR = I\alpha$

for Rolling $a = \alpha R$

$F - f = ma.........(i)$



$fR = \frac{mR^2}{2}.\frac{a}{R}$

$f = \frac{ma}{2}......(ii)$

so, $f - \frac{ma}{2} = ma$

$f = \frac{3}{2}ma$

2. $I_1 = 5A$

$I_2 = 2A$

$\Delta I = 2 - 5 = -3A$

$\Delta t = 0.1\sec$

Emf= 50v

$emf = \varepsilon = -L\frac{di}{dt}$

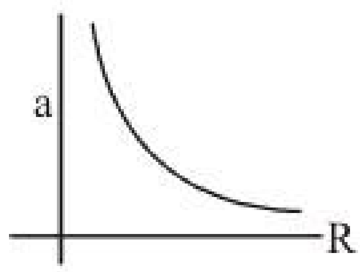
$50 = -L\left(\frac{-3}{0.1}\right)$

$50 = 30L$

$L = \frac{5}{3} = 1.67H$

3. $speed\ v = 10m/\sec$

$a = \frac{v^2}{R}$



$|\vec{v}| = \text{constant}$

$so\ a \propto \frac{1}{R}$

4. Emwave

$f = 2\times10^{14}\,Hz$

$E_0 = 27\,V/m$

we know $\rightarrow \dfrac{E}{B} = C$

so $B = \dfrac{27}{3\times10^{8}} = 9\times10^{-8}\,T$

now for $\lambda = \dfrac{3\times10^{8}}{2\times10^{14}} = 1.5\times10^{-6}\,m$

so $B = 9\times10^{-8}\sin\left(2\pi\left[\left(\dfrac{1}{1.5\times10^{-6}}\right)x - 2\times10^{14}t\right]\right)\hat{k}$

5. $F = \left(\dfrac{k}{r}\right)m$

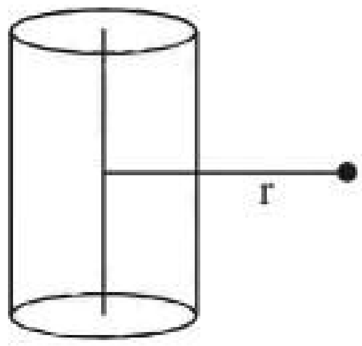
k is some constant

so $\dfrac{mv^2}{r} = \dfrac{km}{r} \Rightarrow v = \text{constant}$

$T = \dfrac{2\pi r}{v}$

$T \propto r$

straight line



6. Time = 5 min = 300 sec.

Volume = 15 ltr. = $15\times10^{-3}\,m^3$

Diameter $= \dfrac{2}{\sqrt{\pi}}cm$

Area of tap = $\pi\left(\dfrac{1}{\sqrt{\pi}}\times10^{-2}\right)^2 = 10^{-4}\,M^2$

Velocity of water = $\dfrac{V}{At} = \dfrac{15\times10^{-3}}{1\times10^{-4}\times300} = \dfrac{1}{2}\,m/\sec$

$R_w = \dfrac{\rho V d}{\eta}$

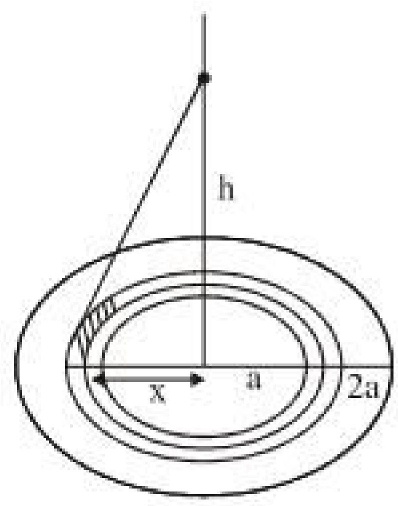
$= 5649 = 5500$

7. For cylinderical

$$\Delta P = \frac{T}{R}$$

no option

8. $$\int \overrightarrow{dE} = \int \frac{Kh\sigma 2\pi\, xdx}{\left(h^2+x^2\right)^{3/2}}$$



$$E = \sigma Kh2\pi \int \frac{x\,dx}{\left(h^2+x^2\right)^{3/2}} \text{............(i)}$$

$$I = \int \frac{x\,dx}{\left(h^2+x^2\right)^{3/2}}$$

$$x = h\tan\theta$$

$$dx = h\sec^2\theta\, d\theta$$

$$I = \int \frac{h\tan\theta \times h\sec^2\theta dx}{h^3\sec^3\theta}$$

$$= \int \frac{1}{h}\sin\theta\, d\theta$$

$$= -\frac{\cos\theta}{h}$$

$$I = -\frac{1}{h}\left(\frac{h}{\sqrt{x^2+h^2}}\right)$$

Put it in equation (i)

$$E = \frac{\sigma h}{2\varepsilon_0}\left[-\frac{1}{\sqrt{x^2+h^2}}\right]_{x=a}^{x=2a}$$

$$= \frac{\sigma h}{2\varepsilon_o}\left[\frac{1}{a} - \frac{1}{2a}\right]$$

$$E = \frac{\sigma h}{4\varepsilon_0 a} = ch$$

$$\Rightarrow C = \frac{\sigma}{4\varepsilon_0 A}$$

9. $C = e^x a_0^y h^z c^a$

Capacitance $C = \left[M^{-1}L^{-2}A^2T^4\right]$

$e = \left[AT\right]$ $\qquad$ $a_0 = \left[L\right]$

$c = \left[L^1T^{-1}\right]$

$h = \left[M^1L^2T^{-1}\right]$

$\left[M^{-1}L^{-2}A^2T^4\right] = \left[AT\right]^x\left[L\right]^y\left[M^1L^2T^{-1}\right]^z\left[L^1T^{-1}\right]^a$

Compare x = 2

z = –1

$\dfrac{M^{-1}L^{-2}A^2T^4}{A^2T^2M^{-1}L^{-2}T^1} = \left[L\right]^y\left[L^1T^{-1}\right]^a$

$T = \left[L^y\right]\left[L^1T^{-1}\right]^a$

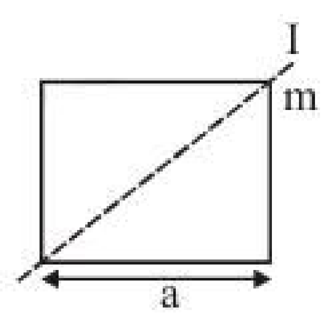
So $u = \dfrac{e^2a_0}{hc}$

$\Rightarrow a = -1$

$\Rightarrow y = 1$

10. Using perpendicular axis theorem.

$I = \dfrac{Ma^2}{12}$



11. angular magnfication on $m = \dfrac{f_0}{f_e} = \dfrac{150}{5} = 30$

so, $\dfrac{\tan\beta}{\tan\alpha} = 30$

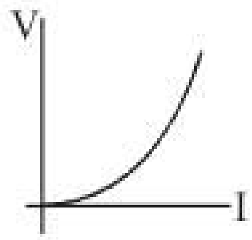
$\tan\beta = \tan\alpha \times 30 = \left(\dfrac{50}{1000}\right)\times 30$

$= \dfrac{15}{10} = \dfrac{3}{2}$

$\beta \approx 60^0$

12. $V_d \propto \sqrt{E}$

$I = neAV_d$



and $E = \frac{V}{l}$

so $E \propto V$

and $I \propto V_d$

so $I \propto \sqrt{V}$

$I^2 \propto V$

13. Electron concentration in n-region is more as compared to that in p-region.

14. $x \propto \sin t - \frac{1}{2}\sin 2t$

at t = 0   x & velocity both has to be zero

15. $\left(P_y\right) d >> h$

to go straight otherwise diffraction will occur

16. Circuit

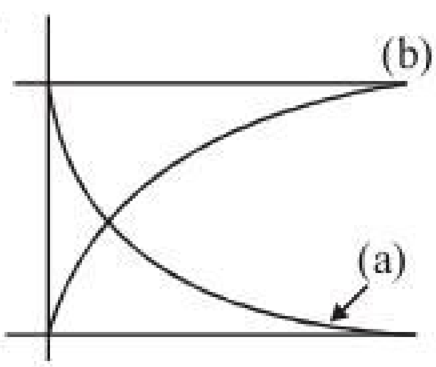
a —

$i = i_0 e^{-t/RC}$

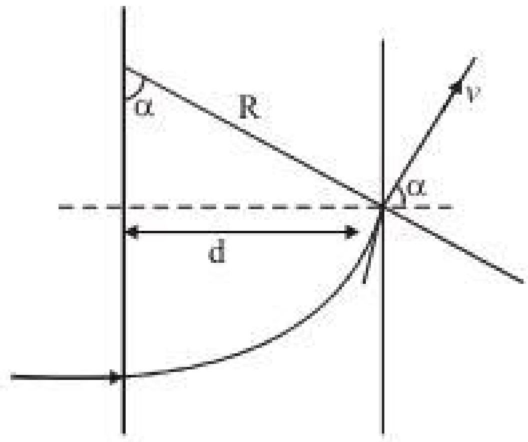
for b

$i = i_0\left(1 - e^{-t/L/R}\right)$

so



17. Energy of proton $= \frac{1}{2}mv^2 = qV$



$$v = \sqrt{\frac{2qV}{m}}$$

magnetic force $= q\left(\vec{v} \times \vec{B}\right) = \frac{mv^2}{R}$

$$R = \frac{mv}{qB}$$

$$\sin\alpha = \frac{d}{R} = \frac{dqB}{mv} = \frac{dqB}{m}\sqrt{\frac{m}{2qV}}$$

$$\sin\alpha = Bd\sqrt{\frac{q}{2mV}}$$

18. momentum $P = \sqrt{2mE}$ and $E = eV$

$$\lambda = \frac{h}{p} = \frac{h}{\sqrt{2mE}}$$

$$= \frac{6.6\times10^{-34}}{\sqrt{2\times9.1\times10^{-31}\times1.6\times10^{-19}\times50}}$$

$$= 1.7\times10^{-10} M$$

$$= 1.7Å$$

19. $\overline{x} = \frac{x_1 + x_2 + x_3}{3}$

$$= \frac{0.58+0.54+0.56}{3}$$

$\overline{x} = 0.56$

so value $= 0.56 +$ error

$= 0.56 + 0.03$

$= 0.59$ cm

20. $mvR = \frac{nh}{2\pi} \ldots (i)$

$and \quad qvB = \frac{mv^2}{R}$

$so \quad qB = \frac{mv}{R} \ldots\ldots (ii)$

$qB\left(\frac{nh}{2\pi mv}\right) = mv$

$mv^2 = \frac{qBnh}{2\pi m}.$

$\frac{1}{2}mv^2 = \frac{1}{4\pi m} nhqB$

$E = n\left(\frac{hqB}{4\pi m}\right)$

21. $x = a\sin wt$

$y = a\sin 2wt$

$y = 2a\sin wt \cos wt$

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

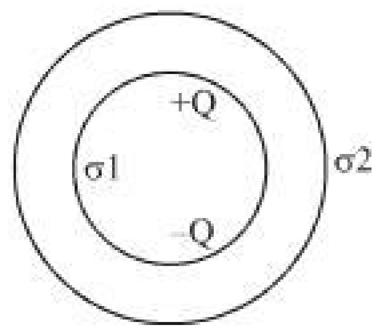
$y = \frac{2}{a}x\sqrt{(a-x)(a+x)}$

22. On outer surface there will be no charge.

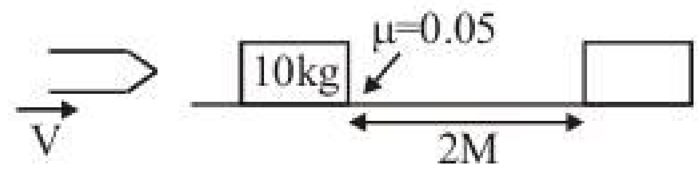
So $Q_2 = \sigma_2 = 0$

On inner surface total charge will be zero but charge distribution will be there so

$Q_1 = 0 \quad \sigma_1 \neq 0$



23. If block to come to rest after 2m.



So, $d = \dfrac{u^2}{2a}$

$a = \mu g = 0.05 \times 10 = 0.5\, m/\sec^2$

$u^2 = 2 \times 2 \times 0.5 = 2$

$u = \sqrt{2}\, m/\sec$

by momentum conservation

$\sqrt{2}\left(10 + 50 \times 10^{-3}\right) = \left(50 \times 10^{-3}\right) \times V$

approximately $\dfrac{\sqrt{2} \times 10}{50 \times 10^{-3}} = V$

$V = 200\sqrt{2}\, m/\sec$

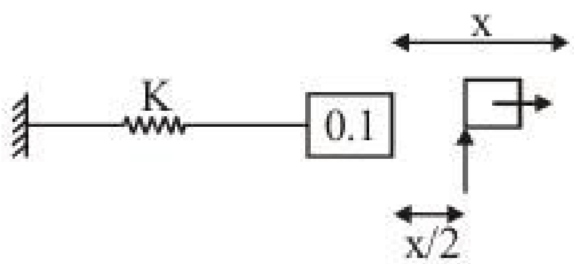
so $\dfrac{V}{10} = 20\sqrt{2}$

to get $V = 20\sqrt{2}\, m/\sec$

$V^2 = 2gh$

$h = \dfrac{800}{20} = 40m$

24. The block comes to rest means its velocity at that point was 3 m/sec.
So that point



$K.E. = \dfrac{1}{2} \times mv^2$

$= \dfrac{1}{2} \times 0.1 \times (3)^2$

$= \dfrac{0.9}{2} = 0.45J$

at displacement $\dfrac{x}{2}$

$P.E. = \dfrac{1}{4} T.E.$

$K.E. = \dfrac{3}{4} T.E.$

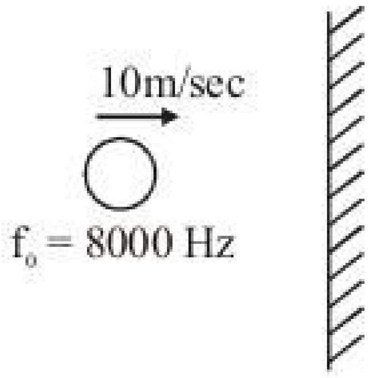
So $T.E. = \dfrac{4}{3} \times 0.45$

$= 0.6$ J

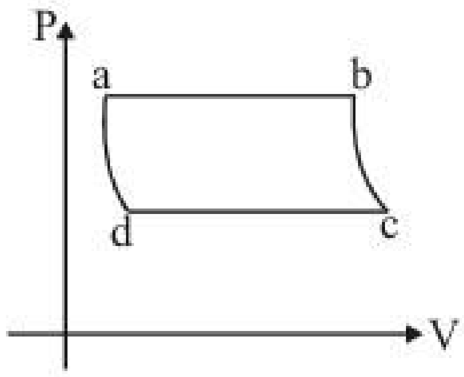
25. $f' = \left(\dfrac{320+10}{320-10}\right) \times 8000$

$= \dfrac{330}{310} \times 8000$

$= 8516 \text{ Hz}$



26.



27. $l = 20cm$

$r = 2cm$

$N = 500\, turms$

$i = 15A$

$\vec{M} = \dfrac{500 \times 15 \times \pi \times (2 \times 10^{-2})^2}{\pi (2 \times 10^{-2})^2 \times 25 \times 10^{-2}}$

$= \dfrac{15 \times 500}{25 \times 10^{-2}}$

$= \dfrac{7500 \times 10^2}{25} = 30000\, AM^{-1}$

28. $F = \dfrac{2mv}{t}$

$t = \dfrac{2l}{v} = \dfrac{\text{distance}}{\text{velocity}}$

$t \propto \dfrac{1}{v}$

$F \propto v^2$

$and\ K.E. \propto T$

$\dfrac{1}{2} mv^2 \propto T$

$V^2 \propto T$

$\Rightarrow F \propto T$

29. $u=-10cm$

$v=+15cm$

$f=?$

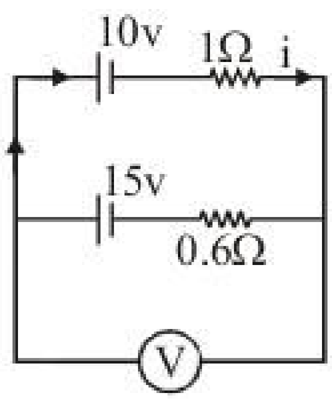
$$\frac{1}{v}+\frac{1}{u}=\frac{1}{f}$$

$$\frac{1}{15}-\frac{1}{10}=\frac{1}{f}=\frac{2}{R}$$

$$-\frac{5}{150}=\frac{2}{R}$$

$$R=-\frac{300}{5}=-60cm$$

30. $i=\frac{5}{1.6}$



$$=\frac{50}{16}=\frac{25}{8}Amp$$

$$V=15-\frac{25}{8}\times 0.6$$

$$=15-\frac{15}{8}$$

$$=13.1volt$$

CHEMISTRY

1. Metal oxide calculation is the process of heating ore in abscence of air

e.g. Calcium carbonate gives $CaCO_3 \xrightarrow{\Delta} CaO + CO_2$ as calculation.

2. Only temporary hardness which is due to HCO_3^- (Bicarbonate) ions is removed by Boiling.

3. $$N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$$

$t=0$	1	0
$t=$equilibrium	$1-\alpha$	2α

where $\alpha =$ Degree of disociation.

$$\text{Mol.wt Mixture}=\frac{(1-\alpha)\times M_{N_2O_4}+2\alpha+M_{NO_2}}{(1+\alpha)}=76.66$$

Now, As per Ideal gas Equation

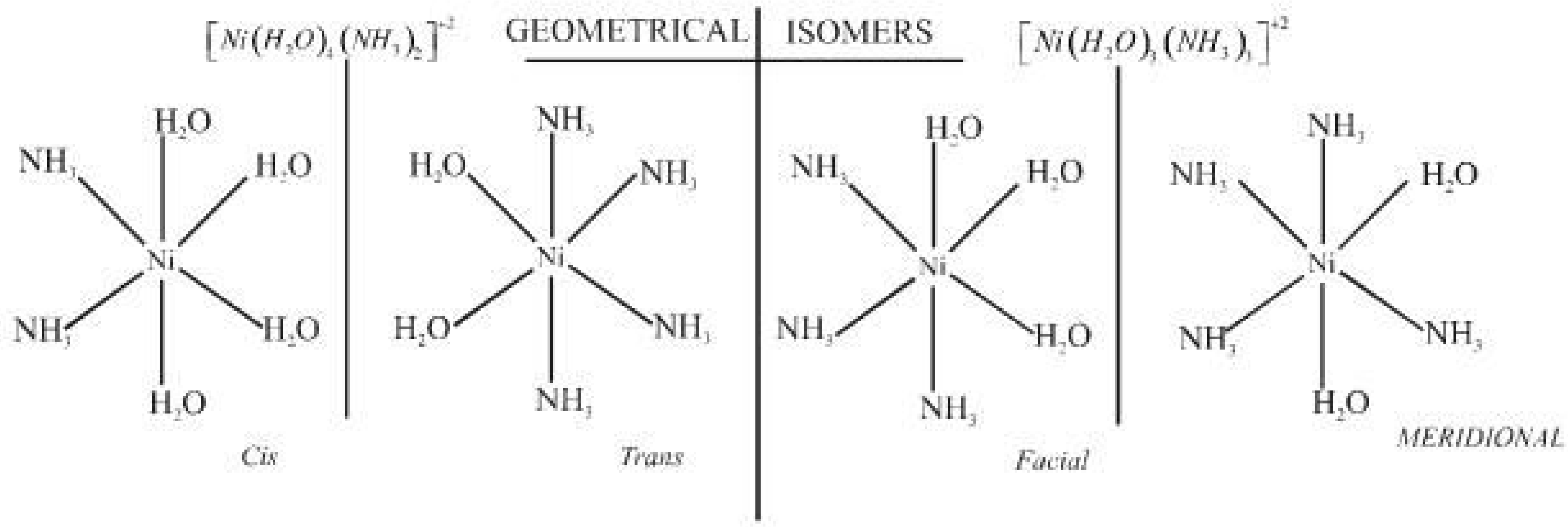
$$PV=nRT$$

$$PM_{mixture}=dRT$$

$$\therefore \quad d=\frac{PM_{mix}}{RT}=\frac{1\times 76.66}{0.0821\times 300}=3.11 \text{ g/L}$$

4. Starch is a mixture of amylose & amylopetin poly saccharides and monomer is glucose.

5. Cis $-\left[Ni\left(H_2O\right)_4\left(NH_3\right)_2\right]^{+2}$ & facial $\left[Ni\left(H_2O\right)_3\left(NH_3\right)_3\right]^{+2}$ have optical isomers.



6. Fluorine is the most electronegative element & has least tendency to form double bonds.

7. Mili equivalents of $H_2SO_4 = 60 \times \dfrac{M \times 2}{10} = 12$

Mili equivalents of NaOH $= 20 \times \dfrac{M}{10} = 2$

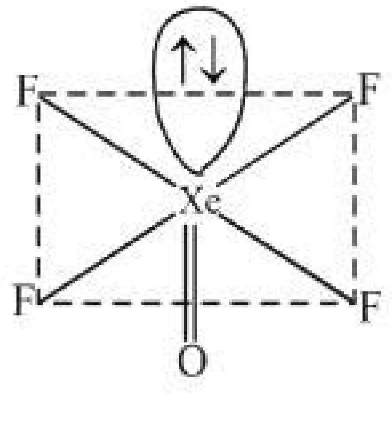
Mili equivalents of $NH_3 = 12 - 2 = 10$

% of Nitrogen $= \dfrac{1.4 \times \left(N \times V\right) NH_3}{W}$

$$= \frac{1.4 \times 10}{1.4} = 10$$

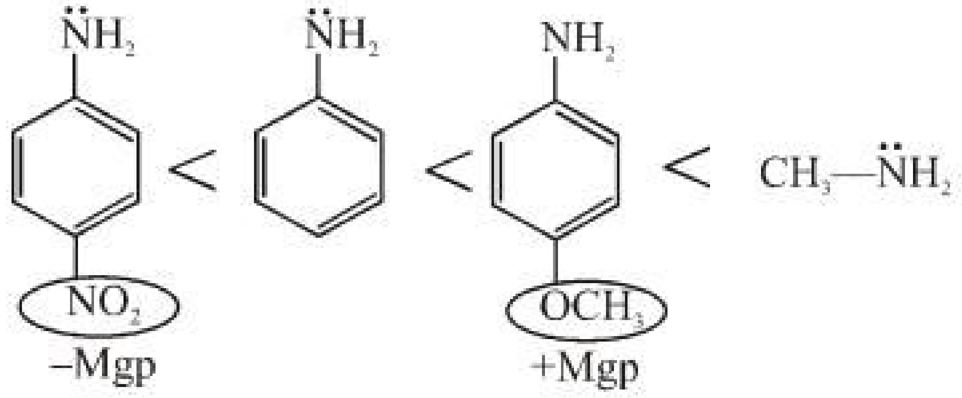
8. Drugs which relieve pain is called analgesics.
Non-narcoties :- aspirin (acetyl salicylic acid)
paracetamol (parahydrous acetanilide)

9. In $XeOF_4$, Xe is sp^3d^2, hybridised having 5 Bond pairs & 1 lone pair
SHAPE: Square Pyramidal



10. Basicity $\propto$ +M group

$$\propto \frac{1}{-M\ group}$$



(L.P is not involved in conjugation $\therefore$ it is more basic)

11. The sequence of filling electrons in sixth period :

$6s-4f-5d-6p$ i.e. $(ns)\rightarrow(n-2)f\rightarrow(n-1)d\rightarrow np$

12. (Thermal stability of $\propto$ Ionic character hydroxdies) or Lattice energy

$Mg(OH)_2 < Ca(OH)_2 < Sr(OH)_2 < Ba(OH)_2$

13. Weight of Hydrated $BaCl_2 = 61\,g$

Weight of Anhydrous $BaCl_2 = 52\,g$

Loss in mass $= 9g$

Assuming $BaCl_2.xH_2O$ as hydrate

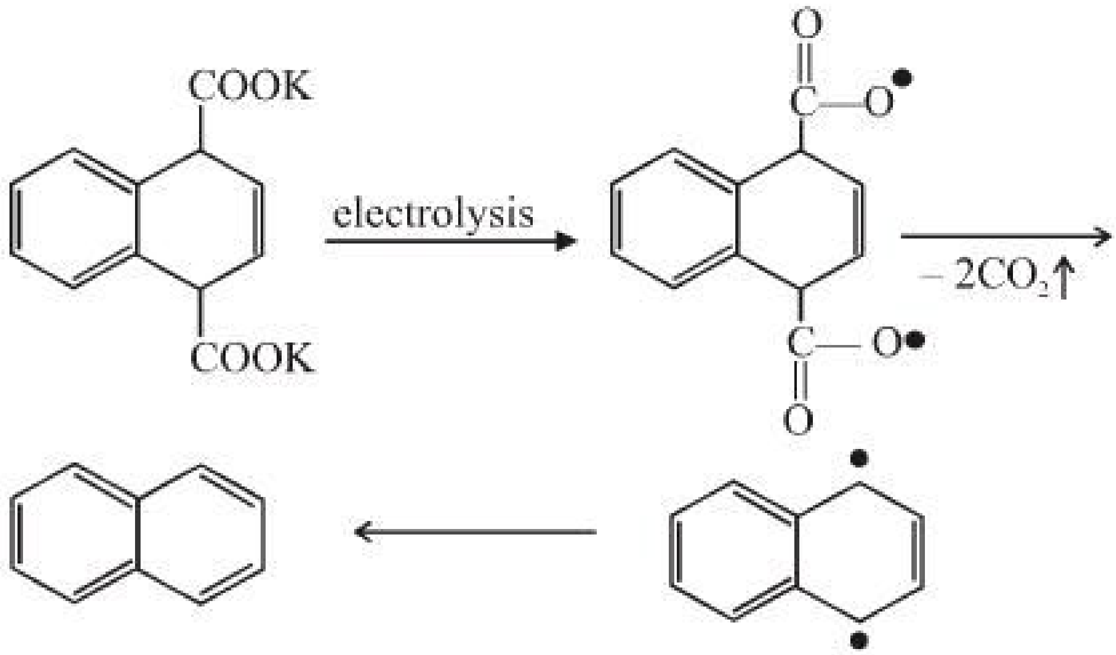
Mass of $H_2O = 9\,g$

Moles of $H_2O = \frac{9}{18} = 0.5$

Grass molecular let of $BaCl_2 = 208$

% of H_2O in this hydrated $BaCl_2 = \frac{9}{61}\times 100 = 14.75\% = \frac{18x}{208+18x}\times 100$ on solving $x = 2$

This percentage is present in $BaCl_2.2\,H_2O$

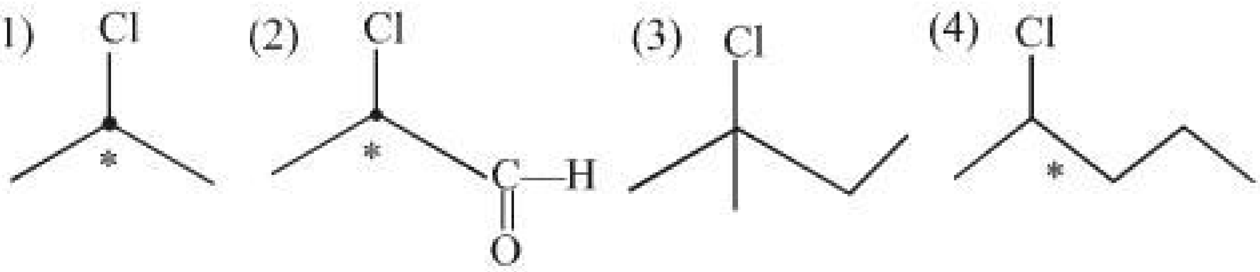
14. 

Stable due to aromatic

15.

Polymer	**Use**
Polystyrene	Manufacture of toys
Glyptal	Paints and lacquars.
P.V.C	Rain Coats
Bakelite	Computer discs

16. (1) (2) (3) (4)



(Chiral) (Chiral) (Achiral) Chiral

17. $5s^2 5p^4$ valence shell configuration of group 16 element present in period 5.

Tellurium (Te).

18. After adsorption these is decrease in the residual forces due to bond formation. ΔG, ΔH & ΔS all are negative in the case of adsorption,

19. EMF of galvanic cell $= 1.1 \, volt$

If $E_{ext} < EMF$ then electron flows steadily from anode to cathode while If $E_{ext} > EMF$ there electron flows from cathode to anode as polarity is changed.

20. Fe^{+3}, radical gives blood red with SCN^-

Cl^- radical gives chromyl chloride Test.

21. Chemical pollutants in photo chemical smog are Nitrogen oxides (NO and NO_2), volatlie organic compounds, Ozone (O_3), peroxyacetyl nitrile.

22. Hell - volhard- Zelinsky Reaction

$$CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-OH \xrightarrow{Cl_2/\text{Red 'P'}} \underset{\underset{\displaystyle Cl}{|}}{CH_2}-\overset{\overset{\displaystyle O}{\|}}{C}-OH$$

23. Co^{+2} ion is precipitated by H_2S & NH_4OH present in group IV cationic Analysis

24. At high pressure real gas particles are easily compressed which was later gives by van-der waal's equations as per kinetic theory.

25. First order reaction rate $= K[N_2O_5]$

$$\begin{array}{lccc} & 2N_2O_{5(g)} \longrightarrow & 4NO_{2(g)} + & O_{2(g)} \\ t=0(\textit{pressure}) & 50 & 0 & 0 \\ t=30\min(\textit{pressure}) & 50-2p & 4p & p \end{array}$$

Total pressure $50-2p+4p+p=50+3p=87.5$ mm Hg

$$\therefore\ P=12.5 \text{ mm Hg}$$

$$\therefore\ P_0=50 \ \&\ P_t=25 \text{ for } N_2O_5 \text{ reactant}$$

$$\therefore\ K=\frac{2.303}{30\min}\times\log\left(\frac{50}{25}\right)=\frac{2.303}{60\min}\times\log\left(\frac{50}{x}\right)$$

On solving $x=12.5$ mm Hg $=50-2p$

$$\therefore\ P=18.75 \text{ mm Hg}$$

$\therefore$ Total pressure $=50+3p=106.25$ mm Hg

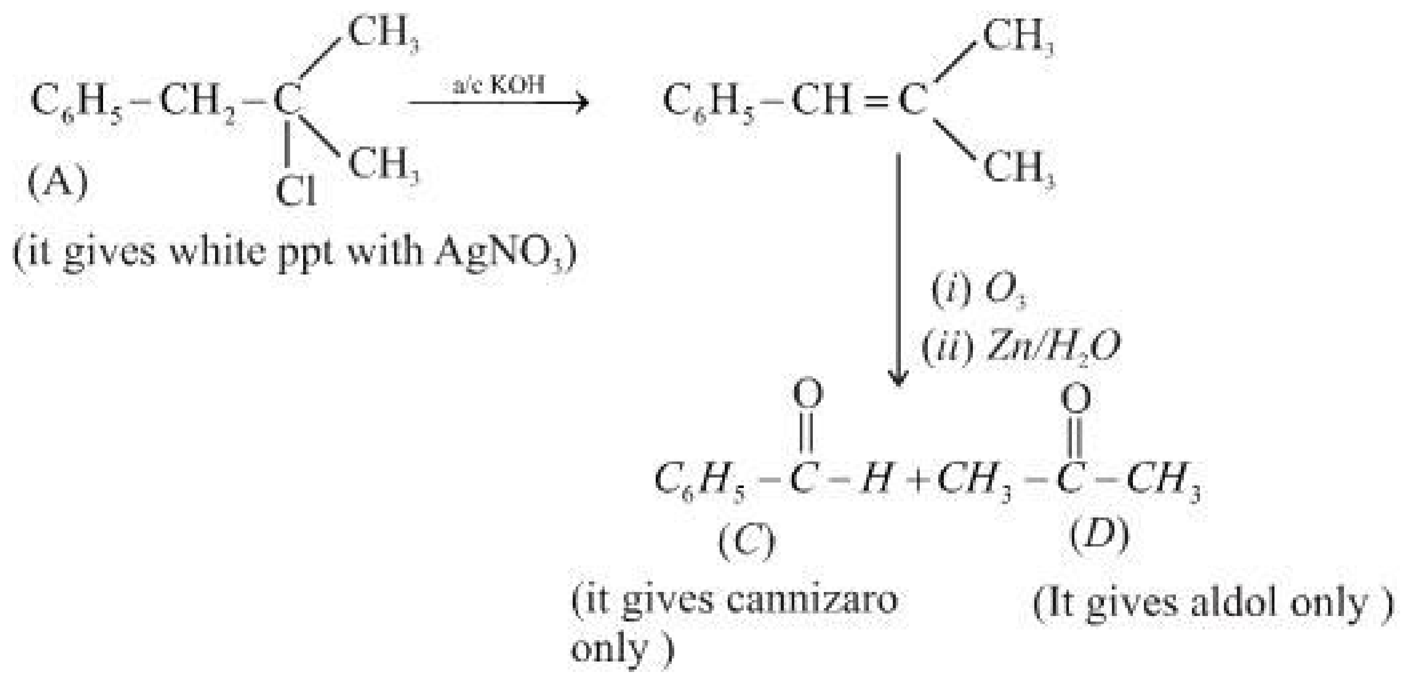
26. Total V.P. of solution $=P_A^0X_A+P_B^0X_B$

Total V.P. of solution $=\left(\frac{1.5}{5}\times74.7+\frac{3.5}{5}\times22.3\right)torr$

$$=(15.6+22.4)\text{ torr}=38\text{ torr}$$

Mole fraction of Benzene in vapour form $=\frac{22.4}{38}=0.589$

27.



28. Ligand donats electrons to metal. In methan there is no electron to donate it is stable with octet configuration.

29. In CH_4 $\quad 4\times BE_{(C-H)} = 360$ KJ/mol $\quad \therefore\ BE_{(C-H)} = 90$ KJ/mol

In C_2H_6 $\quad BE_{(C-C)} + 6\times BE_{(C-H)} = 620$ KJ/mol

$$\therefore\ BE_{(C-C)} = 80 \text{ KJ/mol}$$

$$\therefore\ BE_{(C-C)} = \frac{80\times 10^3}{6.023\times 10^{23}} \text{ J/molecule}$$

Now, $E = \dfrac{hc}{\lambda}$

$$\therefore\ \lambda = \frac{6.626\times 10^{-34}\times 3\times 10^8\times 6.023\times 10^{23}}{80\times 10^3}$$

$$\therefore\ \lambda = 1.49\times 10^3 \text{ nm}$$

30. Assertion is correct but reason is Incorrect. Bonding MO involves contructive interference.

MATHEMATICS

1. Let average wage of Night shift worker is x

$70\times 54 + 30\times x = 60\times 100$

$x = 74$

2. Conduction for Rolls theorem

$f(1) = f(-1)$

and $f'\left(\dfrac{1}{2}\right) = 0$

$c = -2 \text{ and } b = \dfrac{1}{2}$

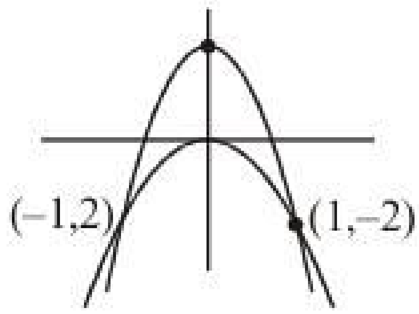
$2b + c = -1$

3. Solving

$y+2x^2=0$

$y+3x^2=1$

Points of intersection (1 , –2) and (–1 , –2)



Area = $2\int_0^1\left(\left(1-3x^2\right)-\left(-2x^2\right)\right)dx$

$=2\int_0^1\left(1-x^2\right)dx=2\left(x-\frac{x^3}{3}\right)_0^1$

$=\frac{4}{3}$

4. $A\left(0,\frac{8}{3}\right)\ B(1,3)\ C(89,30)$

$Slope\ of\ AB=\frac{1}{3}$

$Slope\ of\ BC=\frac{1}{3}$

So, lies on same line

5. Question incomplete.

6. $\frac{(15)^2\times(14)^2\times.....\times(1)^2}{15!}=15!$

Hence, Option is not matching.

7. $|3+4-12\lambda+13|=|-9+0-12+13|$

$|-12\lambda+20|=|8|$

$|3\lambda-5|=2$

$9\lambda^2+25-30\lambda=4$

$9\lambda^2-30\lambda+21=0$

$3\lambda^2-10\lambda+7=0$

8. $f(x)=2\tan^{-1}x+\pi-2\tan^{-1}x$

$f(x)=\pi$

$f(5)=\pi$

9. $\alpha = 2+3; \beta = 2-3i$

$\alpha\beta\gamma = \frac{13}{2}$

$(4+9)\gamma = \frac{13}{2}$

$\gamma = \frac{1}{2}$

10. hyperbola is

$\frac{x^2}{4} - \frac{y^2}{9} = 1$

$foci\ \left(\pm\sqrt{13}, 0\right)$

$e = \frac{\sqrt{13}}{2}$

$e_1 \times \frac{\sqrt{13}}{2} = \frac{1}{2}$

$e_1 = \frac{1}{\sqrt{13}}$

equation of ellipse

$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

$\left(\sqrt{13}, 0\right)$

$a^2 = 13$

foci of ellipse $\sqrt{a^2 - b^2} = a.\frac{1}{\sqrt{13}}$

$13 - b^2 = 1$

$b^2 = 12$

equation of ellipse

$\frac{x^2}{13} + \frac{y^2}{12} = 1$

11. $a_1 a_2 a_3$

$a_2 = \frac{3a}{3} = 13$

$d = 3$

sum of last four term = 178

$a_{n-3}\, a_{n-2}\;\, a_{n-1}\;\, a_n$

Their mean $= \frac{178}{4} = 44.5$

$a_n = 44.5 + 1.5 + 3$

$= 49$

Median $= \frac{10+49}{2} = \frac{59}{2} = 29.5$

12. $n(p) = 25\%$

$n(c) = 15\%$

$n(P' \cup C') = 65\%$

$n(P \cup C) = 35\%$

$n(P \cap C) = n(P) + n(C) - n(P \cup C)$

$25 + 15 - 35 = 5\%$

$x \times 5\% = 2000$

$x = 40{,}000$

13. $f\left(\frac{1}{r}\right) = \int_1^{1/x} \frac{ln\, t}{1+t} dt$

$let\, t = \frac{1}{z}$

$dt = -\frac{1}{z^2} dz$

$= \int_1^x \frac{\ln z}{z(z+1)} dz$

$t(x) + f\left(\frac{1}{r}\right) = \int_1^x \frac{\ln x}{z} dz$

$= \left[\frac{(\ln z)^2}{2}\right]_1^x = \frac{(\ln x)^2}{2}$

14. $\frac{{}^nC_r}{1} = \frac{{}^nC_{r+1}}{7} = \frac{{}^nC_{r+2}}{42}$

By solving line get $r = 6$

so, if is 7^{th} term.

15. $\left|\vec{a}+\vec{b}\right| = \sqrt{3}$

angle between $\vec{a}$ and $\vec{b}$ is 60^0.

$\vec{a}$ x $\vec{b}$ is $\perp^r$ to plane containing $\vec{a}$ and $\vec{b}$

$\vec{c} = \vec{a} + 2\vec{b} + 3\left(\vec{a}\times\vec{b}\right)$

$\vec{c} = \sqrt{|a|^2 + 4\left|\vec{b}\right|^2 + 2.2|\vec{a}|^2 \cos 60^0}\ \vec{n}_1 + 3|\vec{a}|\left|\vec{b}\right| \sin 60^0 \vec{n}_2$

$+3|\vec{a}|\left|\vec{b}\right| \sin 60^0 . \vec{n}_2$

$\vec{n}_1 \perp^r \vec{n}_2$

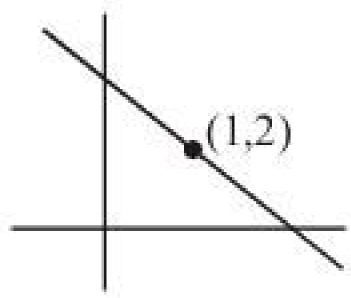
$|\vec{c}|^2 = (1+4+2) + 9\times\frac{3}{4}$

$|\vec{c}|^2 = 7 + 27/4 = 55/4$

$2|\vec{c}| = \sqrt{55}$

so, $h = \frac{4}{\sin 45^0} = 4\sqrt{2}$

16. Equation of line L



$\frac{x}{2} + \frac{y}{4} = 1$

$2x + y = 4$..........(1)

4 line

$x - 2y = -4$........(2)

solving there two

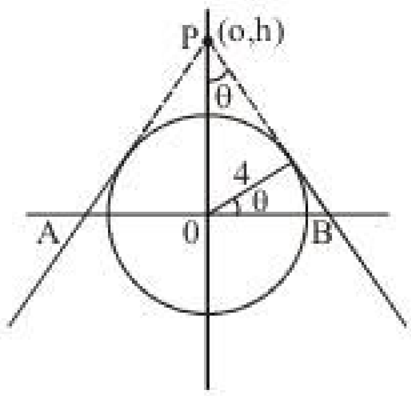
$\left(4/5, \frac{12}{5}\right)$

17. $\dfrac{\sin A}{\sin B} = 2+\sqrt{3}$

$$\frac{\sin\left(105^0\right)}{\sin\left(15^0\right)} = 2+\sqrt{3}$$

$$\frac{\cos 15^0}{\sin 15^0} = 2+\sqrt{3}$$

18. $OP = \dfrac{4}{\sin\theta}$



$$OB = \frac{4}{\cos\theta}$$

$$\text{Area} = OP \times OB = \frac{16}{\sin\theta\cos\theta} = \frac{32}{\sin 2\theta}$$

least value $\sin 2\theta = 1 \ \theta = 45^0$

19. $\displaystyle \lim_{x\to 0} \frac{2x e^{x^2} + \sin x}{2\sin x \cos x}$

$$\lim_{x\to 0}\left(\frac{x}{\sin x}e^{x^2} + \frac{1}{2}\right)\frac{1}{\cos x} = 1+\frac{1}{2} = \frac{3}{2}$$

20. $\displaystyle \sum_{r=16}^{20}\left(r^2 - r - 6\right) = 7780$

21. Given that $y+3x=0$ equation of a choral of the circle then

$$y = -3x....(i)$$

$$x^2 + (-3x)^2 - 30x = 0$$

$$10x^2 - 30x = 0$$

$$10x(x-3) = 0$$

$$x = 0 \ y = 0$$

so the equation of the circle is

$$(x-3)(x-0) + (y+9)(y-0) = 0$$

$$x^2 - 3x + y^2 + 9y = 0$$

$$x^2 + y^2 - 3x + 9y = 0$$

22. $$\int \frac{dx}{(x+1)^{3/4}(x-2)^{5/4}}$$

$$\int \frac{dx}{\left(\frac{x+1}{x-2}\right)^{3/4}(x-2)^2}$$

put $\frac{x+1}{x-2} = E$

$$\frac{-3}{(x-2)^2} = \frac{dt}{dx}$$

23. Given that

$$x = 2\cos t + 2t\sin t$$

$$so, \frac{dx}{dt} = -2\sin t + 2[t\cos t + \sin t]$$

$$\frac{dx}{dt} = 2\cos t - 2[-t\sin t + \cos t]$$

$$\frac{dy}{dx} = 2t\sin t......(ii)$$

$$\frac{dy}{dx} = \frac{2t\sin t}{2t\sin t}$$

$$\frac{dy}{dx} = \tan t$$

$$\left(\frac{dy}{dx}\right)_{t=1/4} = 1$$

so the slopw of the normal is -1

and $at\, l = \pi/4\, x = \sqrt{2} + \frac{\pi}{2\sqrt{2}}\, and\; y = \sqrt{2} - \pi/2\sqrt{2}$

to the equation of normal is

$$\left[y - \left(\sqrt{2} - \pi/2\sqrt{2}\right)\right] = -1\left[\left(x - \left(\sqrt{2} + \pi/2\sqrt{2}\right)\right)\right]$$

$$y - \sqrt{2} + \frac{\pi}{2\sqrt{2}} = -x + \sqrt{2} + \pi/2\sqrt{2}$$

$x + y = 2\sqrt{2}$ so the distacne from the origin is 2

24. $\frac{x-1}{\alpha}=\frac{y+1}{-1}=\frac{z-0}{1}=L_1$

$x+y+z+1=0$

$2x-y+7+3=0=L_2$

so point P(0,1,–2) [on line L_2]

point on other line [on line L_1]

Q (1 , –1 , 0) [on line L_2]

Q (1 , –1 ,0)

$\overrightarrow{PQ}=\hat{i}-2\hat{j}+2\hat{k}$

vector II to line L_2

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

vector $\perp_r to 48 L_2$

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

$\vec{n}=2\hat{i}+\hat{j}(3\alpha+2)+\hat{k}(\alpha+2)$

distance $=\overrightarrow{PQ}.\hat{m}$

$$=\frac{2-2|3\alpha+2|+2(\alpha+2)}{\sqrt{4+(3\alpha+2)^2+(\alpha+2)^2}}=\frac{1}{\sqrt{3}}$$

$\Rightarrow 3(2-4\alpha)^2=10\alpha^2+16\alpha+12$

$\Rightarrow 6\left[1+4\alpha^2-4\alpha\right]=5\alpha^2+8\alpha+6$

$\Rightarrow 19\alpha^2-32\alpha=0$

$\Rightarrow \alpha=\frac{32}{19}$

25. Given that

$$A=\begin{bmatrix}0 & -1\\ 1 & 0\end{bmatrix}$$

$$A^2=\begin{bmatrix}-1 & 0\\ 0 & -1\end{bmatrix}\Rightarrow A^2=-I$$

$$A^3=\begin{bmatrix}0 & 1\\ -1 & 0\end{bmatrix}$$

$$A^4=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}=I$$

$$A^2+I=A^3-A$$

$$-I+I=A^3-A$$

$$A^3\neq A$$

26. Required probability is

$$\frac{\left({}^{10}C_0\right)^2+\left({}^{10}C_1\right)^2+\left({}^{10}C_2\right)^2+\ldots\ldots\left({}^{10}C_{10}\right)^2}{2^{10}}$$

$$=\frac{{}^{20}C_{10}}{2^{20}}$$

27. $x^2-y+6=0$

$$2x-\left(\frac{y+10}{2}\right)+6=0$$

$$4x-y-10+12=0$$

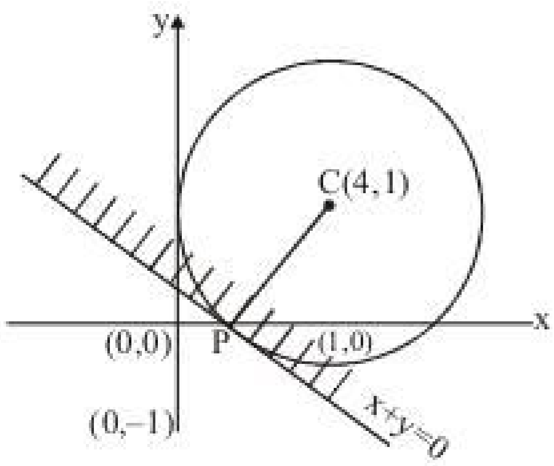
centre of circle $(-4, 2)$

$$\frac{x+4}{4}=\frac{y-2}{-1}=-\frac{(16-2+2)}{17}$$

$$\left(\frac{-8}{17},\frac{2}{17}\right)$$

28. The centre positive of the statement is "If i will come, then it is not raining"

29. Radius



$$CP = \frac{4+1}{\sqrt{2}}$$

$$= \frac{5}{\sqrt{2}} = \frac{5}{2}\sqrt{2}$$

$$\frac{dx}{(x-2)^2} = -\frac{dt}{3}$$

$$= \frac{-1}{3}\int \frac{dt}{t^{3/4}} \;= -\frac{1}{3}\int t \frac{-3}{4} lt$$

$$= -\frac{1}{3}\left[\frac{t^{\frac{-3}{4}+1}}{\frac{-3}{4}+1}\right]$$

$$= \frac{-4}{3}\left[\frac{x+1}{x-2}\right]^{1/4} + c$$

30. $(x+2)\frac{dy}{dx} = x^2+4x-9 \;\; x \neq -2$

$$\frac{dy}{dx} = \frac{x^2+4x-9}{x+2}$$

$$dy = \frac{x^2+4x-9}{x+2}dx$$

$$\int dy = \int \frac{x^2+4x-9}{x+2}dx$$

$$y = \int\left(x+2-\frac{13}{x+2}\right)dx$$

$$y = \int(x+2)dx - 13\int\frac{1}{x+2}dx$$

$$y = \frac{x^2}{2} + 2x - 13\log|x+2| + c$$

Given that y = (0) = 0

$$0 = -13\log z + c$$

$$y = \frac{x^2}{2} + 2x - 13\log|x+2| + 13\log 2$$

$$y(-4) = 8 - 8 - 13\log 2 + 13\log 2 = 0$$