ANSWER KEY (AIPMT-2011)

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

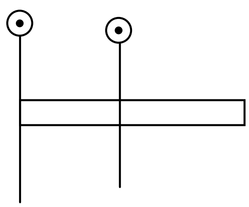
HINTS & SOLUTIONS

PHYSICS

1. Velocity of light $c = \dfrac{1}{\sqrt{\mu_0 \in_0}}$

So dimension of given expression is equal to velocity $\Rightarrow [LT^{-1}]$

2.

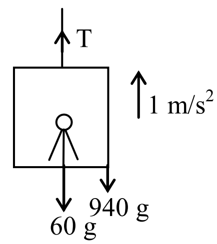


Moment of inertia about an axis passing through one end $= I_{cm} + md^2$

$$= I_0 + M\left(\frac{L}{2}\right)^2 = I_0 + \frac{ML^2}{4}$$

3. $v = \sqrt{2gh} = \sqrt{2\times10\times20} = 20$ m/sec

4.



For (man + lift)

$T - (60 + 940)\,g = (60 + 940) \times 1$

$T = (60 + 940)(10 + 1) = 11000$ N

5. $P = \vec{F}.\vec{V} = FV\cos\theta$

Power will be maximum when velocity and $\cos\theta$ will be maximum.

6. $\theta = 2t^3 - 6t^2$

$\omega = \dfrac{d\theta}{dt} = 6t^2 - 12t$

$\alpha = \dfrac{d\omega}{dt} = 12t - 12$

$\tau = I\alpha$

Torque will be zero when α is zero

so $\alpha = 12t - 12 = 0$

$t = 1$ sec

7. If particle move in a circular path with constant speed, the acceleration of the particle is centripetal acceleration

$$a_c = \omega^2 R = \left(\frac{2\pi}{T}\right)^2 R$$

$$a_c = \frac{4\pi^2 R}{T^2} = \frac{4\pi^2}{(0.2\pi)^2} \times 5 \times 10^{-2}$$

$$a_c = 5 \text{ m/sec}^2$$

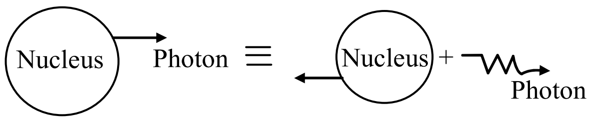
8. Impulse $= mv_2 - mv_1$

$= -mv - mv = -2mv$

9. $v_1 r_1 = v_2 r_2$

$$\frac{v_1}{v_2} = \frac{r_2}{r_1}$$

10.



$$F_{ex} = \frac{dP}{dt} = 0 \Rightarrow dP = 0 \Rightarrow P = \text{constant}$$

$$\boxed{\vec{P}_i = \vec{P}_f}$$

$$0 = \vec{P}_{Nu} + \vec{P}_{Ph}$$

$$|\vec{P}_{Nu}| = |\vec{P}_{Ph}| = \frac{h}{\lambda} = \frac{h\nu}{c}$$

Recoil K.E. of nucleus $K.E_{Nu} = \dfrac{P_{Nu}^2}{2M_{Nu}}$

$$K.E._{Nu} = \frac{(h\nu/c)^2}{2M} = \frac{h^2\nu^2}{2Mc^2}$$

11. Potential energy will increase when work is done by the system against a conservative force.

12. Average acceleration

$$\vec{A}_{avg} = \frac{\vec{v}_f - \vec{v}_i}{t} = \frac{40\hat{j} - 30\hat{i}}{10}$$

$$\vec{A}_{avg} = \frac{\sqrt{40^2 + 30^2}}{10} = 5 \text{ m/sec}^2$$

13. Maximum Range

$$R_{max} = \frac{u^2}{g} = \frac{(20)^2}{10} = 40 \text{ m}$$

14. Work done = area between force *v/s* displacement curve and displacement axis

$$= (2 \times 4) + \frac{2 \times 5}{2} = 13 \text{ J}$$

15. $\phi_{net} = \dfrac{\Sigma q}{\epsilon_0}$

$\because$ Net flux does not depend on size of Gaussian surface

$\Rightarrow$ Flux remains unchanged.

16. $$V_A = \frac{kq}{L} + \frac{kq}{L} - \frac{kq}{\sqrt{5}L} - \frac{kq}{\sqrt{5}L}$$

$$= \frac{2kq}{L}\left(1 - \frac{1}{\sqrt{5}}\right)$$

17. $U = \dfrac{1}{2}CV^2$

$$= \frac{1}{2}\left(\frac{\epsilon_0 A}{d}\right)V^2$$

$$= \frac{1}{2}(\epsilon_0 Ad)\left(\frac{V}{d}\right)^2 = \frac{1}{2}\epsilon_0 E^2 Ad$$

18. $\because \rho = I_g^2 R$

$36 = I^2(9)$

$\Rightarrow I_9 = 2A$

$\because$ In parallel $I \propto \dfrac{1}{R}$

$$\frac{I_9}{I_6} = \frac{6}{9} \qquad \frac{2}{I_6} = \frac{6}{9}$$

$I_6 = 3A$

$\Rightarrow I_{ckt} = 2 + 3 = 5A$

$\Rightarrow V_{2\Omega} = IR = (5)(2) = 10$ volt

19. $I = \dfrac{E}{R + r}$

$$2 = \frac{E}{2 + r} \qquad \text{....(1)}$$

$$0.5 = \frac{E}{9 + r} \qquad \text{...(2)}$$

(1) divided by (2)

$$4 = \frac{9 + r}{2 + r}$$

$8 + 4r = 9 + r$ or $3r = 1$

$\therefore\ r = \dfrac{1}{3}\Omega$

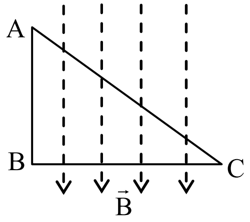
20. At neutral temperature

$$\frac{dE}{dT} = 0$$

21. From $\vec{F} = I(\vec{\ell} \times \vec{B})$

$\vec{F}_{BC} = -\vec{F}_{AC}$

$\vec{F}_{AC} = -\vec{F}$



22. $E = Pt = mc^2$

$$m = \frac{Pt}{c^2} = \frac{10^6 \times 3600}{(3\times10^8)^2}$$

$m = 40$ μgm

23. Diamagnetic will be feebly repelled Paramagnetic will be feebly attracted Ferromagnetic will be strongly attracted.

24. $\hat{v} = \hat{E} \times \hat{B}$ or (direction of propagation of waves is $\hat{E} \times \hat{B}$)

25. B will not apply force E field will apply a force opposite to velocity of the electron hence speed will decrease.

26. $e = -\frac{d\phi}{dt}$

27. $I_{rms} = \frac{E_0/\sqrt{2}}{1/\omega C}$

28. $\tan\phi = \frac{X_L}{R} = 1,\ \phi = 45^o$

29. $dS = \frac{\Delta Q}{T} = \frac{80\times1000}{273} \approx 293$ cal/K

30. In isothermal expansion work done against surrounding is negative but work done by gas is positive.

$\Delta W = +150$ J

$dU = 0$

From F.L.O.T.

$\Delta Q = \Delta W + dU$

$\Delta Q = +150$ J

heat is +ve it means heat absorb by gas

31. Motion start from extreme position and for small displacement it is SHM $y = A\cos(\omega t+\phi)$

32. $Y_1 = a\sin(\omega t + kx + 0.57)$

$Y_2 = a\sin(\omega t + kx + \pi/2)$

Phase difference $= \frac{\pi}{2} - 0.57 = 1$ radian

33. Any function which is converted into single $y = A\sin(\omega t + \phi)$ or $y = A\cos(\omega t + \phi)$ is considered SHM.

34. Frequency is same in both medium

$$n_1 = n_2$$

$$\frac{v_1}{\lambda_1} = \frac{v_2}{\lambda_2}$$

$$\frac{\lambda_2}{\lambda_1} = \frac{v_2}{v_1} = \frac{3500}{350} = 10$$

36. $$\frac{1}{\lambda} = RZ^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

$$R(1)^2\left(\frac{1}{1^2} - \frac{1}{2^2}\right) = RZ^2\left(\frac{1}{2^2} - \frac{1}{4^2}\right)$$

$Z = 2$

38. Focal length of the lens

$$\frac{1}{f} = (1.5-1)\left(\frac{1}{20} - \frac{1}{-20}\right) = \frac{1}{20}$$

$f = 20$ cm

From lens formula

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

$$\frac{1}{v} - \frac{1}{-30} = \frac{1}{20}$$

$v = 60$ cm

$$\frac{I}{O} = m = \frac{v}{u} = \frac{60}{-30} = -I$$

$I = -2(0) = -2 \times 2 = -4$ cm

so image will be real inverted and of size 4 cm.

39. $K.E._{max} = eV_0$

$$V_0 = \frac{K.E_{max}}{e} = \frac{0.5\ eV}{e}$$

$V_0 = 0.5$ volt

40. $$\lambda = \frac{h}{\sqrt{2mq\Delta V}} \propto \frac{1}{\sqrt{\Delta V}}$$

$$\frac{\lambda_2}{\lambda_1} = \sqrt{\frac{\Delta V_1}{\Delta V_2}} = \sqrt{\frac{25}{100}} = \frac{1}{2}$$

$$\lambda_2 = \frac{\lambda_1}{2}$$

41. $v_{max} = \sqrt{\frac{2}{m} K.E_{max}}$

$v_{max} = \sqrt{\frac{2}{m}(E_{Ph} - W)}$

$\frac{v_1}{v_2} = \sqrt{\frac{E_{Ph_1} - W}{E_{Ph_2} - W}} = \sqrt{\frac{1-0.5}{2.5-0.5}}$

$\frac{v_1}{v_2} = \frac{1}{2}$

42. Velocity of electron emitted from the electron gun can be increased by potential difference between the anode and filament.

43. $X \rightarrow Y$

$X : Y = 1 : 15$

$A.P. = \frac{1}{16} = \frac{1}{2^n}$

No. of half life $n = 4$

$t = nT_{1/2} = 4 \times 50 = 200$ yr.

44. Photoelectron emission take place when certain minimum "frequency" light fall on metal surface.

45. Thermal K.E. $\geq$ Electrostatic P.E.

46. ${}_nX^m \xrightarrow{1\alpha} {}_{n-2}Y^{m-4} \xrightarrow{2\beta^-} {}_nZ^{m-4}$

α emission decreases mass no. by 4 and atomic no. by 2 and β^- emission increases atomic number by one but leaves mass no. unchanged.

47. $\beta = \frac{\Delta I_C}{\Delta I_B} = \frac{(20-10)\times 10^{-3}}{(300-100)\times 10^{-6}} = 50$

48. By addition of pentavalent impurity only n-type of semiconductor are constructed

49. In FB width of depletion layer is decreased.

50. From theory

CHEMISTRY

51. Number of atomic orbitals in an orbit

$= n^2 = 4^2 = 16$

52. $\Delta G_3 = \Delta G_1 + \Delta G_2$

$\Rightarrow -2\,FE^o = -1F \times 0.15 + (-1F \times 0.50)$

$\Rightarrow -2\,FE^o = -0.15F - 0.50\,F$

$\Rightarrow -2\,FE^o = -F\,(0.15 + 0.50)$

$\therefore E^o = \frac{0.65}{2} = 0.325$ volt

53. Mole fraction of solute $= \frac{1}{56.55} = 0.0177$

54. Average velocity $= \sqrt{\frac{8RT}{\pi M}}$

55. $pOH = pK_b + \log \frac{[Salt]}{[Base]}$

$= 4.74 + \log \frac{0.20}{0.30} = 4.74 + (0.301 - 0.477)$

$= 4.74 - 0.176 = 4.56$

$\therefore pH = 14 - 4.56 = 9.44$

56. $\frac{r_A}{r_B} = \sqrt{\frac{M_B}{M_A}}$

$\Rightarrow \frac{v_A}{t_A} \times \frac{t_B}{v_B} = \sqrt{\frac{M_B}{M_A}} \qquad \Rightarrow \frac{10}{20} = \sqrt{\frac{M_B}{49}}$

$\Rightarrow \frac{1}{4} = \frac{M_B}{49} \qquad \therefore M_B = \frac{49}{4} = 12.25$

57. For an ideal gas, for free expansion

$q = 0$; $\Delta T = 0$ and $w = 0$

58. $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$; K_1

$2NO(g) + O_2(g) \rightleftharpoons 2NO_2(g)$; K_2

$N_2(g) + 2O_2(g) \rightleftharpoons 2NO_2\,(g)$; $K = K_1 \times K_2$

$\therefore$ For $NO_2(g) \rightleftharpoons \frac{1}{2} N_2(g) + O_2(g)$;

$K' = \left[\frac{1}{K_1.K_2}\right]^{1/2}$

59. $x/m = P \times T$ is the incorrect relation.

60. $\Delta S_{vap} = \frac{\Delta H_{vap}}{T} = \frac{30KJmol^{-1}}{300K} = 100\ J\ mol^{-1}\ K^{-1}$

61. Fact

62. $E^{\circ}_{cell} = E^{\circ}_{cathode(RP)} - E^{\circ}_{anode(RP)}$

$= 0.15 - (-0.74)$

$= +0.89$ V

63. Fact

64. $\because \Delta G^o = -nFE^o$

and $\Delta G^o = -RT \log_e K_{eq}$

65. Using, $\Delta T_f = i \times K_f \times m$

$$i = \frac{\Delta T_f \times W_A}{K_f \times n_B \times 1000}$$

$$= \frac{3.82 \times 45}{1.86 \times \left(\frac{5}{142}\right) \times 1000} = 2.63$$

66. $\lambda_1 = 2\lambda_2$

67. Z > X > Y ; higher the reduction potential lesser the reducing power

68. Fact

71. Melting point $\propto$ lattice energy
Melting point $CaF_2 > CaCl_2 > CaBr_2 > CaI_2$

73. Bond length (C–H < C=C < C–O < C–C)

74. $K_2Cr_2O_7 + 3Na_2SO_3 + 4H_2SO_4 \longrightarrow 3Na_2SO_4 + K_2SO_4 + Cr_2(SO_4)_3$

75. On the basis electrode potential, the correct order is Mn > Fe > Cr > Co

76. NO_2^- $\quad O = \ddot{N} - \overline{O}$ $\quad sp^2$

NO_3^- $\quad O = N - \overline{O}$, $N \rightarrow O$ $\quad sp^2$

78. BF_3 is electron deficient so act as lewis acid.

79. $Ca(OCl)_2$ is active ingredient which is responsible for bleaching action.
Bleaching powder formula
$Ca(OCl)_2.CaCl_2.Ca(OH)_2.2H_2O$

81. In pyrosilicate SiO_4^{-4} unit shared one oxygen atom.

82. Coordination isomerism

83. $Co^{2+} \longrightarrow 3d^7\ 4s^o$

$\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow}\boxed{\uparrow}\boxed{\uparrow}$; having minimum no. of unpaired electrons.

$[Cr(H_2O)_6]^{+2} = Cr^{+2} = [Ar]\ 3d^4 \therefore n = 4$

$[Mn(H_2O)_6]^{+2} = Mn^{+2} = [Ar]\ 3d^5 \therefore n = 5$

$[Fe(H_2O)_6]^{+2} = Fe^{+2} = [Ar]\ 3d^6 \therefore n = 4$

$[Co(H_2O)_6]^{+2} = Co^{+2} = [Ar]\ 3d^7 \therefore n = 3$

84. $[Ni(CN)_4]^{-2}$

$Ni^{+2} = [Ar]\ 3d^8\ 4s^0$

CN^- is a strong ligand causes pairing.

$Ni^{+2} = \underbrace{\underbrace{\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{}}_{3d}\ \underbrace{\boxed{}}_{4s}\ \underbrace{\boxed{}\boxed{}\boxed{}}_{4p}}_{dsp^2}$

$n = 0$

85. Bond length $\propto \frac{1}{\text{Bond order}}$

O–O Bond length	O_2^{-2} >	O_2^- >	O_2 >	O_2^+
Bond order	1	1.5	2	2.5

86. $\Delta n_g = -ve$ and $\Delta H = -ve$