



15. Ans: Magnetite  
Sol: Magnetite is  $\text{Fe}_3\text{O}_4$
16. Ans: Bi  
Sol:  $\text{Bi}_2\text{O}_3$  is predominantly basic
17. Ans: zone refining  
Sol: High purity Ge, Si, B, Ga, In etc are prepared by zone refining
18. Ans:  $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$   
Sol: Plaster of Paris is  $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$
19. Ans:  $\text{H}_3\text{BO}_3$  and  $\text{H}_2$   
Sol:  $\text{B}_2\text{H}_6(\text{g}) + 6\text{H}_2\text{O}(\text{l}) \rightarrow 2\text{B}(\text{OH})_3(\text{aq}) + 6\text{H}_2(\text{g})$
20. Ans: 7.01  
Sol:  $\text{pH} = \frac{1}{2} [\text{pK}_w + \text{pK}_a - \text{pK}_b]$   
 $= \frac{1}{2} [14 + 4.77 - 4.75]$   
 $= 7.01$
21. Ans: 0.5  
Sol:  $K_c = \frac{1 \times 10^{-4} \times 4.5 \times 10^{-4}}{(3 \times 10^{-4})^2}$   
 $= 0.5$
22. Ans: lead  
Sol: Lead does not exhibit catenation
23. Ans:  $2\text{HI}(\text{g}) \rightleftharpoons \text{H}_2(\text{g}) + \text{I}_2(\text{g})$   
Sol: Pressure has no effect on the equilibrium, when  $\Delta n_g = 0$
24. Ans: ethyne  
Sol: Hydrogen atoms attached to sp hybridised carbon atoms are acidic
25. Ans: Staggered > gauche > eclipsed  
Sol: Staggered conformation of ethane is more stable than other conformations.
26. Ans: 3-ethyl-2-methylheptane  
Sol:  $\begin{array}{cccccccc} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ \text{H}_3\text{C} & -\text{CH}_2- & \text{CH}- & \text{CH}_2- & \text{CH}- & \text{CH}_2- & \text{CH}_3 \\ & & | & & | & & \\ & & \text{CH}_2\text{CH}_3 & & \text{CH}_3 & & \end{array}$
27. Ans: differential extraction  
Sol: When an organic compound is present in an aqueous medium, it is separated by shaking it with an organic solvent in which it is more soluble. It is known as differential extraction
28. Ans:  $\text{CH}_2=\text{C}=\text{CH}_2$   
Sol:  $\begin{array}{ccc} \text{CH}_2 = & \text{C} = & \text{CH}_2 \\ \text{sp}^2 & \text{sp} & \text{sp}^2 \end{array}$
29. Ans: Both Li and Mg form solid hydrogen carbonates  
Sol: Bicarbonates of Li and Mg do not exist in solid state
30. Ans: Zantac  
Sol: Zantac (or ranitidine) is an antihistamine
31. Ans: Glycerol  
Sol: Laundry soaps contain fillers like sodium silicate, sodium rosinatate, borax and sodium carbonate
32. Ans: 5.6  
Sol: pH of rain water is 5.6
33. Ans:  $\text{C}_1 - \text{C}_4$   $\alpha$ -linkage  
Sol:  $\text{C}_1 - \text{C}_4$   $\alpha$ -linkage is present in amylose
34. Ans:  $\text{B}_{12}$   
Sol: Anaemia is caused by the deficiency of vitamin  $\text{B}_{12}$
35. Ans: retention  
Sol:  $\begin{array}{ccc} \text{CH}_3 & & \text{CH}_3 \\ | & & | \\ \text{H}-\text{C}-\text{CH}_2\text{OH} & \xrightarrow[\Delta]{\text{HCl}} & \text{H}-\text{C}-\text{CH}_2\text{Cl} \\ | & & | \\ \text{C}_2\text{H}_5 & & \text{C}_2\text{H}_5 \\ (-) & & (+) \end{array}$
36. Ans:  
Sol: All the given options are neutral amino acids
37. Ans: Dimethylamine  
Sol: Dimethylamine is a  $2^\circ$  amine
38. Ans:  $-\text{NO}_2$   
Sol:  $-\text{NO}_2$  group is meta directing and deactivating group.

39. Ans: free radical substitution  
Sol: Photochemical halogenation of alkane is free radical substitution reaction
40. Ans: Freon  
Sol: Freon is used as refrigerant
41. Ans:  $\text{CF}_3\text{COOH} > \text{CHCl}_2\text{COOH} > \text{HCOOH} > \text{C}_6\text{H}_5\text{CH}_2\text{COOH} > \text{CH}_3\text{COOH}$   
Sol:  $\text{CF}_3\text{COOH}$  is the strongest acid and  $\text{CH}_3\text{COOH}$  is the weakest among the given acids
42. Ans: Lucas test  
Sol: Lucas reagent is used to distinguish 1°, 2° and 3° alcohols
43. Ans:  $\text{PdCl}_2$   
Sol:  $\text{CH}_2=\text{CH}_2 + \text{H}_2\text{O} + \text{PdCl}_2 \xrightarrow[\text{air (O}_2\text{)}]{\text{CuCl}_2} \text{CH}_3-\text{CHO} + \text{Pd} + 2 \text{HCl}$
44. Ans: tert-butyl chloride  
Sol: Boiling points of alkyl halides increase with increase in molecular weight. Among isomeric alkyl halides, boiling point decreases with branching
45. Ans:  $\text{LiAlH}_4$   
Sol:  $\text{LiAlH}_4$  will reduce aldehydes to primary alcohols
46. Ans: Reduction of isonitriles  
Sol: Reduction of isocyanides (isonitriles) give 2° amines
47. Ans: 28  
Sol: % of N  

$$= \frac{1.4 \times M \times 2 (V - V_1 / 2)}{m}$$

$$= \frac{1.4 \times 0.5 \times 2 (50 - 80 / 2)}{0.5}$$

$$= 28\%$$
48. Ans: benzenamine  
Sol: Benzenamine (aniline) is the weakest base due to delocalisation of the lone pair of electrons on nitrogen with the benzene ring
49. Ans:  $\text{Rate} = k[\text{A}]^0 [\text{B}]^2$   
Sol: From (1) and (2), [A] has no effect on rate. From (1) and (3), on doubling the [B] rate becomes 4 times  
 $\therefore \text{Rate} = k[\text{A}]^0 [\text{B}]^2$
50. Ans: 25  
Sol: For a 1<sup>st</sup> order reaction,  

$$\text{A}_0 \xrightarrow{3t_{1/2}} \frac{\text{A}_0}{8}$$
 $t_{1/2} = 25 \text{ minutes}$
51. Ans: 166  
Sol:  $\text{Slope} = \frac{-E_a}{R} = -2 \times 10^4$   
 $E_a = 2 \times 10^4 \times 8.3 \times 10^{-3} \text{ kJ mol}^{-1}$   
 $= 166$
52. Ans: Gluconic acid  
Sol: Glucose on oxidation with bromine water gives gluconic acid
53. Ans: independent of the pressure of the gas  
Sol:  $\log \frac{x}{m} = \log K + \frac{1}{n} \log P$   
When  $\frac{1}{n} = 0$   
 $\frac{x}{m}$  remains as a constant
54. Ans: gel  
Sol: Cheese is a liquid dispersed in solid phase
55. Ans: 100  
Sol:  $\Delta T_b = K_b \times \frac{W_2}{M_2} \times \frac{1000}{W_1}$   
 $M_2 = \frac{2.5 \times 1.5 \times 1000}{0.75 \times 50}$   
 $= 100 \text{ g mol}^{-1}$
56. Ans: Carbon disulphide – Acetone  
Sol: Carbon disulphide – Acetone shows positive deviation
57. Ans: 0.555  
Sol:  $p_A = x_A \cdot K_H$   
 $x_A = \frac{1}{10^5} = 10^{-5}$   
 $10^{-5}$  moles of gas in one mole of water

No. of unites moles in 1 L water  
 $= 10^{-2} \times 55.5 = 0.555$

$\Delta G = \Delta H - T\Delta S$   
 Spontaneous at low temperatures

58. Ans: 1148

Sol:  $W = 2.303 nRT \log \frac{V_2}{V_1}$   
 $= 2.303 \times 0.2 \times 8.314 \times 300 \log \frac{25}{2.5}$   
 $= 1148 \text{ J}$

59. Ans: cis-platin

Sol: cis platin inhibit the growth of tumours

60. Ans: tetrammineaquachloridocobalt(III) chloride

Sol:  $\text{Co}[(\text{NH}_3)_4(\text{H}_2\text{O})\text{Cl}]\text{Cl}_2$  is named is tetrammineaquachloridocobalt(III) chloride

61. Ans:  $\text{I}^- < \text{Cl}^- < \text{F}^- < \text{H}_2\text{O} < \text{CN}^-$

Sol: The correct order of ligands as per spectrochemical series is  $\text{I}^- < \text{Cl}^- < \text{F}^- < \text{H}_2\text{O} < \text{CN}^-$

62. Ans:  $\text{Mn}^{2+}$

Sol: There are five unpaired electrons in  $\text{Mn}^{2+}$

63. Ans: Sc

Sol: Scandium ( $Z = 23$ ) does not exhibit variable oxidation state

64. Ans: Peroxy disulphate

Sol: Manganese (II) salt is oxidised to  $\text{MnO}_4^-$  in aqueous solution by peroxy disulphate

65. Ans: Addition of 5 mL of 1 M HCl

Sol: When the  $[\text{H}^+]$  increases, then pH decreases. Addition of an acid of higher concentration increases the  $[\text{H}^+]$

66. Ans:  $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{SO}_3(\text{g})$

Sol:  $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{SO}_3(\text{g})$   
 As there is a decrease in the number of moles of products, there is decrease in Entropy

67. Ans:  $\Delta G \quad \Delta H \quad \Delta S$   
 $- \quad - \quad -$

Sol:  $\Delta G = -ve$   
 $\Delta H = -ve$   
 $\Delta S = -ve$

68. Ans: 180

Sol: For a zero order reaction,  $t_{1/2} \propto [\text{A}_0]$   
 $t_{1/2} = 4 \times 45$   
 $= 180 \text{ minutes}$

69. Ans: 2

Sol: Quantity of electricity  
 $= 3.86 \times 2500$   
 $= 9650 \text{ C}$   
 Wt. of Ca deposited by 96500 C = 20 g  
 $\therefore$  Wt. deposited by 9650 C = 2 g

70. Ans: -0.79

Sol:  $\text{Zn}^{2+} + 2\text{e}^- \rightarrow \text{Zn}$   
 $E_{\text{el}} = E_{\text{el}}^\circ + \frac{0.06}{2} \log [\text{Zn}^{2+}]$   
 $= -0.76 + 0.03 \log 10^{-1}$   
 $= -0.79 \text{ V}$

71. Ans: Cell constant - m

Sol: Unit of cell constant  $\left(\frac{\ell}{A}\right)$  is  $\text{m}^{-1}$

72. Ans: Moist paste of  $\text{NH}_4\text{Cl}$  and  $\text{ZnCl}_2$

Sol: The electrolyte used in dry cell (Leclanche cell) is a moist paste of  $\text{NH}_4\text{Cl}$  and  $\text{ZnCl}_2$

73. Ans:  $[\text{M}^{-1} \text{L}^3 \text{T}^{-2}]$

Sol:  $[\text{G}] = (\text{N m}^2 \text{kg}^{-2})$   
 $= [\text{M}^{-1} \text{L}^3 \text{T}^{-2}]$

74. Ans: Parabola

Sol:  $S = ut + \frac{1}{2}at^2$   
 $\Rightarrow$  Parabola

75. Ans: Velocity

Sol:  $\tan\theta = \frac{S}{t} = v$

76. Ans:  $45^\circ$

Sol:  $R = \frac{u^2}{g} \sin 2\theta$   
 $\Rightarrow$  When  $\theta = 45^\circ$ ,  
 R is maximum

77. Ans: 5

$$\text{Sol: } \bar{a} = \frac{d\bar{v}}{dt} = 5\hat{j}$$
$$\Rightarrow |\bar{a}| = 5 \text{ m s}^{-2}$$

78. Ans: Co-efficient of kinetic friction is less than the coefficient of static friction.

$$\text{Sol: } \mu_k < \mu_s$$

79. Ans: 3.0

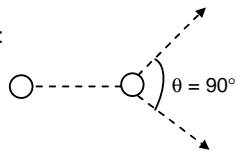
$$\text{Sol: } J = \Delta p$$
$$= m(2u)$$
$$= 2mu$$
$$= 2 \times 0.15 \times 10 = 3 \text{ N s}$$

80. Ans:  $K_f - K_i$

$$\text{Sol: } W = \Delta KE$$
$$= K_f - K_i$$

81. Ans: At right angle to each other

Sol:



82. Ans: Angular momentum

$$\text{Sol: } \bar{L} = \bar{r} \times \bar{p}$$
$$\Rightarrow |\bar{L}| = mvr \text{ is constant}$$

83. Ans:  $\left(1, \frac{4}{3}\right)$

$$\text{Sol: } X_{CM} = \frac{3}{3} = 1 \text{ m}$$
$$Y_{CM} = \frac{4}{3} = \frac{4}{3} \text{ m}$$
$$\Rightarrow \left(1, \frac{4}{3}\right)$$

84. Ans: Areas

$$\text{Sol: } L = 2m \frac{dA}{dt}$$

85. Ans:  $\frac{R-2}{R-1}$

$$\text{Sol: } g_h = g \left[1 - \frac{2}{R}\right]$$
$$g_d = g \left[1 - \frac{1}{R}\right]$$

$$\Rightarrow \frac{g_d}{g_h} = \frac{(R-2)}{(R-1)}$$

86. Ans: Young's modulus of rubber is more than that of steel

Sol: Young's modulus of steel is more than that of rubber

87. Ans:  $5 \times 10^6 \text{ N}$

$$\text{Sol: } F = A \Delta p$$
$$= 0.5 \times 0.5 \times \rho gh$$
$$= 0.5 \times 0.5 \times 10^3 \times 10 \times 2000$$
$$= 5 \times 10^6 \text{ N}$$

88. Ans: 2 cm

$$\text{Sol: } h = \frac{2T \cos \theta}{r \rho g}$$
$$= \frac{2 \times 0.07 \times 1}{7 \times 10^{-4} \times 1000 \times 10}$$
$$= 0.02 \text{ m} = 2 \text{ cm}$$

89. Ans: 50 cc

$$\text{Sol: } V_0 \gamma_{\text{flask}} \Delta T = V_m \cdot \gamma_{\text{Hg}} \Delta T$$
$$\Rightarrow V_0 = 20 V_m$$
$$\Rightarrow V_m = \frac{V_0}{20} = \frac{1000}{20}$$
$$= 50 \text{ cc}$$

90. Ans:  $\frac{5}{2} RT$

$$\text{Sol: } TE = f \frac{1}{2} RT$$
$$= \frac{5}{2} RT$$

91. Ans: Cyclic process -  $\Delta U = 0$

92. Ans: 1 m

$$\text{Sol: } T = 2\pi \sqrt{\frac{\ell}{g}}$$
$$T = 2 \text{ s} \Rightarrow \ell = 1 \text{ m}$$

93. Ans:  $\frac{3\pi}{4}$

$$\text{Sol: } y_1 = 5 \sin 100t$$
$$y_2 = 4 \cos \left(100t + \frac{\pi}{4}\right)$$
$$= 4 \sin \left(100t + \frac{3\pi}{4}\right)$$
$$\Rightarrow \Delta \phi = \frac{3\pi}{4} \text{ rad}$$

94. Ans:  $\frac{\pi}{6}$

Sol:  $\omega = 12$   
 $\Rightarrow T = \frac{2\pi}{\omega} = \frac{2\pi}{12}$   
 $= \frac{\pi}{6} \text{ s}$

95. Ans:  $f\left(1 + \frac{v_s}{v}\right)$

Sol:  $f_{\text{app.}} = f \frac{v}{(v - v_s)}$   
 $f \frac{1}{\left[1 - \frac{v_s}{v}\right]}$   
 $= f \left[1 - \frac{v_s}{v}\right]^{-1} = f \left[1 + \frac{v_s}{v}\right]$

96. Ans: Directly proportional to E

Sol:  $\bar{P} \propto \bar{E}$

97. Ans:  $\frac{1}{r}$

Sol:  $E = \frac{2\lambda}{4\pi\epsilon_0 r}$   
 $\Rightarrow E \propto \frac{1}{r}$

98. Ans: Halved

Sol:  $C = \frac{\epsilon_0 A}{d}$   
 $C' = \frac{\epsilon_0 A}{2d} = \frac{C}{2}$

99. Ans: V depends on I linearly

Sol:  $\frac{V}{I} = \text{constant}$   
 $\Rightarrow$  Ohm's law is valid

100. Ans: 50 cm

Sol: Error is minimized if balancing point is near centre (i.e. at 50 cm point)

101. Ans: 4.7 k $\Omega$ , 20%

Sol:  $4.7 \times 10^3 \pm 20\%$   
 $\Rightarrow 4.7 \text{ k}\Omega, 20\%$

102. Ans: Ampere's Circuital law.

Sol: Biot-Savart's law is also known as Ampere's law.

103. Ans:  $\chi_d < \chi_p < \chi_f$

Sol:  $\mu_r = \chi + 1$   
 $\chi_d < \chi_p < \chi_f$

104. Ans: C is doubled and V remains unchanged.

Sol:  $\frac{V}{I} = \frac{BNA}{C}$   
 $\Rightarrow N \Rightarrow 2N, \frac{\theta}{I} = \text{doubles}$   
 $\frac{\theta}{IR} = \frac{BNA}{CR}$  remains unchanged

105. Ans: 0.5

Sol:  $L = \frac{E}{\left(\frac{di}{dt}\right)} = \frac{5}{10}$   
 $= 0.05 \text{ H}$

106. Ans: 1 A

Sol:  $\epsilon = \frac{d\phi}{dt} = 8t + 2$   
 At  $t = 1 \text{ s}, \epsilon = 8 + 2 = 10 \text{ V}$   
 $\therefore i = \frac{\epsilon}{R} = \frac{10}{10} = 1 \text{ A}$

107. Ans:  $VI \cos \phi$

Sol: Considering the instantaneous values as the measured values, which will be RMS values, average power =  $VI \cos \phi$

108. Ans:  $3.6 \hat{j}$

Sol:  $E = Bc$   
 $= 1.28 \times 10^{-8} \times 3 \times 10^8$   
 $= 3.6 \text{ V m}^{-1}$   
 $\vec{E} \times \vec{B}$  in the direction of  $\vec{c}$   
 $\Rightarrow \vec{E} = 3.6 \hat{j}$

109. Ans: 37.5 cm

Sol:  $u = -25 \text{ cm}$   
 $v = -75 \text{ cm}$   
 $f = ?$   
 $-\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$   
 $\frac{1}{25} - \frac{1}{75} = \frac{1}{f}$   
 $\Rightarrow f = +37.5 \text{ cm}$

110. Ans:  $\frac{\lambda}{d}$

Sol:  $\beta = \frac{\lambda D}{d}$

$$\theta = \frac{\beta}{D} = \frac{\lambda}{d}$$

111. Ans:  $\tan^{-1}\left(\frac{4}{3}\right)$

Sol:  $\tan\phi = \frac{4}{3}$

$$\Rightarrow \phi = \tan^{-1}\left(\frac{4}{3}\right)$$

112. Ans: 0.153 nm

Sol:  $\lambda = \frac{12.27}{\sqrt{V}} \text{ \AA}$

$$= \frac{12.27}{8} \text{ \AA}$$

$$= 1.533 \text{ \AA}$$
$$= 0.1533 \text{ nm}$$

113. Ans:  $\frac{1}{16}$

Sol:  $f = \left(\frac{1}{2}\right)^t$

$$= \left(\frac{1}{2}\right)^4 = \frac{1}{16}$$

114. Ans: 26.7 MeV

Sol: Proton-proton cycle

115. Ans: Photodiode

116. Ans: AND

117. Ans: 50

Sol:  $\beta = \frac{\Delta I_C}{\Delta I_B} = \frac{10^{-3}}{20 \times 10^{-6}}$   
 $= 50$

118. Ans: Telephony

119. Ans: 2010 kHz, 1990 kHz

Sol:  $f_c = 2000 \text{ kHz}$

$$f_s = 10 \text{ kHz}$$

$$f_{sb_1} = 2000 + 10 = 2010 \text{ kHz}$$

$$f_{sb_2} = 2000 - 10 = 1990 \text{ kHz}$$

120. Ans: (D) 54 – 72 MHz

(E) 174 – 216 MHz

Sol: VHF Low band frequency ranges

54 – 216 MHz and high band ranges

175 – 216 MHz