02. $\lambda = \dfrac{1}{\sqrt{2}\pi d^2 (N/V)} = \dfrac{V}{\sqrt{2}\pi d^2 N}$ $\therefore \lambda \propto V$ hence "half"

03. for adiabatic PV^r = const = $\dfrac{P^{r-1}}{T^r}$ = constant.

Hence $\dfrac{P_2}{P_1} = \left(\dfrac{T_2}{T_1}\right)^{r/(r-1)}$ $\therefore \dfrac{P_2}{P_1} = 3^{\frac{3/2}{1/2}} = 27$

04. Mg is also apperent due to air and in liquid also.

Hence $Mg - \dfrac{M}{d_2} dg = M_0 g - \dfrac{M_0}{d_1} dg$. M_0 is true mass

Hence $M_0 = M \cdot \dfrac{d_1(d_2-d)}{d_2(d_1-d)}$

05. Shearing strain = $\tan\theta = \eta^{-1}$. shear stress. $\left(\eta = \dfrac{F/A}{x/L}\right)$

$\therefore \tan\theta = \dfrac{9\times10^4}{0.25\times5.6\times10^9} \simeq 6.4 \times 10^{-5}$

06. $F = G.\dfrac{M_1.M_2}{(8R)^2} = \dfrac{G.\frac{4}{3}\pi(3R)^3(5R)^3\frac{4}{3}\pi}{(8R)^2}$ $\therefore F \propto R^4$

09. $e = B.\dfrac{dA}{dt} = 40\times10^{-3}\times0.5 = 20\,mV$

10. $B_1 = \dfrac{\mu_0 I.R^2}{2(R^2+(\sqrt{3}R)^2)^{3/2}} = \dfrac{\mu_0 IR^2}{2(R^2+3R^2)^{3/2}} = \dfrac{\mu_0 I}{16R}$

$B_2 = \dfrac{\mu_0 I}{2R}$ Hence $\dfrac{B_1}{B_2} = \dfrac{1}{8}$

11. Current throgh Golvanometer = $\dfrac{3}{50+2950} = 10^{-3}A$

$10^{-3}A$ gives 30 div. hence for 20 div current will be $\frac{2}{3}\times10^{-3}A$

$\therefore \frac{2}{3}\times10^{-3} = \dfrac{3}{50+x} \Rightarrow x = 4450\,\Omega$

~~(Ans. is possible by inspection as~~

12.  If upper mass (sphere) is removed the change will be in Y coordinate (now will be 0) & earlier will be at $\frac{1}{3}\cdot\frac{\sqrt{3}}{2}(2\sqrt{3})$ from bottom.

i.e. shift by 1

16. at $t=0$, $x = 0.005\,m$ or $5\,mm$ and hence $\alpha = \frac{\pi}{6}$
& period is 2sec hence $\frac{2\pi}{T} = \omega = \pi$. so phase is $\left(\pi t + \frac{\pi}{6}\right)$

17. $V_{max} = V_0$ hence $V_{rms} = \frac{V_0}{\sqrt{2}}$

19. $\frac{1}{2}mv^2 = \frac{1}{4\pi\epsilon_0} \cdot \frac{(Ze)(2e)}{x}$ hence $x \propto 1/m$ other terms const.

20. $P = m\vartheta = m \cdot \frac{k}{n}$ & $L = \frac{n \cdot h}{2\pi}$ $\therefore$ P.L is independent of n
hence $P.L = n^0$

23. 

$\frac{P}{Q} = \frac{\left(\frac{1}{S_1} + \frac{1}{S_2}\right)^{-1}}{R} \Rightarrow \frac{P}{Q} = \frac{R(S_1+S_2)}{S_1 S_2}$

24. $i = \frac{d\phi/dt}{R}$ $\therefore$ $\frac{dq}{dt} = \frac{1}{R} \cdot \frac{d\phi}{dt}$ $\therefore$ $q = \frac{1}{R} \cdot \frac{B(A-0)}{1} = \frac{BA}{R}$

25. At Q (due to 2Q) is E then at 2Q (due to Q) is $E/2$.

27. $Q \times 10^{11} = \frac{1}{4\pi\epsilon} \cdot \frac{Q}{r}$ we need $\frac{1}{4\pi\epsilon} \cdot \frac{Q}{r^2}$.
from given $r 4\pi\epsilon = 10^{11}$ $\therefore$ $E = \frac{|V|}{r} = \frac{Q \times 10^{11}}{\frac{1}{4\pi\epsilon} \times 10^{11}} = 4\pi\epsilon . Q 10^{22}$
$\therefore$ $r = \frac{10^{11}}{4\pi\epsilon}$ Hence $E = 4\pi\epsilon \cdot Q \cdot 10^{22}$

29. G is universal const.

30. $V = 2t + 2$ $\therefore$ at $t=2$; $\vartheta = 6$ & at $t=4$; $\vartheta = 10$ hence
$\Delta KE = \frac{1}{2} \cdot 2\,(100 - 36) = 64\,J$

31. $\Delta P = h\rho g = B \cdot \frac{\cdot 1}{100}$ $\therefore$ $h = \frac{9.8 \times 10^8}{1000 \times 9.8} \cdot \frac{1}{1000}$ ($\rho_w = 1000$ not 1)
$= 100\,m$

32. $I_1\omega_1 = I_2\omega_2$ $\therefore$ $\frac{MR^2}{2} \cdot 20 = \left(\frac{MR^2}{2} + mR^2\right)x$ $\therefore \omega_2' = x = 10$

33. $\frac{2}{3} M . R_H^2 = \frac{2}{5} M\, R_S^2$ $\therefore$ $\frac{R_H}{R_S} = \sqrt{\frac{3}{5}}$

34. No heat given $\therefore$ $W = P . \Delta V = -100\,J$; $\Delta U = \Delta Q - W = 100\,J$
Case II $W = 0$ $\therefore$ $\Delta U = \Delta Q = 150\,J$ Hence $\Delta U_T = 250\,J$

35. $\vartheta = \sqrt{\frac{T}{\mu}} = \frac{\omega}{k}$ $\therefore$ $T = \frac{\omega^2 \mu}{k^2} = \frac{420^2}{21^2} \cdot (0.2) = 80\,N$

36. $W = \int_0^2 F\cdot dx = \int_0^2 2(2t)(t^2 dt)$ $= 16J$

$x = \frac{t^3}{3} \therefore dx = \frac{3t^2dt}{3}$

$F = m.a = m.(2t)$

$v = t^2 \therefore a = 2t$

38. $I_A \cos^2 30^\circ = I_B \cdot \cos^2 60^\circ$. $\frac{I_A}{I_B} = \frac{1}{3}$

42. If inclination of plane is θ then $S_n = 0 + \frac{g\sin\theta}{2}(2n-1)$ and $S_{n+1} = 0 + \frac{g\sin\theta}{2}(2(n+1)-1) \Rightarrow S_{n+1} = \frac{g\sin\theta}{2}(2n+1)$

44. find v_1 then v_2 & take diff. but will be time consuming. Hence use $\frac{1}{v} + \frac{1}{u} = \frac{1}{f} \therefore -\frac{1}{v^2}dv + \frac{-1}{u^2}du = 0$ hence

$dv = -\frac{v^2}{u^2}.du$ $\left(\frac{1}{v} + \frac{1}{-60} = \frac{1}{-10} \therefore \frac{1}{v} = \frac{1}{60} - \frac{1}{10} = \frac{-1}{12}\right)$

$= -\frac{(-12)^2}{(-60)^2}.(+1)$ mm (du will be +ve as toward mirror)

$= \frac{1}{25}$ mm.

45. $\frac{1}{f} = \left(\frac{1.5}{1.75} - 1\right)\left(\frac{-1}{R} - \left(\frac{1}{R}\right)\right) = \frac{0.28}{R} \therefore f = \frac{R}{0.28} = 3.5R$

as +ve is converging (A)

50. $0 \to 6$ in 1 second $\therefore a = 6\ ms^{-2} \therefore s_1 = \frac{1}{2}.6.1^2 = 3m$.

in $t=1$ to 2 $S_2 = 6.1 + \frac{1}{2}(-6).1^2 \Rightarrow S_2 = 3m$ (speed 0)

in $t=2$ to 3 $S_3 = 0 + \frac{1}{2}(-6).1^2 \Rightarrow S_3 = -3$ m

Av. velocity $= \frac{-3}{3} = -1$ (or 1)

Av. speed $= 9/3 = 3$

CHEMISTRY (SECTION – A)

51. Calculate the weight of one atom of Ag – (At. wt. of Ag = 108)

(A) 17.93×10^{-23} gm (B) 16.93×10^{-23} gm (C) 17.93×10^{23} gm (D) 36×10^{-23} gm

Sol.(A)

$\because$ N atoms of Ag weigh 108 gm

$\therefore$ 1 atom of Ag weigh = $\frac{108}{N}$

$= \frac{108}{6.023 \times 10^{23}}$

$= 17.93 \times 10^{-23}$ gm.

52. The number of gram molecules of oxygen in $6.02 \times 10^{24}\, CO$ molecules is

(a) 10 *gm* molecules (b) 5 *gm* molecules (c) 1 *gm* molecules (d) 0.5 *gm* molecules

Solution: (b) 6.02×10^{23} molecules = 1 mole of CO

$\therefore$ 6.02×10^{24} CO molecules = 10 moles of CO

= 10 *gms* of Oxygen atom =5 *gm* molecules of O_2

53. The relative abundance of two isotopes of atomic weight 85 and 87 is 75% and 25% respectively. The average atomic weight of element is

(a) 75.5 (b) 85.5 (c) 87.5 (d) 86.0

Solution:(b)

Average atomic weight/ The average isotopic weight

$$= \frac{\%\text{ of 1st isotope} \times \text{relative mass of 1st isotope} + \%\text{ of 2nd isotope} \times \text{relative mass of 2nd isotope}}{100}$$

$$= \frac{85 \times 75 + 87 \times 25}{100} = 85.5$$

54. Arrange the orbitals of H-atom in the increasing order of their energy -

$3p_x$, 2s, $4d_{xy}$, 3s, $4p_z$, $3p_y$, 4s

(A) $2s < 3s = 3p_x = 3p_y < 4s = 4p_z = 4d_{xy}$ (B) $2s < 3s < 3p_x = 3p_y < 4s = 4p_z = 4d_{xy}$

(C) $2s < 3s < 3p_x = 3p_y < 4s = 4p_z = 4d_{xy}$ (D) $2s < 3s < 3p_x = 3p_y < 4s < 4p_z < 4d_{xy}$

55. If 900 *J/g* of heat is exchanged at boiling point of water, then what is increase in entropy

(a) 43.4 *J/mole* (b) 87.2 *J/mole* (c) 900 *J/mole* (d) Zero

Solution: (a)

Boiling point $(T_b) = 100°C = 373\,K$; $\Delta H_v = 900\,J/g$

$\Delta S_{vap} = \frac{\Delta H_v}{T}$; Molecular weight of water = 18

$\Delta S_{vap} = \frac{900 \times 18}{373} = 43.4\,JK^{-1}mol^{-1}$

56. The heat of combustion of carbon is –94 *kcal* at 1 *atm* pressure. The intrinsic energy of CO_2 is

(a) + 94 *kcal* (b) –94 *kcal* (c) + 47 *kcal* (d) –47 *kcal*

Solution:(b)

$C_{(s)} + O_{2(g)} \rightarrow CO_2(g);\ \Delta H = -94\,kcal$

$\Delta H = \Delta E + \Delta n_g RT$; $\Delta E = ?$

$\Delta n_g = 1 - 1 = 0$; $\Delta H = \Delta E$; $\Delta E = -94\,kcal$

57. 2 moles of PCl_5 were heated in a closed vessel of 2 litre capacity. At equilibrium, 40% of PCl_5 is dissociated into PCl_3 and Cl_2. The value of equilibrium constant is

(a) 0.266 (b) 0.53 (c) 2.66 (d) 5.3

Solution: (a)

At start, $\underset{2}{PCl_5} \rightleftharpoons \underset{0}{PCl_3} + \underset{0}{Cl_2}$

At equilibrium. $\frac{2\times 60}{100}$ $\frac{2\times 40}{100}$ $\frac{2\times 40}{100}$

Volume of cantainer = 2 litre

$$\therefore\ K_c = \frac{\frac{2\times 40}{100\times 2}\times\frac{2\times 40}{100\times 2}}{\frac{2\times 60}{100\times 2}} = 0.266$$

58. How many grams of CaC_2O_4 (molecular weight = 128) on dissolving in distilled water will give one litre saturated solution. $[K_{sp}(CaC_2O_4)] = 2.5\times 10^{-9}\,mol^2 l^{-2}$

(a) 0.0064 g (b) 0.01280 g (c) 0.0128 g (d) 1.2800 g

Solution: (a)

$s = \sqrt{K_s} = \sqrt{2.5\times 10^{-9}} = 5\times 10^{-5}\,M$

Weight of $CaC_2O_4 = 5\times 10^{-5}\times 128\ gL^{-1} = 0.0064\ g$

59. If pK_w = 13.36 at 50^oC, the pH of water at the same temperature is

(a) 7.00 (b) 6.68 (c) 7.63 (d) 6.00

Solution: (b)

$pH + pOH = pK_w$

For H_2O, $pH = pOH$

$\therefore\ x + x = 13.36$; $2x = 13.36$

$x = \frac{13.36}{2} = 6.68$

60. The oxidation state of tungsten in $Na_2W_4O_{13}.10H_2O$ is –

(A) + 7 (B) + 6 (C) + 4 (D) + 4.5

61. 34.2 g of canesugar is dissolved in 180 g of water. The relative lowering of vapour pressure will be

(a) 0.0099 (b) 1.1597 (c) 0.840 (d) 0.9901

Solution: (a)

$$\frac{P_A^0 - P_A}{P_A^0} = \frac{W_B/M_A}{W_B/M_B + W_A/M_A} = \frac{34.2/342}{34.2/342 + 180/18} = \frac{0.1}{10.1} = 0.0099$$

62. A solution containing 6.8 g of a nonionic solute in 100 g of water was found to freeze at -0.93^oC. The freezing point depression constant of water is 1.86. Calculate the molecular weight of the solute

(a) 13.6 (b) 34 (c) 68 (d) 136

Solution: (d)

$$M_B = \frac{1000\times K_f\times W_B}{\Delta T_f\times W_A} = \frac{1000\times 1.86\times 6.8}{100\times 0.93} = 136$$

63. A metal wire carries a current of 1 *A*. How many electrons move past a point in the wire in one second

(a) 6.02×10^{23} (b) 3.12×10^{18} (c) 3.02×10^{23} (d) 6.24×10^{18}

Solution (d)

Total charge passed in one second $'Q' = I\times t = 1\times1 = 1c$

$\because$ 96500 current carried by 6.02×10^{23} electrons

$\therefore$ 1*C* current carried by $\frac{6.02\times10^{23}}{96500} = 6.24\times10^{18}$

64. Molar conductivity of a solution is $1.26\times10^{2}\,\Omega^{-1}cm^{2}\,mol^{-1}$. Its molarity is 0.01. Its specific conductivity will be

(a) 1.26×10^{-5} (b) 1.26×10^{-3} (c) 1.26×10^{-4} (d) 0.0063

Solution: (b)

$$\Lambda_m = \frac{\kappa\times1000}{\text{Molarity}} \text{ or } \kappa = \frac{\Lambda_m\times\text{Molarity}}{1000} = \frac{1.26\times10^{-2}\times0.01}{1000} = 1.26\times10^{-3}.$$

65. A gaseous hypothetical chemical equation $2A \rightleftharpoons 4B + C$ is carried out in a closed vessel. The concentration of *B* is found to increase by $5\times10^{-3}\,mol\,l^{-1}$ in 10 second. The rate of appearance of *B* is

(a) $5\times10^{-4}\,mol\,l^{-1}\,\sec^{-1}$ (b) $5\times10^{-5}\,mol\,l^{-1}\,\sec^{-1}$

(c) $6\times10^{-5}\,mol\,l^{-1}\,\sec^{-1}$ (d $4\times10^{-4}\,mol\,l^{-1}\,\sec^{-1}$

Solution: (a)

Increase in concentration of $B = 5\times10^{-3}\,mol\,l^{-1}$, Time = 10 *sec*.

Rate of appearance of $B = \frac{\text{Increase of concentration of } B}{\text{Time taken}} = \frac{5\times10^{-3}\,mol\,l^{-1}}{10\text{ sec}} = 5\times10^{-4}\,mol\,l^{-1}\sec^{-1}$.

66. Thermal decomposition of a compound is of the first order. If 50% of a sample of the compound is decomposed in 120 minutes, how long will it take for 90% of the compound to decompose

(a) 399 min (b) 2.99 min (c) 39.9 min (d) 3.99 min

Solution : (a)

Half life of reaction =120 min

$$k = \frac{0.693}{t_{1/2}} = \frac{0.693}{120} = 5.77\times10^{-3}\ \text{min}^{-1}$$

Applying first order reaction equation, $t = \frac{2.303}{k}\log_{10}\frac{a}{(a-x)}$;

If $a = 100,\ x = 90$ or $(a-x) = 10$

So, $t = \frac{2.303}{5.77\times10^{-3}}.\log_{10}10 = \frac{2.303}{5.77\times10^{-3}} = 399$ min

67. Match list-I with list-II and choose the correct answer from the code given below:

List-I	**List-II**
(a) Strongest reductant	i. Aurum
(b) Half filled d-orbital	ii. cerium
(c) Coinage metal	iii. chromium
(d) Lanthanide	iv. iodide ion

Code is -

	(a)	(b)	(c)	(d)
(A)	iv	iii	i	ii
(B)	i	ii	iii	iv
(C)	iv	i	iii	ii
(D)	ii	iii	i	iv

68. Atomic radius decreases in a period, but after halogens, the atomic radius suddenly increases. Thus, inert gases has almost highest radius in a period. The explanation for such an increase is-
(A) Inert gases has most stable configuration
(B) Inert gases do not take part in bonding
(C) Vander Waal's radius is reported in case of inert gases
(D) None of these

69. Identify the correct statement from the given alternatives:
(A) Intra molecular hydrogen bonding is not found to occur in 2 hydroxy benzaldehyde
(B) The boiling poing of hydrogen iodide (HI) is more than hydrogen fluoride (HF)
(C) The dipole moment of CH_3Cl is not equal to zero
(D) CH_3F has a larger dipole moment that CH_3Cl

70. In which of the following species the angle arround the central atom is exactly equal to 109°28' :
(A) SF_4 (B) NH_3 (C) NH_4^+ (D) None of the above

71. Boron has an extremely high melting point because of :
(A) The strong vander Waals forces between its atoms
(B) The strong binding forces in the covalent polymer
(C) Its ionic crystal structure
(D) Allotropy

72. Which element-element bond has the highest bond dissociation energy ?
(A) C–C (B) Si–Si (C) Ge–Ge (D) Sn–Sn

73. Which one of the following is the strongest oxidising agent -
(A) HClO (B) $HClO_2$ (C) $HClO_3$ (D) $HClO_4$

74. The decreasing tendency to exist in puckered 8-membered ring structure is -
(A) S > Se > Te > Po (B) Se > S > Te > Po (C) S > Te > Se > Po (D) Te > Se > S > Po

75. The lanthanide contraction is responsible for the fact that -
(A) Zr and Y have about the same radius
(B) Zr and Nb have similar oxidation state
(C) Zr and Hf have about the same radius
(D) Zr and Zn have the same oxidation state

76. Which one of the following is expected to exhibit optical isomerism [en = ethylenediamine] –
(A) Trans-$[Co(en)_2Cl_2]$ (B)Cis-$[Pt(NH_3)_2Cl_2]$ (C) Cis-$[Co(en)_2Cl_2]$ (D)Trans-$Pt(NH_3)_2Cl_2]$

77. Aqueous solution of Ni^{2+} contains $[Ni(H_2O)_6]^{2+}$ and its magnetic moment is 2.83 BM. When ammonia is added in it, comment on the magnetic moment of solution –
(A) It will remain same
(B) It increases from 2.83 BM
(C) It decreases from 2.83 BM
(D) It cannot be predicated theoretically

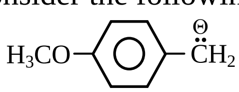
78. When a mixture of solid $NaCl$ solid $K_2Cr_2O_7$ is heated with conc. H_2SO_4 orange red vapours are obtained of the compound
(a) Chromous chloride (b) Chromyl chloride (c) Chromic chloride (d) Chromic sulphate

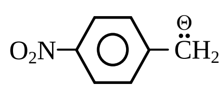
79. Group reagent for the precipitation of group II basic radicals for the qualitative analysis table is
(a) Dil. $HCl + H_2S$
(b) NH_4Cl (solid) + NH_4OH solution + H_2S
(c) $(NH_4)_2CO_3$ solution
(d) None of these

80. The IUPAC name of -
$CH_3–CH(CH_3)–C(=O)–CH(CH_3)–OH$
(A) 4 - methyl -2-hydroxy-3- pentanone
(B) 2-hydroxy -4- methyl-3- pentanone
(C) both are correct
(D) None

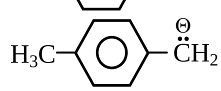
81. Metamerism is shown by -
(A) Diethyl ether and n-propyl methyl ether
(B) Ethyl alcohol and diethyl ether
(C) Acetone and propionaldehyde
(D) Propionic acid and acetic acid

82. Boiling point of a liquid can be increased by-
(A) Increasing the pressure
(B) Decreasing the pressure
(C) Purifying the liquid
(D) Adding water to it

83. Consider the following carbanions :
(I) 

(II) 

(III) 

(IV) 

Correct decreasing order of stability is -
(A) II > III > IV > I (B) III > IV > I > II (C) IV > I > II > III (D) I > II > III > IV

84. Which of the following correctly shows the order of decreasing basicity -
(A) Aniline > o-nitroaniline > p-nitroaniline > m-nitroaniline
(B) Aniline > p-nitroaniline > o-nitroaniline > m-nitroaniline
(C) Aniline > m-nitroaniline > p-nitroaniline > o-nitroaniline
(D) o-Nitroaniline > p-nitroaniline > aniline > m-nitroaniline

85. Unbranched alkenes on ozonolysis give -
(A) Only ketone
(B) Only aldehydes
(C) Aldehydes & ketone
(D) All of the above

SECTION – B (Attempt any 10 questions)

86. $CH_3-\underset{\underset{CH_3}{|}}{C}H-CH=CH_2+HBr$ (product) which is predominate ; X is -

(A) $CH_3-\underset{\underset{CH_3}{|}}{C}H-CH_2CH_2Br$

(B) $CH_3-\overset{\overset{Br}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH_2-CH_3$

(C) $CH_3-\underset{\underset{CH_3}{|}}{C}H-\underset{\underset{Br}{|}}{C}H-CH_3$

(D) None is correct

87. Which of the following, on being heated with alcoholic KOH, will respond positively to the carbylamine test

(A) Chloroform and silver powder
(B) Chloroform and aniline
(C) Methyl chloride and aniline
(D) Methyl cyanide and aniline

88. Phenol reacts with bromine in CS_2 at a low temperature, the product is -

(A) m-Bromophenol
(B) p-Bromophenol
(C) o-and p-Bromophenol
(D) 2, 4, 6-Tribromophenol

89. Aldol condensation between the following compounds followed by dehydration gives methyl vinyl ketone-

(A) HCHO and CH_3COCH_3
(B) HCHO and CH_3CHO
(C) Two molecules of CH_3CHO
(D) Two molecules of CH_3COCH_3

90. K_a will have the highest value for which of the following acids. -

(A) Fluoroacetic acid
(B) Trichloroacetic acid
(C) Trimethyl acetic acid
(D) Lactic acid

91. A secondary amine is a compound which possesses–

(A) two–NH_2 groups
(B) one–NH_2 group attached to a secondary carbon
(C) one–NH–group bonded to two alkyl or aryl groups
(D) one–NH_2 group attached to the second carbon of the main carbon chain

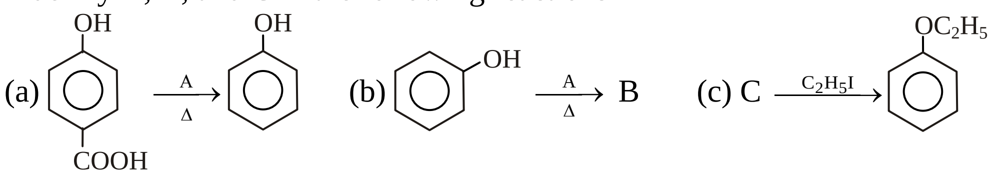
92. A amino acid without asymmetrical carbon atom is-

(A) Glycine
(B) Threonine
(C) Proline
(D) Histidine

93. $A \xrightarrow{H_2O} B \xrightarrow{Cl_2} C \xrightarrow[Ether]{Na} C_2H_6$ in the above reaction sequence A and B respectively are -

(A) CaC_2 , C_2H_2
(B) Al_4C_3 , C_2H_6
(C) Al_4C_3 , CH_4
(D) CaC_2, CH_4

94. Indenify A, B, and C in the following reactions–



(A) Sodalime, benzene, potassium phenoxide
(B) Zn, benzene, sodium ethoxide
(C) Zn, cyclohexanone, sodium ethoxide
(D) None of the above

95. Catalyst $SnCl_2 / HCl$ is used in

(a) Stephen's reduction (b) Cannizzaro reaction
(c) Clemmensen's reduction (d) Rosenmund's reduction

96. Benzene is obtained by all the following reactions except -

(A) Decarboxylation of sodium benzoate (B) Deoxygenation of phenol
(C) Reduction of diazonium chloride (D) Catalytic hydrogenation of acetylene

97. The type of hybrid orbitals used by chlorine atom in ClO^-, ClO_2^-, ClO_3^- and ClO_4^- is/are:

(A) sp, sp^2, sp^3 and sp^3d (B) sp and sp^3 (C) Only sp^3 (D) Only sp

98. If electron, hydrogen, helium and neon nuclei are all moving with the velocity of light, then the wavelengths associated with these particles are in the order

(a) Electron > hydrogen > helium > neon (b) Electron > helium > hydrogen > neon
(c) Electron < hydrogen < helium < neon (d) Neon < hydrogen < helium < electron

99. An isolated system is that system in which

(a) There is no exchange of energy with the surroundings
(b) There is exchange of mass and energy with the surroundings
(c) There is no exchange of mass and energy with the surroundings
(d) There is exchange of mass with the surroundings

100. Electrolysis of molten anhydrous calcium chloride produces

(a) Calcium (b) Phorphorus (c) Sulphur (d) Sodium