Photon Classes

GRAND TEST-3 **Max Marks : 360**

MATHS_SOLUTIONS

01. $b_3 > 4b_2 - 3b_1 \Rightarrow b_1r^2 > 4b_1r - 3b_1 \Rightarrow r^2 > 4r - 3\left(b_1 > 0\right)$

$r^2 - 4r + 3 > 0 \Rightarrow (r-3)(r-1) > 0 \Rightarrow r > 3 \;\; or \;\; r < 1$

02. p: Mr A passed the exam

q: Mr A is sad

r: It is not true that Mr A passed therefore he is sad

r: $\sim p \Rightarrow q$

Hence statement -1 is false

For statement – 2 true from table

03. $f(x) = x^3 + bx^2 + cx$

$f(1) = f(2) \Rightarrow 3b + c + 7 = 0 \longrightarrow (1)$

$f^1\left(\frac{4}{3}\right) = 0 \Rightarrow 16 + 8b + 3c = 0 \longrightarrow (2)$

Solve (1) & (2) b=-5, c = 8, b+c = 3

04. $\sqrt{3}\cot 20^0 - 4\cos 20^0 = \dfrac{\sqrt{3}\cos 20^0 - 4\cos 20^0 \sin 20^0}{\sin 20^0} = \dfrac{2\sin 60^0 \cos 20^0 - 2\sin 40^0}{\sin 20^0}$

$= \dfrac{\sin 80^0 - \sin 40^0}{\sin 20^0} = \dfrac{2\cos 60^0 \sin 20^0}{\sin 20^0} = 1$

05. At x = 0, y =1 also as $x \to 0,\ (1+x)^y = 1 + xy \;\therefore\; y = 1 + xy + \sin^{-1}\left(\sin^2 x\right)$

$(y-1) = \dfrac{-1}{\frac{dy}{dx}(0,1)}(x-0)$ $\qquad y - 1 = \dfrac{-1}{1}(x-0)$ $\qquad x + y = 1$

06. $\cot\alpha - \tan\alpha = 2\cot 2\alpha$

$\underset{n\to\infty}{Lt}\left(-2\cot 2\theta + \dfrac{1}{2^n}\cot\dfrac{\theta}{2^n}\right) = -2\cot 2\theta + \underset{n\to\infty}{Lt}\dfrac{\frac{1}{2^n}}{\tan\left(\frac{\theta}{2^n}\right)} = -2\cot 2\theta + \dfrac{1}{\theta}$

07. ${}^3C_3 \times {}^4C_2 \times 3 + {}^3C_2 \times {}^4C_3 \times 2 + {}^3C_1 \times {}^4C_4 \times 1 = 45$

08. $dx - dy = \dfrac{dx + dy}{x + y} \Rightarrow x - y = \log(x+y) - \log c \Rightarrow e^{x-y} = \dfrac{x+y}{c} \quad x + y = c.e^{x-y}$

09. $f(x) = \int_0^x 2|t|\,dt$

$f^1(x) = 2|x|$

Since, it is given that the tangents of the curves all parallel to the bisector of the first quadrant angle , i.e a line which is inclined at an angle of 45^0 with +ve x-axis $f^1(x)=1$ $2|x|=1$

For $x=\frac{1}{2}$ $y=f(x)=\int_0^{\frac{1}{2}} 2t\,dt=\frac{1}{4}$ and $x=\frac{1}{2}$ $y=\int_0^{\frac{1}{2}} -2t\,dt=-\frac{1}{4}$

Equation of tangent $\left(\frac{1}{2},\frac{1}{4}\right)$ and $\left(-\frac{1}{2},-\frac{1}{4}\right)$ are $y=x-\frac{1}{4}$ and $y=x+\frac{1}{4}$

10. $\begin{vmatrix} a & b & a\alpha-b \\ b & c & b\alpha-c \\ 2 & 1 & 0 \end{vmatrix} = 0$

$c_3 \to c_3 - \alpha c_1 + c_2$ $\quad D = \begin{vmatrix} a & b & 0 \\ b & c & 0 \\ 2 & 1 & -2\alpha+1 \end{vmatrix} = 0$, $D = (1-2\alpha)(ac-b^2) = 0$

$\alpha \neq \frac{1}{2}$ $ac-b^2=0$ $\quad b^2=ac$ a,b,c are in GP

11. $S_1 = S_{11}$ is passing through origin

$xx_1+yy_1-a(x+x_1)=x_1^2+y_1^2-2ax_1$ is passing through (0, 0)

$0.x_1+0.y_1-a(0+x_1)=x_1^2+y_1^2-2ax_1$ $\quad x^2+y^2-ax=0$

12. Injective $f^1(x)>0$

$9x^2+4(a-50)x+4(54-a)>0$ $\forall x\in R$ $\Delta<0$

$a^2-91a+2014<0$ $\quad (a-38)(a-53)<0$

$a\in(38,53)$ $\quad \alpha+\beta=38+53=91$

13. $y=mx+\frac{1}{m}$ $\qquad \beta=m\alpha+\frac{1}{m}$

$\alpha m^2-\beta m+1=0$ $\qquad$ Roots $m_1, 2m_1$

$m_1+2m_1=\frac{\beta}{\alpha}, m_1.2m_1=\frac{1}{\alpha}$ $\qquad 2.\left(\frac{\beta}{3\alpha}\right)^2=\frac{1}{\alpha}$ $\qquad 2\beta^2=9\alpha$

14. $(AB\cos\theta-5,\ AB\sin\theta-4)$ lie on the line $x+3y+2=0$

$\Rightarrow AB\cos\theta-5+3(AB\sin\theta-4)+2=0 \;\Rightarrow \cos\theta+3\sin\theta=\dfrac{15}{AB}$ ______________ (1)

$(AC\cos\theta-5,\ AC\sin\theta-4)$ lie on the line $2x+y+4=0\Rightarrow 2\cos\theta+\sin\theta=\dfrac{10}{AC}$ ________ (2)

$(AD\cos\theta-5,\ AD\sin\theta-4)$ lie on the line $x-y-5=0\Rightarrow\cos\theta-\sin\theta=\dfrac{6}{AD}$ _______ (3)

$\left(\dfrac{15}{AB}\right)^2+\left(\dfrac{10}{AC}\right)^2=\left(\dfrac{6}{AD}\right)^2 \Rightarrow Tan\theta=\dfrac{-2}{3}=m\Rightarrow y+4=-\dfrac{2}{3}(x+5)\Rightarrow 2x+3y+22=0$

15. Formula

16. $T_n=Tan^{-1}\left(\dfrac{2}{1+4n^2-1}\right)\Rightarrow T_n=Tan^{-1}\left(\dfrac{(2n+1)-(2n-1)}{1+(2n+1)(2n-1)}\right)\Rightarrow\sum_{n=1}^{\infty}\tan^{-1}(2n+1)-\tan^{-1}(2n-1)$

$\Rightarrow S=\tan^{-1}3-\tan^{-1}1+\tan^{-1}5-\tan^{-1}3+\tan^{-1}7-\tan^{-1}5-........\tan^{-1}\infty$

$S=\dfrac{\pi}{2}-\dfrac{\pi}{4}=\dfrac{\pi}{4}$

17. $\displaystyle\int\frac{\left(1+\frac{1}{x^2}\right)dx}{\left(x-\frac{1}{x}\right)^2+1}$ Put $x-\dfrac{1}{x}=t$

$\displaystyle\int\frac{dt}{t^2+1}=\tan^{-1}t+c=\tan^{-1}\left(\frac{x^2-1}{x}\right)+c$

18. Equation of tangent at $\left(4\cos\phi,\dfrac{16}{\sqrt{11}}\sin\phi\right)$ is $4x\cos\phi+y\sqrt{11}\sin\phi=16$

This tangent $(x-1)^2+y^2=4^2$ cp = r $\Rightarrow\left|\dfrac{4\cos\phi-16}{\sqrt{16\cos^2\phi+11\sin^2\phi}}\right|=4$

$4\cos^2\phi+8\cos\phi-5=0\Rightarrow(2\cos\phi-1)(2\cos\phi+5)=0$

$\therefore\cos\phi=\dfrac{1}{2},\phi=\pm\dfrac{\pi}{3}$

,

19. Triangle ABC, $A(33,26),B(-2,5)$ and $H(1,2)$

C is ortho centre of triangle AHB

Also 3G = H + 2S

20. Number of parts of non differentiable = 2 At x = 1, $\sqrt{2}$

21. $\begin{vmatrix} 3 & -2 & 1 \\ l & -14 & 15 \\ 1 & 2 & -3 \end{vmatrix} = 0 \Rightarrow l = 5$

22. $f(x) = x + \cos x + 2 \quad f(0) = 3, g(3) = 0 \qquad g(f(x)) = x$

$g^1(f(x)).f^1(x) = 1 \qquad f^1(x) = 1 - \sin x$

Put x =0 $g^1(f(0))f^1(0) = 1 \quad \Rightarrow f^1(0) = 1 \Rightarrow g^1(3)f^1(0) = 1$

$g^1(3) = \frac{1}{f^1(0)} = \frac{1}{1} = 1 \Rightarrow g^1(3) = 1$

23. $\bar{r} = \bar{a} + t\bar{b} \qquad \bar{a} = (3,8,3) \qquad \bar{b} = (3,-1,1)$

$\bar{r} = \bar{c} + s\bar{d} \qquad \bar{c} = (-3,-7,6) \qquad \bar{d} = (-3,2,4)$

$\left| \frac{\left[\bar{c} - \bar{a} \ \bar{b} \ \bar{d} \right]}{\left| \bar{b} \times \bar{d} \right|} \right| = 3\sqrt{30}$

24. If R be the relation x R y $\Leftrightarrow$ x – y is divisible by m

x R x be cause x – x is divisible by m, so R is reflextive, so, R is symmetric

x R y and yRz Also x – y = k_1m y-z = k_2m

x – z = (k_1 + k_2) m so R is transitive

As R is reflexive, symmetrix and transitive, It is an equivalence relation

25. $|\bar{a}| = 1, |\bar{b}| = 1$ Angle between $\vec{a}$ and $\vec{b}$ is

$|\bar{a} + \bar{b}|^2 = 1 \Rightarrow 1 + 1 + 2\cos\alpha = 1 \Rightarrow \cos\alpha = -\frac{1}{2} \Rightarrow \alpha = \frac{2\pi}{3}$

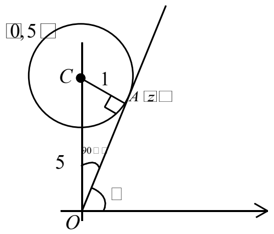
26. $P(B \text{ rides } A) = \frac{2}{3} \qquad P(C \text{ rides } A) = \frac{1}{3}$

P(A wins if B rids on him) = $\frac{2}{3} \times \frac{1}{6} = \frac{1}{9}$

P(A wins if C rids on him) = $\frac{1}{3} \times \frac{3}{6} = \frac{1}{6}$

P(A wins) = $\frac{1}{9} + \frac{1}{6} = \frac{5}{18}$

27.



$\sin \angle AOC = \frac{1}{5} \sin(90 - \theta) = \frac{1}{5}$ $\qquad \cos\theta = \frac{1}{5}$

$OA = \sqrt{OC^2 - CA^2} = \sqrt{24}$ $\sin\theta = \frac{\sqrt{24}}{5}$. Now the co-ordinates of A are

$\left(\sqrt{24}\cos\theta, \sqrt{24}\sin\theta\right) \left(\frac{\sqrt{24}}{5}, \frac{24}{5}\right)$ $\qquad = \frac{\sqrt{24}}{5} + i\left(\frac{24}{5}\right)$

28. $f(x) = x^2 - ax - (a - 3) = 0$

Let α, β be the roots of the Equation f(x) = 0

Since '1' lies between α and β $a.f(1) < 0 \Rightarrow 1 - a - a + 3 < 0 \Rightarrow$ a>2

29. Let the equation of the plane $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$

$A(a,0,0)\ B(0,b,0)\ C(0,0,c)$

$$P = \frac{1}{\sqrt{\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2}}}$$

$\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2} = \frac{1}{p^2}$ Locus of point (a,b,c) is (x,y,z

$\therefore x^{-2} + y^{-2} + z^{-2} = p^{-2}$

30. $p c_0 - (p-1) c_1 + (p-2) c_2 - (p-3) c_3 + ...$

$= p(c_0 - c_1 + c_2 - c_3....) + (1.c_1 - 2.c_2 + ...)$

= p(0)+ 0 = 0.

PHYSICS_SOLUTIONS

31. Total gravitational energy gained

= work done + energy released by the spring

= W + E.

32. (Hint : f = 20cm, u = -4000cm. Using $\frac{1}{u}+\frac{1}{u}=\frac{1}{f}$, we get $u=\frac{4000}{201}cm$. Also

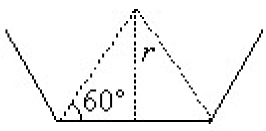
$$m=\frac{I}{O}=-\frac{u}{u}=+\frac{4000}{201}′ \frac{1}{4000}=\frac{1}{201}$$

\ Size of the image $=\frac{1}{201}′$ (size of object)

33. $r=\sqrt{3}L$

The desired moment of inertia about O is

I = 6 x $I_{one\ side}$



$$=6\left[\frac{m(2L)^2}{12}+mr^2\right]$$

$$=6\left[\frac{mL^2}{3}+3mL^2\right]=20\,mL^2$$

34. $I_1=\frac{I_o}{2}$

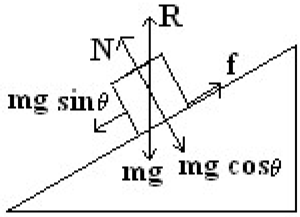
$$I_2=I_1Cos^2 60=\frac{I_o}{2}\left(\frac{1}{2}\right)^2=\frac{I_o}{8}$$

$$I_3=I_2Cos^2 60=\frac{I_o}{8}\left(\frac{1}{2}\right)^2=\frac{I_o}{32}$$

$$I_4=I_3Cos^2 60=\frac{I_o}{32}\left(\frac{1}{2}\right)^2=\frac{I_o}{128}$$

$$I_5=I_4Cos^2 60=\frac{I_o}{128}\left(\frac{1}{2}\right)^2=\frac{I_o}{512}$$

35. Because the cubical block slides with a uniform velocity and does not topple, $f = mg\,sin\,q$ and $N = mg\,cos\,q$.



$\left|\bar{t}\right| = mg\,sin\,q' \ \frac{a}{2}$

36. $n = \dfrac{Sin\left(\frac{A+A}{2}\right)}{Sin\frac{A}{2}}$

SinA = n Sin$\frac{A}{2}$

$2Sin\frac{A}{2}Cos\frac{A}{2} = nSin\frac{A}{2}$

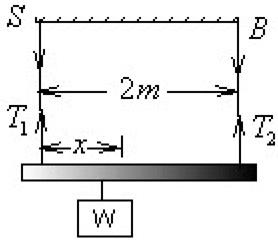
n = $Cos\frac{A}{2}$

Sin $\frac{A}{2} = \sqrt{1-\frac{n^2}{4}}$

A = $2Sin^{-1}\left(\sqrt{\frac{4-n^2}{4}}\right)$

37. The equation of a general conic is,
$\frac{1}{r} = \frac{1}{l}(1+ecos\theta)$
where e is eccentricity.
For ellipse, turning points are at $\theta = 0°$ and $\theta = 180°$ giving $r_{min.} = r_2$ and $r_{max.} = r_1$ respectively.
$\therefore \frac{1}{r_2} = \frac{1}{l}(1-e)$
And $\frac{1}{r_1} = \frac{1}{l}(1+e)$
$\therefore \frac{1}{r_2} + \frac{1}{r_1} = \frac{2}{l}$
Or $l = \frac{2r_1r_2}{r_1+r_2}$

38. $i_D = i_C = \frac{V}{X_C} = V\omega C = V(2\pi f)C \ \ if \ \ f\downarrow \therefore i_D \downarrow$

39. 

As stresses are equal, $\frac{T_1}{A_1} = \frac{T_2}{A_2}$

i.e., $\frac{T_1}{T_2} = \frac{A_1}{A_2} = \frac{0.1}{0.2}$ or $T_2 = 2T_1$ …….(1)

Now, for translatory equilibrium of the rod,

$T_1 + T_2 = W$

From eqn. (i) and (ii), $T_1 = \frac{W}{3}; T_2 = \frac{2W}{3}$ …..(ii)

Now, if x is the distance of weight W from steel wire, then for rotational equilibrium of rod.

$T_1 x = T_2 (2 - x)$

Or $\frac{W}{3} \times = \frac{2W}{3}(2 - x)$

$\therefore$ x = $\frac{4}{3}m$

40. $f^1 = f\left(\frac{v + v_0}{v}\right) = f \times 6/5$

motion of observer doesn't effect the wavelength

41. In general R (rate of collection) = vA cosθ.

Where θ is the angle between the velocity of the rain and the normal to the cross-section A of the vessel.

R = vA cos 0° = vA

When the wind blows, R' = v' A cosθ, where v' is the new velocity of rain. Now,

$v' = \sqrt{u^2 + v^2}$

And $\cos\theta = \frac{v}{\sqrt{u^2 + v^2}}$

R' = v' A cosθ

= vA = R

42. For solid sphere of radius R_1

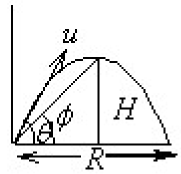
$$a_1 = \int_0^{R_1} 4\pi r^2 drp = a_1 = \int_0^{R_1} 4\pi r^2 dr \frac{p_o}{r}$$

$q_1 = 4\pi \frac{R_1^2}{2}\rho_0$ and $q_2 = -4\pi R_2^2 \sigma$

$q_1 + q_2 = 0$ or $4\pi \frac{R_1^2}{2}\rho_0 - 4\pi R_2^2 \sigma = 0$

$$\left(\frac{R_1}{R_2}\right) = \frac{2\sigma}{\rho_0} \left(\frac{R_2}{R_1} = \sqrt{\frac{\rho_0}{2\sigma}}\right)$$

43. It is clear from the adjoining figure that, $\tan\phi = \frac{H}{R/2}$



$$= \frac{u^2 \sin^2\theta / 2g}{u^2 \sin 2\theta / 2g} = \frac{\sin^2\theta}{\sin 2\theta} = \frac{1}{2}\tan\theta$$

44. $V_1 = \frac{kq}{R} - \frac{kq}{\sqrt{R^2 + d^2}}, V_2 = \frac{-kq}{R} + \frac{kq}{\sqrt{R^2 + d^2}}$ $V_1 - V_2 = 2\left(\frac{kq}{R} - \frac{kq}{\sqrt{R^2 + d^2}}\right)$

45. Time taken by the bullet and ball to strike the ground is,

$$t = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 \times 5}{10}} = 1s$$

Let v_1 and v_2 be the velocities of ball and bullet after collision.Then applying

x = vt

We have, $20 = v_1 \times 1$

Or $v_1 = 20 m/s$

100 = $v_2 \times 1$

Or $v_2 = 100 m/s$

Now, from conservation of linear momentum before and after collision we have,

0.01v = (0.2 x 20) + (0.01 x 100)

On solving, we get v = 500 m/s

46. The weight is to balance the weight of upper plate of capacitor plus the force between the plates of capacitor.

47. 4g sin30 + 2g sin 30 - 0.3 x 4g cos30 - 0.2 x 2g cos 30° = 6a

$2g + g - 0.3 \times 4g \times \frac{\sqrt{3}}{2} - 0.2 \times 2g \frac{\sqrt{3}}{2} = 6a$

$3g - 0.6\sqrt{3} - 0.2g\sqrt{3} = 6a$

$30 - 6\sqrt{3} - 2\sqrt{3} = 6a$

$30 - 8\sqrt{3} = 6a$

30 - 8 x 1732 = 6a

30 - 13.856 = 6a

$a = \frac{16.144}{6} = 2.6$ m/sec^2.

48. $\frac{B_V}{B_H\ Cos\theta} = Tan\phi_1$

$\frac{B_V}{B_H\ Cos\ (90-\theta)} = Tan\phi_2$

$\left(\frac{Bv}{B_H} = Tan\phi\right)$

49. $r gh = \frac{mg}{A}$

50. $dR = \rho\frac{dx}{A}$

51. Apply Bernouli's theorem

52. mg + ilB = 2kx

By given substitution of related values x = 1 cm

53. Conceptual

54. Initial no.of coils N = 100 and radius = 1 m

$2\pi f \times 100 \times B \times \pi \times 1^2 = 100V$

Total length = = 100 x 2π x 1 = 200π m

The circumference of turn of radius 2m = 2 x 2m

no.of turns in 2π x 100 m is $\frac{2\pi\times100}{2\pi\times2} = 50$ turns

$V_m^1 = 2\pi \times f \times 50 \times B \times \pi 2^2 = 200V$

55. Let T be the temperature of the sun

$\lambda T = b = Wien's$ constant

T = $\frac{b}{\lambda}$

Energy lost by the sun per second

$= \left(\sigma T^4\right) 4\pi R^2 = \sigma \left(\frac{b}{\lambda}\right)^4 4\pi R^2$

This is equal mc2.

$mc^2 = \sigma \left(\frac{b^4}{\lambda^4}\right) 4\pi R^2$

$m = \frac{\sigma b^4 4\pi R^2}{\lambda^4 c^2}$

$= \frac{R^2}{\lambda^4 c^2} = \left(4\pi\sigma b^4\right)$

$m \propto \frac{R^2}{\lambda^4 c^2}$

56. Potential energy of electron $= \frac{-KZe^2}{r}$,

Kinetic energy of electron $= \frac{1}{2}\frac{KZe^2}{r}$

Where $K = \frac{1}{4\pi\varepsilon_0}$

Total energy (T.E.) of electron $= -\frac{1}{2}\frac{KZe^2}{r}$

When an electron undergoes transition from excited state to ground state, r decreases.
$\therefore$ K.E. increases.
P.E. decreases as it becomes more negative.
T.E decreases as it becomes more negative.
Option (a) is correct.

57. $P = \frac{Q_2}{Q_1 - Q_2}$

$\frac{1}{3} = \frac{Q_2}{200 - Q_2}$

$Q_2 = 50J$

W = $Q_1 = Q_2$

= 150 J

58. Since the half life is 2 hours, the intensity of the radiation falls by a factor of 2 evey 2 hours. In 12 hours it will fall by a factor of $(2)^6 = 64$. Thus, in 12 hours the intensity attains the safe level.

59. $(\Delta Q)_{ab} = +7000 = \mu c_v (1000 - 300)$

For the process ca :

$T_a = 300K,\ T_c = T_b = 1000K$

$(\Delta Q)_{ca} = \mu C_p (300 - 1000) = \mu C_p \times 700$

$= -\mu (C_v + R) 700$

For carbon monoxide :

r = $1 + \frac{2}{n} = 1 + \frac{2}{5} = \frac{7}{5}$

$C_v = \frac{R}{\gamma - 1} = \frac{R}{\frac{7}{5} - 1} = \frac{5R}{2}$

Hence, from, eqn. (i)

700 = $\mu \frac{5R}{2} \times 700$ or $\mu R = \frac{20}{5} = 4$

$\therefore\ (\Delta Q)_{ca} = -[7000 + 4 \times 700] = -9800J$

Negative sign shows that heat is ejected

60. According to K.V.L $I_C R_L + V_{CE} = 8V$

$4 \times 10^{-3} \times R_L + 4V = 8V$

$R_L = \frac{4}{4 \times 10^{-3}} \Rightarrow 1k\,\Omega$

CHEMISTRY SOLUTIONS

62. $\Delta T_f = \frac{1.000 \times k_f \times \omega}{M \times \omega}$

$0.45 = \frac{1000 \times 5.12 \times 0.2}{20 \times M}$

$\mathbf{M_{obs} = 113.78}$

Now for $2CH_3COOH \rightleftharpoons (CH_3COOH)_2$

Before assosiation 1 0

after association $1-\alpha$ $\frac{\alpha}{2}$

Where X is degree os association

$\frac{M_{normal}}{M_{observed}} = 1 - \alpha + \frac{\alpha}{2}$

$\frac{60}{113.78} = 1 - \alpha + \frac{\alpha}{2}$ $\alpha = 0.948$

65. $\wedge_m^0 BaSO_4 = 2\wedge_{eq}^{\theta} BaSO_4$

$\wedge_{eq}^0 BaSO_4 = \wedge_{eq}^0 Ba^{2+} + \wedge_{eq}^0 SO_4^{2-}$

$\wedge_{eq}^0 BaCl_2 + \wedge_{eq}^0 H_2SO_4 - \wedge_{eq}^0 HCl$

$\wedge_{eq}^0 BaSO_4 = x_1 + x_2 - x_3$

$\wedge_m^0 BaSO_4 = 2(x_1 + x_2 - x_3)$

For sparingly soluble salts

$\wedge_m^0 = \frac{k}{M} \times 1000$

$M = \frac{x}{2(x_1 + x_2 - x_3)} \times 1000$

69. $\ln \frac{kp_2}{kp_1} = \frac{\Delta H^0}{R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$

$\Rightarrow \ln \frac{10^{-4}}{10^{-6}} = \frac{\Delta H^0}{8.314}\left[\frac{25}{298 \times 323}\right]$

$\Delta_r H^0 = 147.41 \text{ kJ / mol}$

71. Phenolphthalein gives the end point corresponding to the reactions

$NaOH + HCl \rightarrow NaCl + H_2O$

$Na_2CO_3 + HCl \rightarrow NaHCO_3 + NaCl$

millimoles of NaOH + millimoles of $Na_2CO_3 =$ millimoles of HCl = 2.5

Methyl orange gives the end point corresponding to the reactions

$NaOH + HCl \rightarrow NaCl + H_2O$

$Na_2CO_3 + 2HCl \rightarrow 2NaCl + CO_2 + H_2O$

Millimoles of NaOH + millimoles of $Na_2CO_3 \times 2 =$ millimoles of HCl = 3

millimoles of $Na_2CO_3 = 0.5$

millimoles of NaOH = 2.5 – 0.5 = 2

Ratio of mole of NaOH and Na_2CO_3

72. Energy absorbed $13.6 \times 1.5 = 20.4\ eV$

20.4 – 13.6 = 6.8 ev

this 6.8 ev is converted KE

$$KE = \frac{1}{2}mv^2$$

$$6.8 \times 1.6 \times 10^{-19} = \frac{1}{2} \times 9.11 \times 10^{-31} \times v^2$$

$$v = \sqrt{\frac{2 \times 6.8 \times 1.6 \times 10^{-19}}{9.11 \times 10^{-31}}} = 1.54 \times 10^6 m/sec$$

74. $\frac{r_{mx}}{r_x} = \frac{4}{5} \times \frac{10}{4} = 2 = \sqrt{\frac{M_x}{M_{mx}}}$

$M_{mix} = 9 \quad \therefore M_x = 36$

$M_{mix} = M_{H_2}X_{H_2} + M_{CH_4}X_{CH_4} = 2X_{H_2} + 16(1 - X_{H_2}) = 9 \qquad X_{H_2} = 0.5$

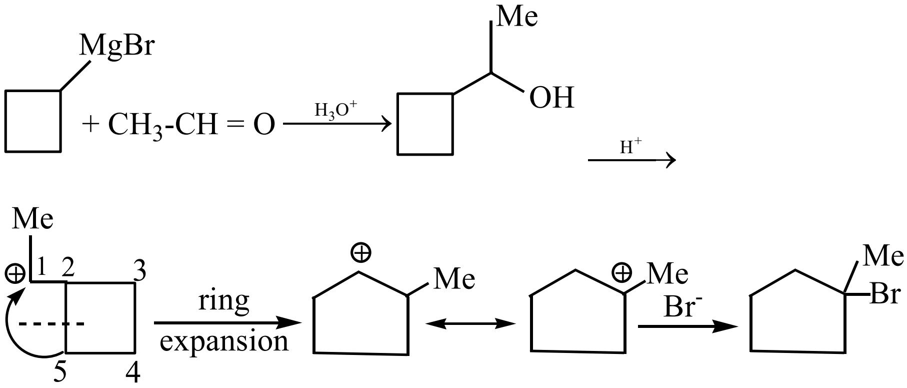
75. In CsBr

$$2(r_e + r_a) = \sqrt{3}a \quad r_e + r_a = \frac{\sqrt{3} \times 4.3}{2} = 3.72Pm$$

76. In 2,3 and 4 conbanion is stabilised by resonance, but in (1) it is not stabilized. Moreover (+I) effect of Me group destabilises the carbanion in (1)

78. Step 2 in wrong because friedel - crofts reaction will not take palce in the presence of e^- - with drawing, m- directing group

80.



82. The units of rate of reaction and rate constant are same for a zero order reaction

83. **PhCOOH (B), PhCOC*l*(C), (phCO)$_2$O (D)**

$$\underset{(x)}{PhCONH_2} \xrightarrow{Br_2+KOH} \underset{y}{PhNH_2} \xrightarrow{NaNO_2+HCl} ph-N_2^+Cl^- \xrightarrow{\text{Phenol}} \text{azodye}$$

85. $k_{sp} = [Fe^{2+}][OH^-]^2$

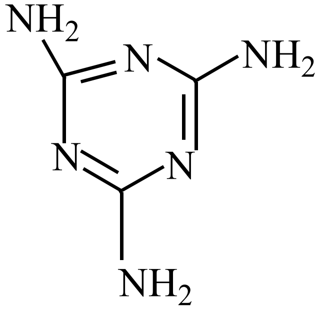
P^H=13 P^{OH} = 1

$[OH^-] = 10^{-1}$

$8\times10^{-16} = [Fe^{2+}][10^{-1}]^2$

$[Fe^{+2}] = 8\times10^{-14} \Rightarrow$ solibility

86. The monomers are



and HCHO

2,4,6 – triamino 1,3,5 – triazine

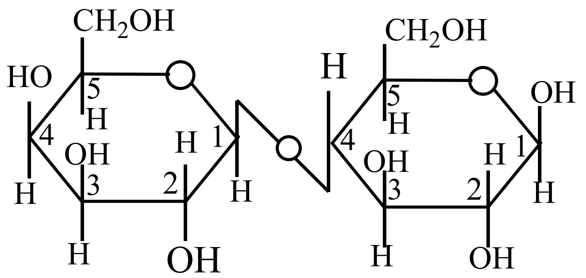
88. $\Delta G = \Delta H - T\Delta S$

at eqm 0 = -40000 + T50 $T = \frac{40,000}{50} = 800k$

Len than 800k spontaneous

More than 800k non spontaneous

89.



$\beta - D - \text{Galatose}$ $\beta - D - \text{Glu}\cos e$