SOLUTIONS & ANSWERS FOR KERALA ENGINEERING ENTRANCE EXAMINATION-2013 – PAPER 1 VERSION – A1

[PHYSICS & CHEMISTRY]

1. Ans: Latent heat

Sol: [Latent Heat] = $\frac{Q}{m} = \frac{ML^2T^{-2}}{M} = L^2T^{-2}$

Gravitational potential = $\frac{\text{work}}{\text{mass}}$

$= \frac{ML^2T^{-2}}{M} = L^2T^{-2}$

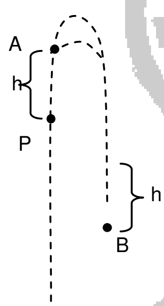
2. Ans: 5.5%

Sol: $\frac{\Delta x}{x}\times 100 = \frac{\Delta M}{M}\times 100 + \frac{\Delta L}{L}\times 100 + \frac{\Delta T}{T}\times 100$

= 1 + 1.5 + 3 = 5.5%

3. Ans: $\frac{5}{3}h$

Sol:



$v^2 = u^2 - 2gh$ —(1)

$(2v)^2 = u^2 + 2gh$ —(2)

(1) + (2) $\Rightarrow 2u^2 = 5v^2$

$u^2 = \frac{5v^2}{2}$ —(3)

(2) − (1) $\Rightarrow 4gh = 3v^2$

$v^2 = \frac{4}{3}gh$ —(4)

$H = \frac{u^2}{2g} = \frac{\frac{5}{2}v^2}{2g}$

$= \frac{5}{3}h$

4. Ans: x^{-3}

Sol: $x^2 = 2t^2 + 6t + 1$

$2x\frac{dx}{dt} = 4t + 6 \Rightarrow xv = 2t + 3$ —— (1)

$xa + v.v = 2$

$xa + v^2 = 2$ —— (2)

$v^2 = \frac{4t^2+12t+9}{x^2}$

$= \frac{2(2t^2+6t+1)+7}{x^2}$

$v^2 = \frac{2x^2+7}{x^2}$

$xa + \frac{2x^2+7}{x^2} = 2$

$x^3a + 2x^2 + 7 = 2x^2$

$a = \frac{-7}{x^3}$

5. Ans: $8\ m\ s^{-1}$

Sol: $\omega = 2\ rad\ s^{-1}$

$t = \frac{\pi}{2}\ s$

$\theta = \omega t = \pi\ rad$

$v = r\omega = 2 \times 2 = 4\ m\ s^{-1}$

$\Delta v = 2v\sin\left(\frac{\theta}{2}\right) = 2\times 4\times \sin\left(\frac{\pi}{2}\right)$

$= 8\ m\ s^{-1}$

6. Ans: $50\ m\ s^{-1}$

Sol: R = Horizontal component × T

$300 = u_h \times 6$

$u_h = 50\ m\ s^{-1}$

7. Ans: $v + \frac{F}{2}$

Sol: $a = \frac{F}{m} = \frac{F}{1}$

$S = ut + \frac{1}{2}at^2$

$= v + \frac{1}{2}F(1)^2$

$= v + \frac{F}{2}$

8. Ans: 40 m

Sol: Height = area under v – t graph

$= \frac{1}{2}\times 30\times 3 - \frac{1}{2}\times 10\times 1$

= 45 – 5 = 40 m

9. Ans: 11.11×10^3 m s^{-1}

Sol: $mu = m_1v_1 + m_2v_2$
$100 \times 10^4 = 0 + 90 \times v_2$
$v_2 = \frac{100}{90} \times 10^4 = 1.1 \times 10^4$
$= 11.11 \times 10^3$

10. Ans: 1 : 4

Sol: $T_H = \frac{mv^2}{r} - mg = 3mg - mg$
$= 2mg$
$T_L = \frac{mv_L{}^2}{r} + mg$
$v_L{}^2 = 3gr + 2g.2r = 7gr$
$T_L = 7mg + mg = 8mg$
$T_H : T_L = 2mg : 8mg$
$= 1 : 4$

11. Ans: 90°

Sol: $v \perp$ acceleration

12. Ans: 300 J

Sol: $F - f_r = ma$
$100 - 40 = ma$
$a = \frac{60}{m}$
$v = \sqrt{2aS}$
$K.E = \frac{1}{2} m.2aS$
$= \frac{1}{2} m.2 \times \frac{60}{m} \times 5$
$= 300$ J

13. Ans: 1.5 m

Sol: $V = x^2 - 3x$
For equilibrium
$\frac{dV}{dx} = 0 \Rightarrow 2x - 3 = 0$
$\Rightarrow x = 1.5$ m

14. Ans: $\frac{1}{2} m.v^3$

Sol: Rate of K.E $= \frac{d}{dt} \frac{1}{2} Mv^2$
but $M = mL$
□ $\frac{1}{2} \frac{dm}{dt} L.v^2$
$= \frac{1}{2} m.v^3$

15. Ans: 2 m

Sol: $L = I\omega$
$= Mk^2\omega$
$1.8 = 1.5 \times k^2 \times 0.3$
$k^2 = \frac{1.8}{0.5 \times 0.3} = 4$
$k = 2$ m

16. Ans: $\frac{m_1 d}{m_2}$

Sol: $m_1(x - d) = m_2(y - d_2)$
$m_1x - m_1d = m_2y - m_2d_2$
$m_1x = m_2y$ ($\because$ constant)
$\Rightarrow d_2 = \frac{m_1 d}{m_2}$

17. Ans: Conservation of angular momentum

Sol: Law of conservation of angular momentum

18. Ans: 24 cm

Sol: Let x be distance from m_1
$x = \frac{r}{\sqrt{\frac{m_2}{m_1}} + 1} = \frac{60}{\sqrt{\frac{9}{4}} + 1}$
$= \frac{60}{\frac{3}{2} + 1} = 24$ cm

19. Ans: Negative and positive

Sol: $T.E = -\frac{GMm}{2r}$
$K.E = +\frac{GMm}{2r}$

20. Ans: $\frac{1}{8}^{th}$ of the present year

Sol: $T^2 \propto r^3$
$\left(\frac{T_1}{T_2}\right) = \left(\frac{r_1}{r_2}\right)^3 = (4)^3$
$T_2 = \frac{T_1}{4^{3/2}} = \frac{T}{8}$

21. Ans: 1.96×10^9

Sol: $B = \frac{h\rho g}{\left(\frac{\Delta V}{V}\right)}$
$= \frac{400 \times 10^3 \times 9.8}{\frac{0.2}{100}}$
$= \frac{400 \times 10^3 \times 9.8 \times 100}{0.2}$
$= 2000 \times 10^3 \times 9.8 \times 100$
$\cong 1.96 \times 10^9$

22. Ans: 129.6

Sol: $\frac{Q}{t} = \frac{\pi p r^4}{8\eta\ell}$

$\therefore$ Pressure difference $p \propto r^{-4}$

$\frac{p_1}{p_3} = \left(\frac{r_3}{r_1}\right)^4$

$\frac{p_1}{8.1} = \left(\frac{0.6}{0.3}\right)^4$

$p_1 = 8.1 \times 16$

$= 129.6$

23. Ans: 4.4 g

Sol: mg = force due to surface tension

$mg = 2\pi(r_1 + r_2) \times T$

$m = \frac{2\pi(r_1 + r_2) \times T}{g}$

$= \frac{2 \times 3.14(9.8) \times 10^{-2} \times 70 \times 10^{-3}}{9.8}$

$= 6.28 \times 70 \times 10^{-2} \times 10^{-3}$

$\cong 4.4$ g

24. Ans: 1 : 32

Sol: $v_t \propto r^3$

$\frac{v_1}{v_2} = \left(\frac{r_1}{r_2}\right)^2$

mass $\propto r^3$

$\frac{m_1}{m_2} = \left(\frac{r_1}{r_2}\right)^3$

$\therefore$ momenta $\frac{p_1}{p_2} = \frac{m_1 v_1}{m_2 v_2}$

$= \left(\frac{r_1}{r_2}\right)^5$

$= \left(\frac{1}{2}\right)^5$

= 1 : 32

25. Ans: Increases

Sol: $\eta = 1 - \frac{T_2}{T_1} = \frac{T_1 - T_2}{T_1}$

$\eta' = 1 - \frac{T_2 - 100}{T_1 - 100} = \frac{T_1 - T_2}{T_1 - 100}$

$\therefore$ increases

26. Ans: 10 min

Sol: $\frac{dQ}{dt} \propto \left[\frac{\theta_1 + \theta_2}{2} - \theta_0\right]$

$\therefore \frac{10}{10} \propto [45 - 25]$ ——(1)

$\frac{10}{t} \propto [35 - 15]$ ——(2)

$\frac{(1)}{(2)} \Rightarrow \frac{t}{10} = \frac{20}{20}$

t = 10 minute

27. Ans: 400 J

Sol: Area below DA is the work done in isobaric compression

$= 2 \times 10^2 \text{ N m}^{-2} \times (3 - 1) \text{ m}^3$

= 400 J (negative)

28. Ans: Network done by the system

Sol: $\Delta Q = \Delta U + \Delta W$

For cyclic process $\Delta U = 0$,

$\therefore \Delta Q = \Delta W$

29. Ans: $\frac{2}{\sqrt{5}}$ A

Sol: $\frac{K.E}{P.E} = \frac{\frac{1}{2}k(A^2 - x^2)}{\frac{1}{2}kx^2} = \frac{1}{4}$

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

$4A^2 - 4x^2 = x^2$

$4A^2 = 5x^2$

$x^2 = \frac{4}{5}A^2$

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

30. Ans: 5 : 4

Sol: $A_1 = 5$

$A_2 = \sqrt{(2\sqrt{2})^2 + (2\sqrt{2})^2}$

$= \sqrt{8 + 8}$

$= 4$

$\therefore \frac{A_1}{A_2} = \frac{5}{4}$

31. Ans: 16

Sol: $x = 10\sin\left(2t - \frac{\pi}{6}\right)$

$\omega = 2$

$A = 10$

$v = \omega\sqrt{A^2 - x^2} = 2\sqrt{10^2 - 6^2}$

$= 2 \times 8 = 16 \text{ m s}^{-1}$

32. Ans: 500

Sol: $v = \sqrt{\frac{B}{\rho}} = \sqrt{\frac{2\times10^9}{8000}}$

$= \sqrt{\frac{1}{4}\times10^6}$

$= \frac{1}{2}\times10^3 = \frac{1000}{2}$

$= 500$

33. Ans: 16

Sol: $f = \frac{P}{2L}\times v$

(P = number of loops)

$\frac{96\pi}{2\pi} = \frac{P}{2\times60}\times\frac{\omega}{k}$

$= \frac{P}{2\times60}\times\frac{96\pi}{\frac{4\pi}{15}}$

$P = 16$

34. Ans: Adiabatic

Sol: Adiabatic

$V = \sqrt{\frac{\gamma p}{\rho}}$

35. Ans: $\frac{V_1 - V_2}{V_2}$

Sol: $V_2 = \frac{CV_1 + 0}{(C + KC)}$

$1 + K = \frac{V_1}{V_2}$

$K = \frac{V_1}{V_2} - 1$

$K = \frac{V_1 - V_2}{V_2}$

36. Ans: Comb induces a net dipole moment opposite to the direction of the field.

Sol: The field due to charge on comb induces dipole moment in paper by stretching or re-orienting molecules of the dielectric.

37. Ans: $3\varepsilon_0 \times 10^6$

Sol: Net flux $= \frac{q_{enclosed}}{\varepsilon_0}$

$9\times10^6 - 6\times10^6 = \frac{q_{encl}}{\varepsilon_0}$

$q_{encl} = 3\varepsilon_0 \times 10^6$

38. Ans: The electric field is parallel to the equipotential surface.

Sol: Electric field is always perpendicular to equipotential surface.

39. Ans: 12 μF

Sol: $\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} = \frac{1}{4}$

$\frac{1}{C_1} + \frac{1}{C_2} = \frac{1}{6}$

□ $\frac{1}{6} + \frac{1}{C_3} = \frac{1}{4}$

$\frac{1}{C_3} = \frac{1}{4} - \frac{1}{6} = \frac{1}{12}$

$C_3 = 12\ \mu F$

40. Ans: 36 Ω

Sol: $\frac{R_1}{R_2} = \frac{i_1}{i_2}$

$\frac{\frac{12X}{12+X}}{16} = \frac{36}{64}$

$\frac{12X}{(12+X)16} = \frac{36}{64}$

$\frac{X}{12+X} = \frac{3}{4}$

$4X = 36 + 3X$

$X = 36\ \Omega$

41. Ans: 0.2 Ω

Sol: $I = \frac{E_{eff}}{R_{eff}}$

$2 = \frac{20}{8+10r}$

$16 + 20r = 20$

$20r = 4$

$r = \frac{4}{20} = \frac{1}{5} = 0.2\ \Omega$

42. Ans: $\frac{\ell}{2}$

Sol: $\frac{E_1}{E_2} = \frac{\ell_1}{\ell_2}$

$\frac{V}{1.5V} = \frac{\frac{\ell}{3}}{\ell_2}$

$\ell_2 = \frac{\ell}{3}\times1.5$

$= \frac{\ell}{2}$

43. Ans: 1 Ω

Sol: When all resistors are connected in parallel, the effective value will be the smallest.

$\therefore R = \frac{10}{10} = 1\ \Omega$

44. Ans: The relation between voltage and current for a non-ohmic conductor is linear.

Sol: For non ohmic conductors; V is not proportional to I

45. Ans: 1 A

Sol: Mass deposited = volume × density

$= (6 \times 6 \times 0.01) \times 10\ \text{g cm}^{-3}$

$= 3.6$ gram

$\therefore$ Charge needed $= \frac{m}{Z} = \frac{3.6}{0.001} = 3600$ C

$\therefore I = \frac{Q}{t} = \frac{3600\text{C}}{3600\text{s}} = 1$ A

46. Ans: 2 : 1

Sol: Let $I_1 > I_2$

$\therefore \frac{\mu_0}{2\pi r}(I_1 - I_2) = 10\ \mu\text{T}$ —(1)

and $\frac{\mu_0}{2\pi r}(I_1 + I_2) = 30\ \mu\text{T}$ —(2)

$\frac{(1)}{(2)}\ \frac{I_1 - I_2}{I_1 + I_2} = \frac{1}{3}$

Solving $\frac{I_1}{I_2} = \frac{4}{2} = 2$

47. Ans: 45°

Sol: $B_v = B_H$

$B \sin\delta = B \cos\delta$

$\tan\delta = 1$

$\delta = 45°$

48. Ans: $\frac{1}{\sqrt{2}}$ A

Sol: $I_0 = \frac{E_0}{2} = \frac{20}{20} = 1$ A

$\therefore I_{rms} = \frac{I_0}{\sqrt{2}} = \frac{1}{\sqrt{2}}$ A

49. Ans: $1 \times 10^6 \pm 10\%$

Sol: Black – 0

Brown – 1

Green – 5

Silver - +10%

$\therefore 10 \times 10^5 \pm 10\% = 1 \times 10^6 \pm 10\%$

50. Ans: At resonance the net reactance is zero.

Sol: At resonance, $X = X_L - X_C = 0$

51. Ans: 0.1 C

Sol: $q = \left|\frac{d\phi}{R}\right| = \frac{\phi_{max}}{R} = \frac{BAN}{R}$

$= \frac{0.1 \times 200 \times 10^{-4} \times 100}{2}$

$= 0.1$ C

52. Ans: 125 mH

Sol: $L = \frac{\mu_0 \mu_r N^2 A}{\ell}$

$\frac{L_2}{L_1} = \frac{\mu_0 \mu_r N_2^2 A}{\mu_0 N_1^2 A} = \mu_r \left(\frac{N_2}{N_1}\right)^2$

$L_2 = L_1 \mu_r \left(\frac{N_2}{N_1}\right)^2 = 1 \times 10^{-3} \times 500 \times \left(\frac{50}{100}\right)^2$

$= 125 \times 10^{-3}$ H $= 125$ mH

53. Ans: 1.25 A

Sol: $P_{out} = 10 \times 100$ VA

$= 100$ VA

$P_{in} = \frac{P_{out}}{\eta} = \frac{1000}{0.8}$ VA

$I_{in} = \frac{P_{in}}{V_{in}} = \frac{1000}{0.8 \times 1000}$

$= 1.25$ A

54. Ans: Eddy currents are produced in a steady magnetic field.

Sol: Time varying magnetic field is needed to produce eddy current.

55. Ans: 6.28 mm

Sol: $B = B_0 \sin(\omega t + kx)$

$k = \frac{2\pi}{\lambda} \Rightarrow \lambda = \frac{2\pi}{k}$

$B_y = 2 \times 10^{-7} \sin(10^3 x + 1.5 \times 10^{12} t)$

$\Rightarrow k = 10^3\ \text{m}^{-1}$

$\therefore \lambda = \frac{2\pi}{10^3} = 6.28 \times 10^{-3}$ m

$= 6.28$ mm

56. Ans: The speed of light $c = 3 \times 10^8\ \text{m s}^{-1}$ in free space.

Sol: $c = 3 \times 10^8\ \text{m s}^{-1}$ in free space for EM waves

57. Ans: 45

Sol: Magnifying power of telescope for normal vision

$= \frac{f_0}{f_e} = \frac{225}{5}$
$= 45$

58. Ans: 60°

Sol: $r_1 = \frac{A}{2} = \frac{60°}{2} = 30°$

$\frac{\sin i}{\sin r_1} = \sqrt{3} \Rightarrow \sin i = \sqrt{3}\sin r_1$

$= \sqrt{3} \times \sin 30°$

$= \frac{\sqrt{3}}{2}$

$\Rightarrow i = \sin^{-1}\left(\frac{\sqrt{3}}{2}\right) = 60°$

59. Ans: 16 : 9

Sol: $\frac{I_1}{I_2} = \frac{49}{1}$

$\frac{\sqrt{I_1}}{\sqrt{I_2}} = \frac{7}{1}$

$\Rightarrow \frac{\sqrt{I_1}+\sqrt{I_2}}{\sqrt{I_1}-\sqrt{I_2}} = \frac{7+1}{7-1} = \frac{8}{6}$

□ $\frac{I_{max}}{I_{min}} = \left(\frac{4}{3}\right)^2 = \frac{16}{9}$

60. Ans: Inversely proportional to fourth power of wavelength of light.

Sol: $I \propto \frac{1}{\lambda^4}$ according to Rayleigh.

61. Ans: 2 Å

Sol: $\lambda \propto \frac{1}{\sqrt{KE}} \Rightarrow \lambda\sqrt{KE}$ = constant

$\Rightarrow 2000\ \text{Å} \times \sqrt{1\ \text{eV}} = \lambda \times \sqrt{10^6\ \text{eV}}$

$\Rightarrow \lambda = 2\ \text{Å}$

62. Ans: 1 : 2

Sol: $KE_{MAX\,1} = 3 - 2.75 = 0.25$ eV
$KE_{MAX\,2} = 3 - 2 = 1.00$ eV

$\left(\frac{p_1}{p_2}\right)_{MAX} = \sqrt{\frac{KE_{MAX1}}{KE_{MAX2}}} = \sqrt{\frac{0.25}{1.00}}$

$= \frac{1}{2}$

($\because p = \sqrt{2mKE}$)

63. Ans: 40 days

Sol: T = 69.3 days

$\frac{N_0}{N} = (2)^{\frac{t}{T}}$

$\frac{N_0}{\left(\frac{2}{3}N_0\right)} = (2)^{\frac{t}{T}}$

$\Rightarrow \frac{3}{2} = 2^{\frac{t}{T}}$

$\ell n\frac{3}{2} = \frac{t}{T}\ell n2 \Rightarrow 0.4 = \frac{t}{69.3} \times 0.6932$

$= \frac{t}{100} \Rightarrow t = 0.4 \times 100$

= 40 days

64. Ans: Depends on the frequency of light source and the nature of emitter plate material.

Sol: $h\upsilon = h\upsilon_0 + KE_{MAX}$
$\Rightarrow KE_{MAX}$ depends on υ and $h\upsilon_0$.

65. Ans: 0.01 A

Sol: $i = \frac{\Delta V}{R} = \frac{(3-1)V}{200R}$
= 0.01 A

66. Ans: Semiconductor

Sol: Semiconductor band gap ≤ 3 eV

67. Ans: 500 μA

Sol: $\beta = \frac{i_c}{i_b} = 50$

$(i_b)_{MAX} = \frac{0.01\ V}{1000\ \Omega} = 1 \times 10^{-5}$ A

$(i_c)_{MAX} = (i_b)_{MAX}\,\beta$
$= 1 \times 10^{-5} \times 50 = 500\ \mu A$

68. Ans: for t_3 to t_4 ; y = 1

Sol:

	A	B	AB	AB = y
t_1 to t_2	1	0	0	1
t_2 to t_3	1	0	0	1
t_3 to t_4	0	1	0	1
t_4 to t_5	0	0	0	1
t_5 to t_6	1	0	0	1

69. Ans: $\frac{\ell^2}{\lambda^2}$

Sol: Power radiated by antenna $\propto \left(\frac{\ell}{\lambda}\right)^2$

$\propto \frac{\ell^2}{\lambda^2}$

70. Ans: 0.4

Sol: A_C = amplitude of carrier = 25 V
Amplitude of side band

$= 5\ V = \frac{\mu A_C}{2}$

$\Rightarrow \mu = \frac{5\times 2}{A_C} = \frac{10}{25} = 0.4$

71. Ans: Receiver and transmitter

Sol: Repeater is a combination of receiver and transmitter.

72. Ans: Mobile telephony : Frequency range 800 – 950 kHz

Sol: Mobile telephony 896 – 901 MHz
(Mobile to base station)
840 – 935 MHz
(Base station to mobile).

73. Ans: 448

Sol: No. of moles in 0.8 g Ca = $\frac{0.8}{40} = 2\times 10^{-2}$
Vol. of 2×10^{-2} moles at STP
$= 2\times 10^{-2}\times 22400 = 448\ cm^3$

74. Ans: 44.1×10^{-18} J atom^{-1}

Sol: Ionisation enthalpy of Li^{2+} = Ionisation enthalpy of $He^{+}\times \frac{9}{4}$

$= 19.6\times 10^{-18}\ \frac{9}{4}$

$= 44.1\times 10^{-18}$ J atom^{-1}

75. Ans: 6.023×10^{18}

Sol: $\underset{100\,g}{CaCO_3} + 2HCl \longrightarrow CaCl_2 + H_2O + \underset{1\,mole}{CO_2}$
1×10^{-3} g $CaCO_3 \rightarrow 1\times 10^{-5}$ moles of CO_2
$= 10^{-5}\times 6.023\times 10^{23}$ molecules
$= 6.023\times 10^{18}$

76. Ans: different, with 1, 0 and 2

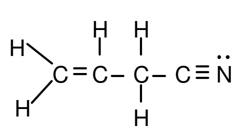
Sol: SF_4 – 1 lp, see-saw
CF_4 – 0 lp, tetrahedral
XeF_4 – 2 lp, square planar

77. Ans: Pure atomic orbitals are more effective in forming stable bonds than hybrid orbitals

Sol: Statement E is not correct in respect of hybridisation

78. Ans: 9 sigma bonds, 3 pi bonds and 1 lone pair

Sol:



Allyl cyanide

79. Ans: 2

Sol: $\frac{P_1V_1}{P_2V_2} = \frac{n_1T_1}{n_2T_2}$
$\frac{1.5\times 16.4\times 500}{4.1\times 5\times 300} = \frac{2}{1}$

80. Ans: 2 : 3

Sol: $p \propto n$
Same pressure $\rightarrow$ same number of moles
$\frac{W_A}{M_A} = \frac{W_B}{M_B}$
$\frac{M_A}{M_B} = \frac{W_A}{W_B} = \frac{4}{6} = \frac{2}{3}$

81. Ans: Ferrimagnetic substance like $ZnFe_2O_4$ becomes paramagnetic on heating

Sol: Ferrimagnetic substance become paramagnetic on heating

82. Ans: Neon

Sol: He – 48 kJ mol^{-1}
Ne – 116 kJ mol^{-1}
Ar, Kr – 96 kJ mol^{-1}
Xe – 77 kJ mol^{-1}

83. Ans: B < Al < Mg < K

Sol: Their electronegativity values are
K – 0.8; Mg –1.2; Al 1.5; B –2.0

84. Ans: $CaCl_2$

Sol: $NH_4Cl + Ca(OH)_2 \rightarrow 2NH_3 + CaCl_2 + H_2O$

85. Ans: NH_4NO_3, N_2O, H_2O

Sol: $\underset{A}{NH_4NO_3} \xrightarrow{\Delta} \underset{B}{N_2O} + 2\underset{C}{H_2O}$

86. Ans: $Na_2[B_4O_5(OH)_4].8H_2O$

Sol: Borax is $Na_2[B_4O_5(OH)_4].8H_2O$

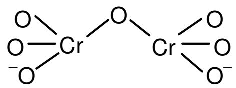
87. Ans: (a)-(iv); (b)-(iii); (c)-(ii);(d)-(i)

Sol: H_3PO_2 – white P + H_2O
H_3PO_3 – P_2O_3 + H_2O
H_3PO_4 – P_4O_{10} + H_2O
$H_4P_2O_6$ – red + alkali

88. Ans: Fe

Sol: Fe possess hcp while all others ccp

89. Ans: Six equivalent Cr–O bonds and one Cr–O–Cr bond

Sol: 

90. Ans: SO_4^{2-}

Sol: In neutral or faintly alkaline medium thiosulphate is quantitatively oxidized by $KMnO_4$ to sulphate, according to the equation

$$8MnO_4^- + 3S_2O_3^{2-} + H_2O \longrightarrow 8MnO_2 + 6SO_4^{2-} + 2OH^-$$

91. Ans: –8.3

Sol: $2MO_{2(s)} \rightarrow 2MO_{(s)} + O_{2(g)}$

Work done = $-P\Delta V = -nRT$

$= -2 \times 8.31 \times 500$ J

$= -8.3$ kJ

92. Ans: 27°C

Sol: At equilibrium, $\Delta H = T\Delta S$

$$T = \frac{\Delta H}{\Delta S} = \frac{12\times10^3}{40} = 300\ K$$

Above 27°C, the reaction becomes spontaneous.

93. Ans: 0.1

Sol: $pOH = pK_b - \log\frac{[Base]}{[Salt]}$

$14 = pH + pK_b - \log\frac{[Base]}{[Salt]}$

$-1 = \log\frac{[Base]}{[Salt]}$

$\frac{[Base]}{[Salt]} = 0.1$

94. Ans: Inversely proportional to the square of $[B^-]$

Sol: $AB \rightleftharpoons A^+ + B^-$

$AB_2^- \rightleftharpoons AB + B^-$

Adding, $AB_2^- \rightleftharpoons A^+ + 2B^-$

$k = \frac{[A]^+[B^-]^2}{[AB_2^-]}$

$\frac{[A^+]}{[AB_2^-]} = \frac{k}{[B^-]^2}$

95. Ans: $\frac{yz}{x}$

Sol: $y = x \times m$

$\Delta T_f = z \times m$

$\Delta T_f = \frac{yz}{x}$

96. Ans: 0.67

Sol: Total vapour pressure = 50 + 25 = 75

$50 = 75 \times X_{C_6H_6}$

$X_{C_6H_6} = \frac{2}{3} = 0.67$

97. Ans: 20.16

Sol: $1F \rightarrow 11.2\ L\ Cl_2$ at STP

$\therefore$ No. of Faradays

$= \frac{9.65\times5\times60\times60}{96500} = 1.8$

$\therefore$ Vol. of $Cl_2 = 1.8 \times 11.2\ L = 20.16$

98. Ans: Q is less than one and ΔG is less than zero

Sol: $\Delta G = \Delta G° + RT \ln Q$

E_{cell} is + ve, $\therefore \Delta G$ is –ve

E_{cell} is also +ve, $\Delta G°$ is –ve

$\therefore RT \ln Q$ is also –ve

i.e., Q < 1

99. Ans: 1.25×10^{-3} mol lit^{-1} s^{-1}

Sol: $r = k[A]^1[B]^2 = 10^{-2} \times \left(\frac{1}{2}\right)\times\left(\frac{1}{2}\right)^2$

$= 1.25 \times 10^{-3}$

100. Ans: Both k and the reaction rate remain the same

Sol: k is a constant at constant temperature and CO has no contribution to the rate of reaction

101. Ans: Sulphur sol in water

Sol: Lyophobic sols are multimolecular colloids.

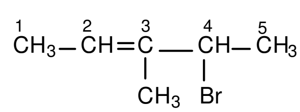
102. Ans: $[CoF_6]^{3-}$

Sol: In $[CoF_6]^{3-}$ cobalt is in 3+ state; sp^3d^2 hybridisation contains 4 unpaired electrons

103. Ans: Yellow – $(NH_4)_2MoO_4$

Sol: Yellow colour is due to the formation of $(NH_4)_3PO_4.12MoO_3$

104. Ans: 4-bromo-3-methylpent-2-ene

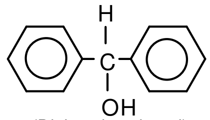
Sol: 

4-bromo-3-methylpent-2-ene

105. Ans: Chlorobenzene

Sol: Chlorobenzene does not undergo hydrolysis by S_N1 mechanism

106. Ans: Diphenyl methanol

Sol: 

(Diphenyl methanol)

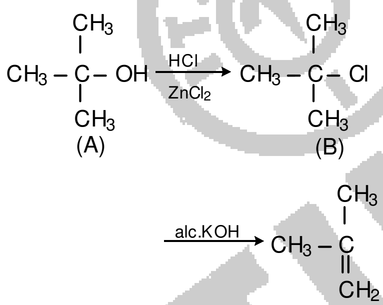
It does not contain any chiral carbon atom

107. Ans: 7

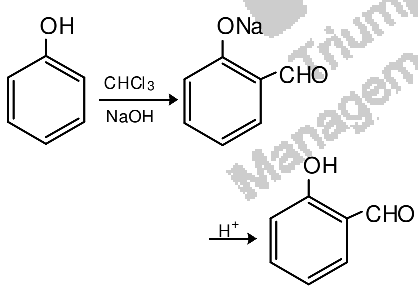
Sol: The different isomers are

1. $CH_3CH_2CH_2CH_2OH$
2. $CH_3-CH(OH)-CH_2-CH_3$
3. $CH_3-CH(CH_3)-CH_2OH$
4. $(CH_3)_3COH$
5. $CH_3CH_2-O-CH_2CH_3$
6. $CH_3-O-CH_2CH_2CH_3$
7. $CH_3-O-CH(CH_3)-CH_3$

108. Ans: 2-methyl-2-propanol and 2-methyl-2-chloropropane

Sol: 

109. Ans: Reimer-Tiemann reaction

Sol: 

110. Ans: 4-bromobut-1-ene

Sol: $BrH_2C-CH_2-CH=CH_2$

4–Bromobut–1–ene

111. Ans: 3,4-dimethylhex-3-ene

Sol: $CH_3-CH_2-C(CH_3)=C(CH_3)-CH_2-CH_3$

3,4-Dimethylhex-3-ene

$\xrightarrow{\text{ozonolysis}} 2CH_3-CH_2-C(=O)-CH_3$

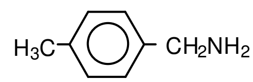
112. Ans: $CH_3CH_2CH_2NH_2$

Sol: Amines do not form oxime or semicarbazone

113. Ans: Phenol

Sol: It is a commercial method for the manufacture of phenol.

114. Ans: p-methyl benzylamine

Sol: 

(p-methyl benzylamine)

It is a 1° amine

115. Ans: Benzenamine

Sol: Benzenamine (aniline) is the weakest base among the given amines

116. Ans: Acetonitrile

Sol: $\underset{\text{Acetonitrile (A)}}{CH_3-C\equiv N} \xrightarrow{H_3O^+} \underset{(B)}{CH_3-COOH}$

$CH_3-C\equiv N \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) } CH_3MgBr}$

$(CH_3COO)_2Ca \xrightarrow{\text{dry distillation}}$

$CH_3-C(=O)-CH_3$

117. Ans: 51

Sol: Insulin contains 51 amino acids

118. Ans: $\left[CO(CH_2)_5NH \right]$

Sol: Repeating unit of Nylon 6 is $\left[CO(CH_2)_5NH \right]$

119. Ans: In sucrose the two monosaccharides are held together by peptide linkage

Sol: The linkage between monosaccharide units is called glycosidic linkage

120. Ans: 300

Sol: Carboxyhaemoglobin is 300 times more stable than oxyhaemoglobin