ANSWER KEY (AIPMT-2006)

Ques.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Ans	1	4	2	3	3	1	4	2	3	2	1	2	3	1	3	4	1	1	2	3
Ques.	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
Ans	4	2	1	3	2	4	1	3	2	3	4	4	1	2	4	4	2	4	1	2
Ques.	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
Ans	1	4	4	4	2	3	1	1	1	4	2	2	3	1	4	3	2	4	2	1
Ques.	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**	**71**	**72**	**73**	**74**	**75**	**76**	**77**	**78**	**79**	**80**
Ans	2	1	3	1	1	4	3	1	2	1	1	1	4	4	2	2	2	3	2	3
Ques.	**81**	**82**	**83**	**84**	**85**	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**100**
Ans	1	1	2	2	4	4	3	4	1	2	4	2	3	3	3	3	1	4	1	4
Ques.	**101**	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**	**111**	**112**	**113**	**114**	**115**	**116**	**117**	**118**	**119**	**120**
Ans	2	3	1	2	2	2	4	2	2	4	4	3	4	2	4	4	3	4	4	3
Ques.	**121**	**122**	**123**	**124**	**125**	**126**	**127**	**128**	**129**	**130**	**131**	**132**	**133**	**134**	**135**	**136**	**137**	**138**	**139**	**140**
Ans	2	2	4	3	2	4	2	2	4	2	4	4	2	2	2	3	1	1	2	2
Ques.	**141**	**142**	**143**	**144**	**145**	**146**	**147**	**148**	**149**	**150**	**151**	**152**	**153**	**154**	**155**	**156**	**157**	**158**	**159**	**160**
Ans	2	4	3	1	1	2	1	3	3	1	3	3	1	1	1	1	1	2	1	1
Ques.	**161**	**162**	**163**	**164**	**165**	**166**	**167**	**168**	**169**	**170**	**171**	**172**	**173**	**174**	**175**	**176**	**177**	**178**	**179**	**180**
Ans	2	4	4	1	1	2	3	4	4	3	3	3	2	3	4	2	2	4	4	4
Ques.	**181**	**182**	**183**	**184**	**185**	**186**	**187**	**188**	**189**	**190**	**191**	**192**	**193**	**194**	**195**	**196**	**197**	**198**	**199**	**200**
Ans	1	4	2	2	3	2	3	2	2	1	2	2	1	4	4	4	3	2	2	3

HINTS & SOLUTIONS

1. $m = ZIt = (Z)\left(\frac{P}{V}\right)(t) = (0.367 \times 10^{-6})\left(\frac{100}{125}\right)(60)$

$= 1.76 \times 10^{-5}$ kg = 17.6 mg

2. $V_A - V_B = \left[V - \left(\frac{V}{8} \times 4\right)\right] - \left[V - \left(\frac{V}{4} \times 1\right)\right]$

$= -\frac{V}{2} + \frac{V}{4} = -\frac{V}{4} \Rightarrow V_B > V_A \Rightarrow$ **Ans (4)**

3. Restoring force = $Ax\rho g = kx \Rightarrow k = A\rho g$

$\Rightarrow T = 2\pi\sqrt{\frac{m}{A\rho g}} \Rightarrow$ **Ans(2)**

4. $\eta = 1 - \frac{T_2}{T_1} \Rightarrow 1 - \frac{300}{T_1} = 0.4 \Rightarrow T_1 = 500$ K

now $\eta' = 0.4 + 0.4 \times \frac{50}{100} = 0.6$

Therefore $0.6 = 1 - \frac{300}{500 + \Delta T}$

$\Rightarrow 500 + \Delta T = 750 \Rightarrow \Delta T = 250$ K

5. $\vec{F} = q(\vec{v} \times \vec{B}) = avB \sin\theta\, \hat{n}$

Therefore when $\theta = 0^o$ or $\theta = 180^o$, F = 0

6 According to question

$E - Ir_1 = 0$ & $I = \frac{E + E}{r_1 + r_2 + R}$ $\therefore \frac{E}{r_1} = \frac{2E}{r_1 + r_2 + R}$

$\Rightarrow r_1 + r_2 + R = 2r_1$ $\Rightarrow R = r_1 - r_2$

7. By Wiens displacement law $\lambda_m T = b$ we have (5000) (1500) = (λ'_m) (1500 +1000)

$\Rightarrow \lambda'_m = \frac{(5000)(1500)}{(2500)} = 3000$ Å

8. Let r_1 and r_2 are the radius of coil 1 & 2. If B_1 and B_2 are magnetic induction at their centre, then

$B_1 = \frac{\mu_0 I_1}{2r_1}$; and $B_2 = \frac{\mu_0 I_2}{2r_2}$

Since $B_1 = B_2$; and $r_1 = 2r_2$ therefore $I_1 = 2I_2$ Again if R_1 and R_2 are resistance of the coil 1 and 2 then $R_1 = 2R_2$ (as $R \propto$ length = $2\pi r$) and if V_1 and V_2 are the potential difference across them respectively, then

$\frac{V_1}{V_2} = \frac{I_1 R_1}{I_2 R_2} = \frac{(2I_2)(2R_2)}{I_2 R_2} = 4$

9. $f = \frac{1}{2\pi\sqrt{LC}}$ & $f' = \frac{1}{2\pi\sqrt{2L(4C)}}$

Therefore $f' = \left(\frac{1}{2\sqrt{2}}\right)\frac{1}{2\pi\sqrt{LC}} = \frac{f}{2\sqrt{2}}$

10. Energy released = 28 – 2 × 2.2 = 28 – 4.4 = 23.6 MeV

11. $R_1 = R_0 e^{-\lambda t_1}$ & $R_2 = R_0 e^{-\lambda t_2}$

$\Rightarrow \frac{R_1}{R_2} = \frac{e^{-\lambda t_1}}{e^{-\lambda t_2}} = e^{-\lambda(t_1 - t_2)} \Rightarrow R_1 = R_2\, e^{-\lambda(t_1 - t_2)}$

12. According to question $12.1 = 13.6\left(\frac{1}{\ell^2} - \frac{1}{n^2}\right)$

$\Rightarrow n^2 = \frac{13.6}{1.5} \approx 9 \Rightarrow n = 3$

No. of spectral lines emitted

$= \frac{n(n-1)}{2} = \frac{(3)(2)}{2} = 3$

13. $U = \frac{1}{2}K(2)^2$ & $U' = \frac{1}{2}K(8)^2$

$\Rightarrow \frac{U'}{U} = \left(\frac{8}{2}\right)^2 = 16 \Rightarrow U' = 16U$

14. For complementary angles, range will be same

OR

$$\frac{R_1}{R_2} = \frac{\left[\frac{u^2 \sin 2(45-\theta)}{g}\right]}{\left[\frac{u^2 \sin 2(45+\theta)}{g}\right]} = \frac{u^2 \sin(90-2\theta)}{u^2 \sin(90+2\theta)}$$

$$= \frac{\cos 2\theta}{\cos 2\theta} = 1$$

15. By using work energy theorem

$W = \Delta KE = \frac{1}{2}\ mv_2^2 - \frac{1}{2}\ mv_1^2$

Now $s = \frac{1}{3}t^2 \quad \Rightarrow v = \frac{2}{3}t$

$\Rightarrow v_1 = 0,\ v_2 = \frac{2}{3} \times 2 = \frac{4}{3}\ ms^{-1}$

Therefore $W = \frac{1}{2} \times 3\left(\frac{4}{3}\right)^2 - \frac{1}{2} \times 3 \times (0)^2 = \frac{8}{3}\ J$

16. $x = 40 + 12t - t^3 \Rightarrow v\ \frac{dx}{dt} = 12 - 3t^2$

$\Rightarrow v = 0$ at $t = 2$ sec

Distance travelled by particle before coming to rest

$=$ **x** (at t = 2) – **x** (at t = 0)

$= [40 + 12 \times 2 - 2^3] - [40] = 16$ m

17. $v = at + \frac{b}{t+c} \Rightarrow [c]\ [t] = T;$

$[v] = [at] \Rightarrow [a] = \frac{[v]}{[t]} = LT^{-2};$

$[b] = (LT^{-1})\ T = L$

18. Shifting in microscope = upward shifting in mark

$= t\left(1 - \frac{1}{\mu}\right) = 3\left(1 - \frac{1}{1.5}\right) = 1$ cm

19. By using work energy theorem $W = \Delta KE$

(here $\Delta KE = 0$) $\Rightarrow\ 300 - W_{gravity} - W_{friction} = 0$

$\Rightarrow W_{friction} = 300 - mgh$

$= 300 - (2)(10)(10) = 100J$

20. $\beta = \frac{\Delta I_C}{\Delta I_B} = \frac{(10-5)\times 10^{-3}}{(150-100)\times 10^{-6}} = 100$

24. By using $M = K\ \sqrt{L_1 L_2}$ Here $K = 1$, $L_1 = 2mH$

$L_2 = 8mH \Rightarrow M = \sqrt{16} = 4$ mH

26. According to given situation

$h\nu = E_0 + K$ & $2h\nu = E_0 + K' \Rightarrow K' = K + h\nu$

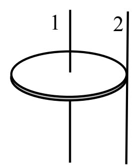
27. In given situation output C is high only when both inputs A and B are high so logic ckt gate is AND gate.

28. Power factor $= \cos\phi = \frac{R}{|Z|} = \frac{8}{\sqrt{8^2 + (31-25)^2}}$

$= \frac{8}{\sqrt{8^2 + 6^2}} = \frac{8}{10} = 0.8$

29. $F = \frac{\Delta p}{\Delta t} = \frac{2mv \sin 30^o}{0.25} = 24$ N

30.



$I_2 = I_1 + MR^2 = \frac{3}{2}MR^2$

31. For a photon $E = pc$

$\Rightarrow p = \frac{E}{c} = \frac{10^6 \times 1.6 \times 10^{-19}}{3 \times 10^8} = 5.33 \times 10^{-22}$ $kgms^{-1}$

32. $R = R_0 A^{1/3} \Rightarrow A_{Ge} = \left(\frac{R_{Ge}}{R_{Be}}\right)^3 (A_{Be}) = (2)^3(9)$

$= 8 \times 9 = 72$

33. $C_P = \frac{7}{2}R \Rightarrow C_V = C_P - R = \frac{5}{2}R \Rightarrow \gamma = \frac{C_P}{C_V} = \frac{7}{5}$

34. According to question and by using COME

$-\frac{GMm}{R+R} + \frac{1}{2}m(fv)^2 = 0 + 0$

$\Rightarrow fv = \sqrt{\frac{GM}{R}}$ but $v = \sqrt{\frac{2GM}{R}}$

Therefore $f\sqrt{\frac{2GM}{R}} = \sqrt{\frac{GM}{R}} \Rightarrow f = \frac{1}{\sqrt{2}}$

35. Number of beats per second

$$= \frac{v}{\lambda_1} - \frac{v}{\lambda_2} = 330\left(\frac{1}{5} - \frac{1}{5.5}\right) = 66 - 60 = 6$$

36. As voltage drop across

$$8\Omega = \sqrt{2\times 8} = 4V \quad \left(\because P = \frac{V^2}{R}\right)$$

Therefore voltage drop across $3\Omega = 3V$

[$\because$ 4V is divided in ratio of resistances between 1Ω and 3Ω]

Hence power dissipated in $3\Omega = \frac{(3)^2}{3} = 3$ watt

38. $V = \frac{\omega}{k} = \frac{4\pi}{0.5\pi} = 8\ ms^{-1}$

39. Time of reverberation $\propto \frac{V}{A}$ (sabine's formula)

Where V = volume of room and A = area of room

42. $P = P_1 + P_2 = \frac{1}{f_1} + \frac{1}{f_2} = \frac{1}{25} + \frac{1}{(-25)} = 0$

43. Work done in rotating a dipole from θ_1 to θ_2 is

$W = pE(\cos\theta_1 - \cos\theta_2)$

Here $\theta_1 = 0^o$ and $\theta_2 = 90^o$ therefore $W = pE$

44. According to question

Q = constant and C$\downarrow$ therefore V$\uparrow$

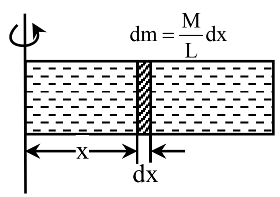
45. Average velocity $= \frac{\text{Displacement}}{\text{Time taken}} = \frac{0}{62.8} = 0$

Average speed $= \frac{\text{Distance}}{\text{Time taken}} = \frac{2\pi r}{T}$

$$= \frac{(2\pi)(100)}{(62.8)} = 10ms^{-1}$$

46. $\phi = \vec{E}\cdot\vec{S} = ES\cos 90^o = 0$ ($\therefore$ area vector is $\perp^r$ to $\vec{E}$)

47.

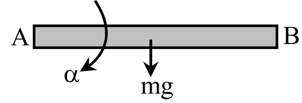


Consider a small mass element dm at distance x from axis

Required force $F = \int dF = \int (dm)(\omega^2)(x)$

$$= \int_0^L \frac{M}{L}\omega^2 x dx = \frac{M\omega^2 L}{2}$$

48.



Here $\tau = I\alpha$

$$\Rightarrow (mg)\left(\frac{\ell}{2}\right) = \left(\frac{m\ell^2}{3}\right)(\alpha) \Rightarrow \alpha = \frac{3g}{2\ell}$$

49. $|\vec{A}+\vec{B}| = |\vec{A}-\vec{B}| \Rightarrow |\vec{A}+\vec{B}|^2 = |\vec{A}-\vec{B}|^2$

$\Rightarrow A^2 + B^2 + 2AB\cos\theta = A^2 + B^2 - 2AB\cos\theta$

$\Rightarrow \cos\theta = 0 \Rightarrow \theta = 90^o$

50. $\therefore h = \frac{1}{2}gt^2 \therefore \frac{t_1}{t_2} = \sqrt{\frac{h_1}{h_2}} = \sqrt{\frac{16}{25}} = \frac{4}{5}$

51. If ΔG system < 0, the process is spontaneous

If ΔG system > 0, the process is nonspontaneous

If ΔG system = 0, the process is in equilibrium

52. For isotonic solution $\pi_1 = \pi_2$

or $C_1 = C_2$ (conc. in mol/lit.)

(Urea solution) (unknown solution)

$$\frac{10}{60} = \frac{5\times 1000}{m_w \times 100}$$

$m_w = 300$ gm mol^{-1}

54. For $H_2(g) + Br_2(g) \rightarrow 2HBr(g)$

$\because \Delta n_g = 0$

$\therefore \Delta H = \Delta E + \Delta n_g RT$

$\Rightarrow \Delta H = \Delta E$

55. $CH_3CH_2COOH \xrightarrow{SOCl_2} \underset{(B)}{CH_3CH_2COCl}$

$\underset{(B)}{CH_3CH_2COCl} \xrightarrow{NH_3} \underset{(C)}{CH_3CH_2CONH_2}$

$\underset{(D)}{CH_3CH_2NH_2} \xleftarrow[Br_2]{KOH} \underset{(C)}{CH_3CH_2CONH_2}$

58. For CsBr no. of formulas/unit cell

n = 1 (like CsCl type)

$$C.D. = \frac{n\times M}{V\times N_A}\left[\begin{array}{l} M = 133+80 = 213 \\ V = a^3 = (436.6\times 10^{-12})^3 \end{array}\right]$$

$$C.D. = \frac{1\times 213\,gm}{83.22\times 10^{-24}\,cm^3 \times 6.02\times 10^{23}} = 4.25 gm/cm^3$$

60. $\Delta x \times \Delta V \geq \dfrac{h}{4\pi m}$

$\because \Delta x = 0.1$ Å

$= 1 \times 10^{-11}$ m

$$\Delta V \geq \frac{h}{4\pi m \times \Delta x}$$

$$\Delta V \geq \frac{6.626 \times 10^{-34}\,\text{J sec}}{4 \times 3.14 \times 9.11 \times 10^{-31}\,\text{kg} \times 10^{-11}\,\text{m}}$$

$\Delta V \geq 5.79 \times 10^{6}$ m sec^{-1}

61. $2KCN + CuSO_4 \rightarrow K_2SO_4 + Cu(CN)_2$

$Cu(CN)_2 \rightarrow CuCN + (CN)_2$

unstable

$CuCN + 3KCN \rightarrow K_3[Cu(CN)_4]$ i.e. $[Cu(CN)_4]^{3-}$

64. For the reaction

$Br_2(\ell) + Cl_2(g) \rightarrow 2BrCl(g)$

$\Delta H = 30$ kJ/mol

$\Delta S = 105$ JK^{-1} mol^{-1}

For at equilibrium $\Delta G = 0$

$\therefore \Delta G = \Delta H - T\Delta S$

$\Delta H = T\Delta S$

$$T = \frac{\Delta H}{\Delta S} = \frac{30 \times 1000\,\text{J mol}^{-1}}{105\,\text{JK}^{-1}\text{mol}^{-1}} = 285.7\text{K}$$

65. Due to F centre defect colourless ionic crystal Converts into coloured ionic crystal

67. For the cell reaction

$Fe + 2Fe^{3+} \rightarrow 3Fe^{2+}$

Anode reaction is $Fe \rightarrow Fe^{2+} + 2e^-$

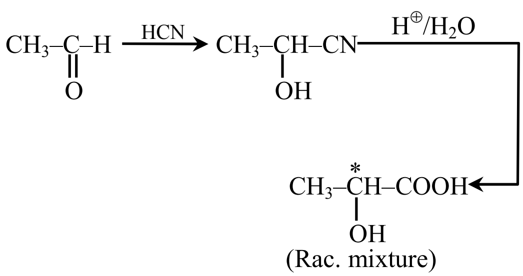
Cathode reaction is $2Fe^{3+} + 2e^- \rightarrow 2Fe^{2+}$

$E^{\circ}_{Cell} = E^{\circ}_{Cathode} - E^{\circ}_{Anode}$ (E° is reduction potential)

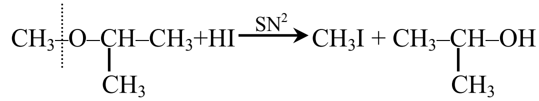
$= 0.771 - (-0.441)$

$E^{\circ}_{Cell} = 1.212$ V

71.



73.



74. $\text{Reactivity} \propto \dfrac{1}{\text{steric} - \text{Hinderence}}$

75. $\because$ Heat of hydrogenation of cyclohaxene

$= -119.5$ kJ/mol

$\therefore$ Heat of hydrogenation of benzene

$= 3 \times -119.5 = -358.5$ KJ/mol

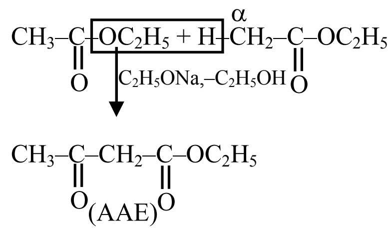
Resonance energy

$=$ Observed ΔH – Calculated ΔH

$-150.4 = -358.5 - x$

$x = -208.1$ KJ

76.

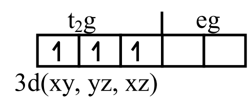


77. For the reaction $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

$$\frac{-d[N_2]}{dt} = -\frac{1}{3}\frac{d}{dt}([H_2]) = \frac{1}{2}\frac{d}{dt}([NH_3])$$

$$\therefore \frac{d}{dt}([NH_3]) = -\frac{2}{3}\frac{d}{dt}([H_2])$$

80. Cr^{+3}



81. $\Delta T_f = \text{molality} \times K_f$

$$\Delta T_f = \left(\frac{1 \times 1000}{250 \times 51.2}\right) \times 5.12$$

$\Delta T_f = 0.4$ K

83 $[H^+] = 10^{-8}$ M

Due to dilute solution.

$[H^+] = 10^{-8} + 10^{-7}$ M

$= 10^{-7}$ [0.1 + 1]M

$= 1.1 \times 10^{-7}$ M

$= 1.1 \times 10^{-7}$ M

$\simeq 1.0525 \times 10^{-7}$ M

85. $A/A^{+}\ (xM)\ ||\ B^{+}(yM)/B$

$E_{cell} = +\ 0.20\ V \qquad \therefore \Delta G = -\ Ve$

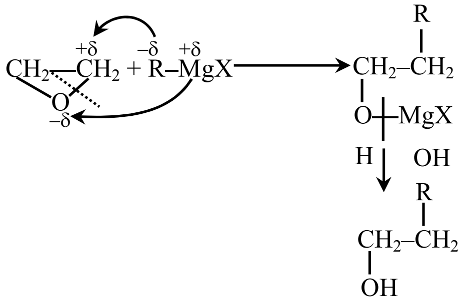
Therefore given cell reaction is spontaneous

At Anode $\quad A \rightarrow A^{+} + e^{-}$

At Cathode $\quad \underline{B^{+} + e^{-} \rightarrow B}$

Cell reaction $\quad A + B^{+} \rightarrow A^{+} + B$

86.



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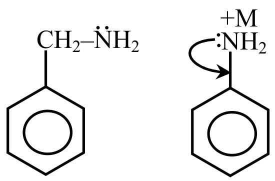


Benzyl amine Aniline

* Benzylamine has localised lone pair therefore it is more basic.

89. In the ClF_3, Cl atom is sp^3d hybridised, having trigonal bipyramidal geometry, in which axial bonds are longer than equatorial bonds.

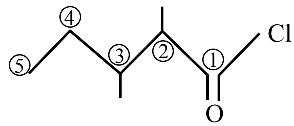
91. Charge density $\propto$ hydration. Therefore hydrated size of Li^{+} is large and having less mobility. Down the group degree of hydration decreases.

93. $O = \overset{+}{N} \rightarrow O$ sp hybridization hence Linear

94. Al_2O_3 and Sb_2O_3 are amphoteric, SeO_2 is acidic and Bi_2O_3 is basic.

97. Element of At. no. = 16 is sulphur, its diatomic molecule is like O_2 which have two unpaired e^{-} according to MOT.

100.



2-3-dimethyl pentanoyl chloride