ANSWERS TO PAPER – I
PHYSICS

1. $v_T = 108$ km/hr = 30 m/s, $f' = f\left[\frac{v+v_T}{v-v_T}\right] = 600\left[\frac{330+30}{330-30}\right]$ Hz, $f' = 720$ Hz

$\therefore$ **(c)**

2. $D = \frac{m}{v} \Rightarrow \Delta D = \left(\frac{\Delta m}{m} + \frac{\Delta v}{v}\right)D,\ \frac{\Delta v}{v} = \frac{3\Delta r}{r} = 0.06$

$\Delta D = \left(\frac{\Delta m}{m} + \frac{\Delta v}{v}\right)D = (0.1 + 0.06)2.25$

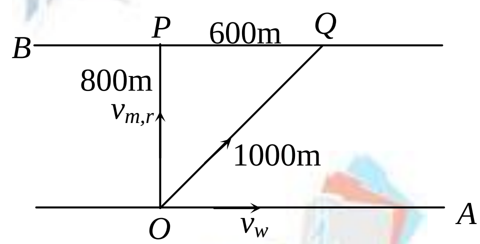
$\Rightarrow$ $\Delta D = 0.4$ $\therefore$ $D = (2.5 \pm 0.4)$ g/cm^3

$\therefore$ **(c)**

3. Width of the river = d = 800 m

$\therefore$ $v_w = \frac{600}{5\times 60} = 2$ m/s

$\therefore$ **(b)**



4. $y = \sin(50t)\cos(0.02x)$, on the comparing this equation, with $y = 2A\sin(\omega t)\cos(kx)$

$\omega = 50,\ k = 0.02$

$v = \frac{\omega}{k} = \frac{50}{0.02} = 2500$ m/s

$\therefore$ **(c)**

5. $\frac{\lambda}{4} = 30 \Rightarrow \lambda = 120$, $v = f_x 120$

$\frac{\lambda}{2} = 59 \Rightarrow \lambda = 118$, $v = f_y 118$

$\frac{f_x}{f_y} = \frac{59}{60}$, $f_y - f_x = 10$, $f_x = 590$, $f_y = 600$

$\therefore$ **(b)**

6. $x = \sin\omega t,\ y = 4\sin\left(\omega t - \frac{x}{2}\right)$ or $x = 4\sin\omega t$, $y = 4\cos\omega t$

So $x^2 + y^2 = 4^2$

Thus particle describes a circle of radius 4

$\therefore$ **(a)**

7. $N = 2a$, $(f_s)_{max} = 2g$

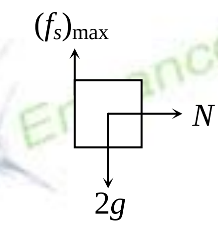
$\mu.2a = 2g$ $\therefore$ $a = \frac{g}{\mu} = 2g$

$T\cos\theta = mg$, $T\sin\theta = ma$

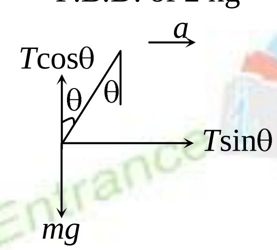
$a = g\tan\theta$, $\tan\theta = \frac{a}{g} = \frac{2g}{g} = 2$

$\theta = \tan^{-1}(2)$

$\therefore$ **(d)**



F.B.D. of 2 kg



F.B.D. of 2 kg

8. Rest λ be the mass per unit length of the chain and x be the length of hanging part of the chain.
In case of limiting equilibrium of the chain, we have

$\lambda xg = \lambda(l - x)g \times \frac{1}{4} \Rightarrow x = \frac{l}{5}$

$\therefore$ **(a)**

9. **(c)**

10. Distance travelled by $B = \frac{10 \times (240 + 60)}{(60 + 300)} = \frac{10 \times 300}{360} = 8\,\text{m}$ (approximately)

$\therefore$ **(a)**

11. Applying conservation of linear momentum, we have $mv\cos\theta = \frac{m}{2}v'$

$v' = 2v\cos\theta$

$\therefore$ Required distance $= \frac{v^2 \sin 2\theta}{2g} + (v\cos\theta) \times \frac{v\sin\theta}{g}$

$\therefore$ **(b)**

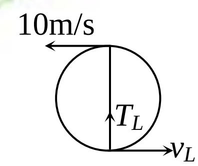
12. $v = \sqrt{\frac{2gh}{\left(1 + \frac{k^2}{R^2}\right)}}$

For the solid sphere, $I = \frac{2MR^2}{5} = MK^2 \Rightarrow \frac{k^2}{R^2} = \frac{2}{5}$

$h = s \sin\theta \qquad \therefore \qquad v = \sqrt{\frac{5(g\,s)\sin\theta}{7}} = \sqrt{\frac{10}{7} gs\sin\theta}$

$\therefore$ **(d)**

13. From the principle of conservation mechanical energy, we have



$\frac{1}{2}mv_L^2 = m \times g \times 20 + \frac{1}{2} \times m \times 100$

$v_L^2 = 40g + 100 = 500$

Now, $T_L - mg = \frac{mv^2}{L}$

$T_L = \frac{m \times 500}{10} + mg = 600\,\text{N}$

$\therefore$ **(d)**

14. During the motion of the missile, its mechanical energy is always conserved.

$ME = -\frac{GMm}{2R} = -\frac{mgR}{2} \qquad \left(\because g = \frac{GM}{R^2}\right)$

$\therefore$ **(c)**

15. We know, $g' = g - R\omega^2 \cos^2\lambda$

For equator, $\lambda = 0 \qquad \therefore \qquad \omega^2 = \frac{g}{R}$

For north pole, $\lambda = 90^0 \qquad \therefore \qquad g' = g$

$\therefore \qquad mg = 100g$

Required weight, $mg' = mg - m \times R \times \frac{g}{R} \times \frac{1}{4} = \frac{3mg}{4} = 750\text{ N}$

$\therefore$ **(a)**

16. Let v be the volume outside the water

For the equilibrium of the body, we have

$(L^3 - v) \times 1 \times g = L^3 \times d \times g \Rightarrow v = 400$ c.c.

$\therefore$ **(a)**

17. We have, $v = \sqrt{2 \times g \times \frac{h}{2}} = \sqrt{gh}$

Also, $\sqrt{gh} \times \sqrt{\frac{h}{g}} = 135$ cm, $h = 135$ cm

When the hole is made at a depth $\frac{h}{3}$ below the free surface, velocity of efflux

$$v' = \sqrt{2\times g\times\frac{h}{3}} = \sqrt{2\times1000\times\frac{135}{3}} = 300 \text{ cm/s}$$

$\therefore$ volume of water coming out/second = 300 × 9 = 2700 c/s

$\therefore$ **(a)**

18. We have $\frac{\Delta v}{V} = 10^{-4}$ $\therefore$ $B = \frac{P}{\Delta v/v} = \frac{\rho gh}{\Delta v/v} = \frac{10^3\times10\times50}{10^{-4}} = 5\times10^9 \text{ N/m}^2$

$\therefore$ **(b)**

19. $T = \frac{U}{A}$

$U_I = 35\times10^{-4}(4\pi r^2)2,$ $U_F = 35\times10^{-4}(4\pi 4r^2)2$

Work done $= U_F - U_I = 2.52\times10^{-1}$ J

$\therefore$ **(b)**

20. $-\frac{1}{4\pi\varepsilon_0}\frac{q^2}{a} = -\frac{1}{4\pi\varepsilon_0}\frac{2q^2}{a} + \frac{1}{2}(2m)v_A^2 + \frac{1}{2}mv_B^2,$ $2mv_A = mv_B \Rightarrow v_B = 2v_A$

$$\frac{q^2}{4\pi\varepsilon_0 a} = \frac{1}{2}(2m)v_A^2 + \frac{1}{2}m(4v_A^2), \qquad \frac{q^2}{4\pi\varepsilon_0 a} = \frac{1}{2}(2m)v_A^2(1+2)$$

$$\Rightarrow \frac{q^2}{4\pi\varepsilon_0 a} = 3mv_A^2 \Rightarrow 9\times10^9\times\frac{q^2}{a} = 3mv_A^2 \Rightarrow 3\times10^9\times\frac{q^2}{a} = mv_A^2$$

$$K_A = \frac{1}{2}m_A v_A^2 = \frac{1}{2}2mv_A^2 = mv_A^2 = 3\times10^9\times\frac{q^2}{a}$$

i.e. $K_A = 3\times10^9\frac{q^2}{a}$

$\therefore$ **(c)**

21. Net electrical field strength at L is = 15 N/C

$\therefore$ force on $2C$ change is = 15 × 2 = 30 N

$\therefore$ **(c)**

22. $\frac{Q}{6\varepsilon_0} = \frac{10^6}{8.85}$, $Q = \frac{6\varepsilon_0\times10^6}{8.85}$

Distance between two changes = 15 m

$$F = \frac{1}{4\pi\varepsilon_0}\frac{6\varepsilon_0\times10^6}{8.85}\times\frac{1\times10^{-6}}{(5)^2} = 0.24\text{ N}$$

$\therefore$ **(b)**

23. $dv = -E.dl = -10(x_2 - x_1) = -10 \times 8 = -80$

$\therefore$ **(d)**

24. $R = 4\ \Omega$ for maximum power transfer

$P = I^2 R = 1 \times 4 = 4$ watt

$\therefore$ **(b)**

25. Magnetic flux density due to a single wire is

$$B = \frac{\mu_0 I}{4\pi R}\left[\sin\alpha + \sin\beta\right] = \frac{10^{-7}\times 2}{\frac{1}{\sqrt{3}}}\left[2\times\frac{\sqrt{3}}{2}\right] = 6\times 10^{-7}\ \text{T} = 0.6\times 10^{-6}\ \text{T}$$

$B_{net} = 3B = 3 \times 0.6 \times 10^{-6}$ T $= 1.8 \times 10^{-6}$T

$\therefore$ **(a)**

26. B at centre $= \frac{\mu_0 I}{2\pi r}\left(\;\right)$, $I = \frac{v}{\rho\frac{r\theta}{A}}$

B at centre $= \frac{\mu_0 v_A}{2\pi\rho r^2}$

i.e. independent of θ. So B at centre is zero

$\therefore$ **(d)**

27. Acceleration of rod $\Rightarrow -\frac{BIL}{m} = -2$ m/s^2

Distance $d = \frac{v^2}{2a} = 1$m

$\therefore$ **(d)**

28. $F_e = F_B \Rightarrow \frac{eV}{l} = Bev \Rightarrow B = \frac{V}{lv}$

$B = \frac{100}{10^{-2}\times 10^{5}} = 0.1T$ outward

$\therefore$ **(b)**

29. $\varepsilon = B_A \tan 30^0\, lv = 2\times 10^{-4}\times\frac{1}{\sqrt{3}}\times\frac{1}{2}\times 20\sqrt{3}\times 10^{-2} = 2\times 10^{-5}$ volt $= 20\mu$v

$\therefore$ **(a)**

30. Energy $= \frac{1}{2}LI^2$

$L = \text{Energy}\,\frac{2}{I^2}$

Dimensions of self inductance = ML^2 T^{-2} A^{-2}

$\therefore$ **(d)**

31. $V^2 = (V_L - V_C)^2 + V_R^2$

$|V_L - V_C| = 6V$

$V_C = 8V$

$\therefore$ **(d)**

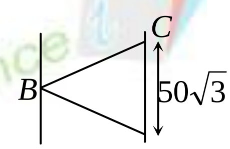
32. $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$, u = 50 cm and f = 30 cm

Solving v = 75 cm

$\therefore$ **(d)**

33. Such triangles (OBC) are around 20 in number each will have two new reflections except the first triangle in which we have three reflections.

Hence 41 reflections in all



$\therefore$ **(a)**

34. **(c)**

35. $D = (\mu_v - \mu_R)A + (\mu'_v - \mu'_R)\left(-\frac{\mu_y - 1}{\mu'_y - 1}A\right) = (0.04)9^0 + (0.04)\left(-\frac{1.5-1}{1.75-1}9^0\right)$

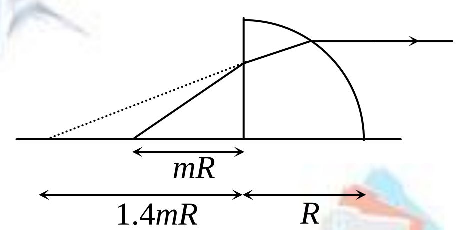
$= (0.04)9^0\left[1 - \frac{0.50}{0.75}\right] = (0.04)3^0 = 0.12^0$

$\therefore$ **(c)**

36. Refraction from IInd surface

$\frac{1.4}{1.4mR + R} = \frac{1.4-1}{R}$

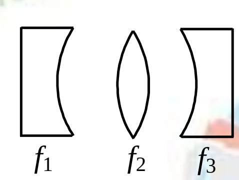
$m = \frac{25}{14}$



$\therefore$ **(a)**

37. $\frac{1}{f_{eq}} = \frac{1}{f_1} + \frac{1}{f_2} + \frac{1}{f_3}$

$\frac{1}{f_{eq}} = \frac{1-\frac{3}{2}}{20} + \left(\frac{4}{3} - 1\right)\left(\frac{1}{20} + \frac{1}{40}\right) + \frac{1-\frac{3}{2}}{80} = -\frac{1}{80}$

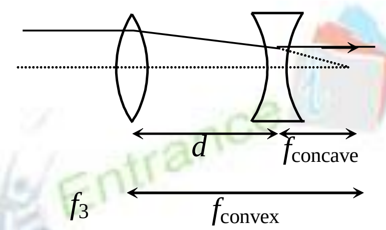


f_{eq} = –80 cm

$\therefore$ **(b)**

38. $d = 50 - 10 = 40$ cm

$\therefore$ **(d)**



39. $m = \frac{f_0}{f_e} = 8 \Rightarrow f_0 = 8f_e$, $f_0 + f_e = L = 45$ cm

$9f_e = 45$ cm, $f_e = 5$cm, $f_0 = 40$ cm

$\therefore$ **(a)**

40. $\frac{\lambda}{2} = t(\mu - 1) \Rightarrow t = \frac{\lambda}{2(\mu - 1)}$

$\therefore$ **(b)**

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

Because image is erect and 4 times means lens is convex and object between pole and focus.

$-\frac{1}{4u} + \frac{1}{u} = \frac{1}{20}$

$\frac{3}{4v} = \frac{1}{20}$

$u = 15$ cm

$\therefore$ **(a)**

42. $\frac{1}{10} = \left(\frac{3}{2} - 1\right)\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$ … (i)

$-\frac{1}{20} = \left(\frac{\frac{3}{2}}{\mu} - 1\right)\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$ … (ii)

$\mu = 2.0$

$\therefore$ **(c)**

43. $y = \frac{Dn\lambda}{d}$, $n_1\lambda_1 = n_2\lambda_2$, $\frac{n_1}{n_2} = \frac{\lambda_2}{\lambda_1} = \frac{6}{7}$, $n_1 = 6$, $n_2 = 7$

$y = \frac{100 \times 6 \times 7000 \times 10^{-8}}{0.1} = 42 \times 10^{-2}$ cm $= 0.42$ cm

$\therefore$ **(c)**

44. $E = 5 - \phi_x \Rightarrow \phi_x = 5 - E$, $(E-2) = 6 - \phi_y \Rightarrow \phi_y = 8 - E$

$\frac{P_1}{P_2} = \frac{\lambda_2}{\lambda_1}$, $\frac{E}{E-2} = \frac{P_1^2}{P_2^2} = 3 \Rightarrow E = 3, E = 6$, $E = 3$

$\phi_x = 2$, $\phi_y = 5$, $\phi_x : \phi_y = 2 : 5$

$\therefore$ **(b)**

45. $T = \frac{T_1 T_2}{T_1 + T_2} = \frac{40}{3}$ $\therefore$ in 80 years, $\frac{1}{64}$ of the initially substance will remain undecay.

$\therefore$ fraction which will decay is $1 - \frac{1}{64} = \frac{63}{64}$

$\therefore$ **(a)**

46. Q = change in binding energy = 4.6 MeV

$\therefore$ **(a)**

47. $\frac{dT}{dt} = 10$, $\frac{dH}{dt} = C$, $\frac{\Delta H}{dt} = ms_1$

$\therefore$ $\frac{\Delta H}{dt} = ms_1 \times 10$, $\frac{\Delta H}{dt} = ms_2 \times \frac{20}{8}$ $\therefore$ $\frac{s_1}{s_2} = \frac{1}{4}$

$\frac{mL_1}{mL_2} = \frac{C \times 6}{C \times 8} = \frac{L_1}{L_2} = \frac{3}{4}$

$\therefore$ **(c)**

48. $PV^{\gamma} =$ constant , $P \alpha T^{-\frac{\gamma}{\gamma - 1}}$ $\therefore$ $-\frac{r}{r-1} = 4 \Rightarrow r = 4/3$

$\Delta H = 5 \times C_p \times 15 = 75 \times C_P = 300R$

$\therefore$ **(a)**

49. $\eta = \left[1 - \frac{(273^0 + 27^0\text{ C})}{273 + 227^0}\right] = \frac{2}{5}$, $\frac{2}{5} = \frac{300}{Q}$, $Q = 150 \times 5 = 750$ J

$\therefore$ **(b)**

50. $\frac{\Delta H}{\Delta U} = \frac{nC_p \Delta T}{nC_v \Delta T} = \gamma$, $\Delta U = \frac{\Delta H}{v} = \frac{700}{7} \times 5 = 500$ J

$\therefore$ **(d)**

51. $\frac{\text{K.E}}{\text{mole}} =$ constant $\therefore$ 16 : 1

$\therefore$ **(a)**

52. $Cv_{mix} = \dfrac{\frac{1}{2}\times\frac{3}{2}R + \frac{1}{4}\times\frac{5}{2}R}{\frac{1}{2}\times\frac{1}{4}} = \dfrac{11}{6}R$, $\quad Cp_{mix} = \dfrac{11}{6}R + R = \dfrac{17}{6}R$

$\Delta Q = \dfrac{3}{4}\times\dfrac{17}{6}R\times 50 = 212.5\ \text{cal}$

$\therefore$ **(c)**

53. $\dfrac{30}{10} = K\left(\dfrac{150}{2} - 15\right) \Rightarrow 3 = K\times 60, \quad K = \dfrac{1}{20}$

$\dfrac{10}{t} = \dfrac{1}{20}\times(25-15) \quad\Rightarrow\quad t = \dfrac{200}{10} = 20\ \text{min}$

$\therefore$ **(a)**

54. $\dfrac{dH}{dt} = \dfrac{KA}{l}(\theta_1 - \theta_2)$, $\quad \dfrac{20}{5} = \dfrac{KA}{l}(\theta_1 - \theta_2)$

$\dfrac{160}{t} = 4\dfrac{KA}{l}(\theta_1 - \theta_2) \quad\therefore\quad \dfrac{160}{t} = 4\times\dfrac{20}{5}$

$t = 10$ min

$\therefore$ **(b)**

55. $t\ \alpha\ (\text{thickness})^2$

$\dfrac{t_1}{t_2} = \dfrac{4}{16} = \dfrac{1}{4}$, $t_2 = 32$ hour $\quad\therefore\quad \Delta t = t_2 - t_1 = 32 - 8 = 24$ hour

$\therefore$ **(c)**

56. $KE = \dfrac{1}{2}m\omega^2\left(A^2 - \dfrac{A^2}{4}\right) = \dfrac{3}{8}m\omega^2A^2$, $E = \dfrac{3}{8}m\omega^2A^2$, $P.E = \dfrac{1}{2}m\omega^2A^2 = \dfrac{4}{3}E$

$\therefore$ **(c)**

57. $A_1 = 4$, $\quad A_2 = 8\sin\left(4\pi t + \dfrac{\pi}{3}\right) \quad\therefore\quad A_2 = 8, \quad \dfrac{A_1}{A_2} = \dfrac{1}{2}$

$\therefore$ **(b)**

58. $y = A\cos\dfrac{2\pi}{6}t$, $\quad \dfrac{\sqrt{3}}{2}A = A\cos\dfrac{2\pi}{6}t$, $\quad t = \dfrac{4}{3}\sec$

$\therefore$ **(a)**

59. $T = 2\pi\sqrt{\dfrac{R^3}{KQ}}$, $T' = \dfrac{T}{2} = 2\sec$

$\therefore$ **(a)**

60. $f = 202$, $f - 202 = 5$, $f = 207$, $\omega = 414\pi$

$\therefore$ **(a)**

CHEMISTRY

61. **(b)** With increase in temperature; the intermolecular attraction decreases.

62. **(b)** $C(s) + O_2(g) \longrightarrow CO_2(g)$; $\Delta H = -94.6$ kcal ...(i)

$CO(g) \longrightarrow C(s) + \frac{1}{2}O_2(g)$; $\Delta H = +26.4$ kcal ...(ii)

$CO(g) + \frac{1}{2} O_2(g) \longrightarrow CO_2(g)$; $\Delta H = -68.2$

Equation (ii) is reverse of the equation of heat of formation of CO(g).

63. **(a)** $\Delta H = \Delta U + \Delta ng\, RT$

$\Rightarrow \Delta H - \Delta U = \Delta ng\, RT = \frac{-3 \times 8.314 \times 298}{1000} = \mathbf{-7.4327\ kJ\ mol^{-1}}$.

64. **(c)** At anode: $\frac{1}{2}H_2(g) \longrightarrow H^+(aq) + e^-$

At cathode: $AgCl(s) + e^- \longrightarrow Ag(s) + Cl^-(aq)$

$\frac{1}{2}H_2(g) + AgCl(s) \longrightarrow H^+(aq) + Cl^-(aq) + Ag(s)$.

65. **(c)** Rate of reaction = $\frac{-d[SO_2]}{2dt} = \frac{-d[O_2]}{dt} = \frac{+d[SO_3]}{2dt}$

Hence, the rate of reaction will be 2.5×10^{-4} mol/L sec.

66. **(d)** $B(OH)_3 + H_2O \rightleftharpoons B(OH)_4^- + H^+$. It's a monobasic acid.

67. **(b)** Because after giving one electron, it gains inert gas configuration.

68. **(a)**

69. **(c)**

71. **(d)**

70. **(b)**

72. **(b)**

73. **(a)** Rubidium belongs to IA group and 5^{th} period, hence its outermost configuration is $5s^2$, this implies that

$n = 5, l = 0, m = 0, S = +\frac{1}{2}, -\frac{1}{2}$

74. **(c)**

75. **(c)**

	A	+	2B	$\rightleftharpoons$	2C	+	D
t = 0	1.1		2.2		0		0
At equilib	$(1.1 - x)$		$(2.2 - 2x)$		$2x$		x

According to question [C] = $2x = 0.2$

$\Rightarrow$ $x = 0.1$

$$K_c = \frac{[C]^2\,[D]}{[A]\,[B]^2} = \frac{4x^2.x}{(1.1-x)\,(2.2-2x)^2} = \frac{x^3}{(1.1-x)^3} = 0.001.$$

76. **(b)** In I_3^-, $3x = -1$, or $x = -\frac{1}{3}$.

77. **(c)**

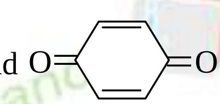
78. **(b)** Element belonging to groups 15 and 3rd period must have $5e^-$ in 3rd orbit, hence electronic configuration is $1s^2, 2s^2, 2p^6, 3s^2, 3p^3$.

79. **(c)** In BCl_3, Boron has only six electrons in outer most orbit.

80. **(c)**

81. **(a)**

82. **(a)**

83. **(b)** There is no sp^3 hybridised α–hydrogen in the compound .

84. **(d)** $\underset{1}{CH_2}=\overset{sp^2}{\underset{2}{CH}}-\overset{sp^3}{\underset{3}{CH_2}}-\underset{4}{C}\equiv\underset{5}{CH}$

85. **(b)** Compounds containing at least 3 α–hydrogens (in case of carbonyl compounds) or 3 β–hydrogens (in case of alcohols) will give iodoform test.

86. **(d)**

87. **(c)**

88. **(a)**

89. **(c)**

90. **(c)**

91. **(d)** For FCC, $4r = a\sqrt{2}$

$\Rightarrow$ $r = \frac{a\sqrt{2}}{4}$

Closest distance = $2r = \frac{a}{\sqrt{2}}$.

92. **(d)** Rate = $k[N_2O_5]$

$\therefore\ [N_2O_5] = \dfrac{2.4\times10^{-5}}{3\times10^{-5}} = \mathbf{0.8}$.

93. **(c)** W = 27 ; $E = \dfrac{\text{atomic weight}}{\text{valency}} = \dfrac{27}{3} = 9$

$Z = \dfrac{E}{F} = \dfrac{9}{96500} = \mathbf{9.326 \times 10^{-5}}$.

94. **(c)** Milli equivalent of NaOH = 100 × 0.5 = 50

Milli equivalent of HCl = $\dfrac{1}{5}\times100$ = 20

Milli equivalent of H_2SO_4 = $\dfrac{1}{10}\times100$ = 10

Total milli equivalent of acid = 20 + 10 = 30

Total milli equivalent of NaOH = 50

Left milli equivalent of NaOH = 50 – 30 = 20 i.e., alkaline.

95. **(c)**

96. **(c)** $E_n = \dfrac{-13.6\times Z^2\ \text{eV}}{n^2}$ [Z = 1, n = 3]

$= \dfrac{-13.6}{9} = \mathbf{-1.5\ eV}$.

97. **(c)** $2Ag(s) + \frac{1}{2}O_2(g) \longrightarrow 2Ag_2O(s)$

$\Delta H = \Delta U + \Delta ng\, RT$

$\Delta H = \Delta U - \frac{1}{2} RT$

$\Rightarrow\ \mathbf{\Delta H < \Delta U}$.

98. **(c)** $E = -\dfrac{RT}{2F}\ln\dfrac{1}{[H^+]^2}$

$= -0.0591 \log\dfrac{1}{[H^+]} = -0.0591 \log 10 = -0.0591$.

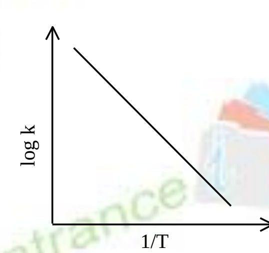
99. **(d)** According to Arrhenius equation

$\log k = \log A - \dfrac{E_a}{2.303R}\cdot\dfrac{1}{T}$

Plot of log k vs $\dfrac{1}{T}$ is a straight line

Slope = $-\dfrac{E_a}{2.303R}$

Intercept = log A.



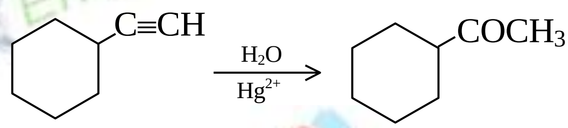
100. **(c)** The bond between chlorine and benzene has a partial double bond character.

101. **(d)**

102. **(a)**

103. **(a)**

104. **(c)**



105. **(d)**

106. **(d)**

107. **(a)**

108. **(b)**

109. **(a)**

110. **(b)**

111. **(d)** –CHO or $>$C=O can be reduced to –CH_2OH or $>$CHOH respectively by H_2 + catalyst. $LiAlH_4$ or $NaBH_4$.

112. **(c)**

113. **(a)**

114. **(c)** $P = P_A^o x_A + P_B^o x_B$

Let mole fraction of benzene = x_A

Let mole fraction of toluene = $(1 - x_A)$

$380 = 500\ x_A + (1 - x_A)\ 200$

$\boldsymbol{x_A = 0.60}$.

115. **(a)**

116. **(a)**

117. **(c)**

118. **(a)**

119. **(b)**

120. **(a)**