76. The electrons identified by quantum numbers :

(I) $n = 4, l = 1$ (II) $n = 4, l = 0$

(III) $n = 3, l = 2$ (IV) $n = 2, l = 1$

can be placed in order of increasing energy from the lowest to highest as :

(a) (IV) < (II) < (III) < (I)

(b) (II) < (IV) < (I) < (III)

(c) (I) < (III) < (II) < (IV)

(d) (III) < (I) < (IV) < (II)

77. Ground state electronic configuration of nitrogen atom can be represented as :

(a) ⏫ ⏫ ⏫ ⏫ ⏫ | ↿ | ↿ | ↿ |

(b) ⏫ ⏫ | ↿ | ⇂ | ↿ |

(c) ⏫ ⏫ | ↿ | ⇂ | ⇂ |

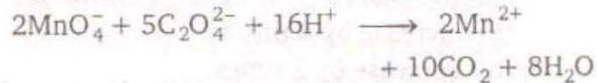(d) ⏫ ⏫ | ⇂ | ↿ | ⇂ |

78. The first emission line in the electronic spectrum of hydrogen in the balmer series appears at cm^{-1} :

(a) $\dfrac{9R}{400}$ cm^{-1}

(b) $\dfrac{7R}{144}$ cm^{-1}

(c) $\dfrac{3R}{4}$ cm^{-1}

(d) $\dfrac{5R}{36}$ cm^{-1}

79. $KMnO_4$ reacts with oxalic acid according to the equation

$$2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \longrightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$$

Here, 20 mL of 0.1 M $KMnO_4$ is equivalent to :

(a) 20 mL of 0.5 M $H_2C_2O_4$

(b) 50 mL of 0.1 M $H_2C_2O_4$

(c) 50 mL of 0.01 M $H_2C_2O_4$

(d) 20 mL of 0.1 M $H_2C_2O_4$

80. Half life of a sample is 160 days. After 800 days, 1 g of the sample shall be reduced to :
(a) $\frac{1}{2}$ g
(b) $\frac{1}{5}$ g
(c) $\frac{1}{4}$ g
(d) $\frac{1}{32}$ g

81. Radio-carbon dating was discovered by :
(a) G.N. Lewis
(b) J. Williard Gibbs
(c) W.F. Libby
(d) W. Nernst

82. An aqueous solution of 6.3 g oxalic acid dihydrate is made up to 250 mL. The volume of 0.1 N sodium hydroxide required to completely neutralise 10 mL of this solution is :
(a) 40 mL
(b) 20 mL
(c) 10 mL
(d) 4 mL

83. How will increase of pressure affect the equation?
$$C(s) + H_2O(g) \rightleftharpoons CO(g) + H_2(g)$$
(a) Shift in the forward direction
(b) Shift in the reverse direction
(c) Increase in the yield of hydrogen
(d) No effect

84. For which of the following reactions, $K_P = K_C$?
(a) $N_2 + 3H_2 \rightleftharpoons 2NH_3$
(b) $N_2 + O_2 \rightleftharpoons 2NO$
(c) $PCl_5 \rightleftharpoons PCl_3 + Cl_2$
(d) $2SO_3 \rightleftharpoons 2SO_2 + O_2$

85. Which of the following salts is most soluble?
(a) Bi_2S_3 ($K_{sp} = 1 \times 10^{-17}$)
(b) MnS ($K_{sp} = 7 \times 10^{-16}$)
(c) CuS ($K_{sp} = 8 \times 10^{-37}$)
(d) Ag_2S ($K_{sp} = 6 \times 10^{-51}$)

86. Ostwald dilution law is applicable to :
(a) strong electrolytes only
(b) weak electrolytes only
(c) non-electrolytes only
(d) strong as well as weak electrolytes

87. In the reaction $2A + B \longrightarrow A_2B$, if the concentration of A is doubled and that of B is halved, then the rate of reaction will :
(a) increase by 4 times
(b) decrease by 2 times
(c) increase by 2 times
(d) remains the same

88. The Arrhenius equation expressing the effect of temperature on the rate constant of a reaction is :

(a) $k = e^{-E/RT}$
(b) ...
(c) $k = \frac{A \cdot E}{RT}$
(d) $k = A \cdot e^{-Ea/RT}$

89. If the half-time for a particular reaction is found to be constant and independent of the initial concentration of the reactants, then the reaction is of :
(a) first order
(b) zero order
(c) second order
(d) none of these

90. Normality of 2 M H_2SO_4 is :
(a) 2 N
(b) 4 N
(c) $\frac{N}{2}$
(d) $\frac{N}{4}$

91. Which of the following is a non-colligative property?
(a) Elevation in boiling point
(b) Osmotic pressure
(c) Optical activity
(d) Depression in freezing point

92. The freezing point of equimolal aqueous solution will be highest for :
(a) $C_6H_5NH_3Cl$
(b) $La(NO_3)_3$
(c) glucose
(d) $Ca(NO_3)_2$

93. The van't Hoff factor for 0.1 M $Ba(NO_3)_2$ solution is 2.74. The degree of dissociation is :
(a) 91.3%
(b) 87%
(c) 100%
(d) 74%

94. The enthalpy of vaporisation of liquid water using the data :
$$H_2(g) + \tfrac{1}{2}O_2(g) \longrightarrow H_2O(l);$$
$$\Delta H = -285.77 \text{ kJ/mol}$$
$$H_2(g) + \tfrac{1}{2}O_2(g) \longrightarrow H_2O(g);$$
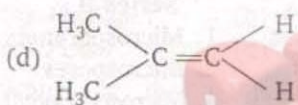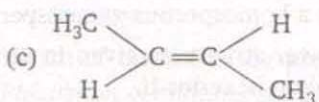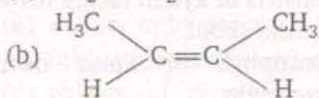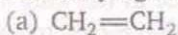$$\Delta H = -241.84 \text{ kJ/mol}$$
is :
(a) +43.93 kJ/mol
(b) −43.93 kJ/mol
(c) 527.61 kJ/mol
(d) −527.61 kJ/mol

95. The enthalpy charge for the transition of liquid water to steam is 40.8 kJ mol^{-1} at 373 K. Calculate the entropy of vaporisation of water.
(a) 109.4 JK^{-1} mol^{-1}
(b) −109.4 JK^{-1} mol^{-1}
(c) 218.8 JK^{-1} mol^{-1}
(d) −218.8 JK^{-1} mol^{-1}

96. The occurrence of the reaction is impossible if :
    (a) ΔH is +ve; ΔS is also +ve
    (b) ΔH is –ve; ΔS is also –ve
    (c) ΔH is –ve; ΔS is +ve
    (d) ΔH is +ve; ΔS is –ve

97. The bond energy of an O—H bond is 109 kcal/mol. When a mole of water is formed, then :
    (a) 109 kcals is released
    (b) 218 kcals is absorbed
    (c) 109 kcals is absorbed
    (d) 218 kcals is released

98. Of the following reaction, only one is a redox reaction. Identify this reaction.
    (a) $Ca(OH)_2 + 2HCl \longrightarrow CaCl_2 + 2H_2O$
    (b) $2S_2O_7^{2-} + 2H_2O \longrightarrow 2SO_4^{2-} + 4H^+$
    (c) $BaCl_2 + MgSO_4 \longrightarrow BaSO_4 + MgCl_2$
    (d) $Cu_2S + 2FeO \longrightarrow 2Cu + 2Fe + SO_2$

99. Oxidation number of nitrogen is highest in :
    (a) N_3H
    (b) N_2O_4
    (c) NH_2OH
    (d) NH_3

100. Correct order of first ionization potential among the following elements Be, B, C, N, O is :
    (a) $B < Be < C < O < N$
    (b) $B < Be < C < N < O$
    (c) $Be < B < C < N < O$
    (d) $Be < B < C < O < N$

101. The unit of equivalent conductivity is :
    (a) ohm cm
    (b) $ohm^{-1} cm^2 \ g \ equiv^{-1}$
    (c) $ohm \ cm^2 \ g \ equiv.$
    (d) $ohm^{-2} \ cm^{-2} \ g \ equiv.$

102. In which of the crystals of ionic compounds would you expect maximum distance between the centres of cations and anions?
    (a) LiF
    (b) CsF
    (c) CsI
    (d) LiI

103. 50 mL. of hydrogen diffuses through small hole from a vessel in 20 min time. Time taken for 40 mL of oxygen to diffuse out under similar conditions will be :
    (a) 12 min
    (b) 32 min
    (c) 8 min
    (d) 64 min

104. A gas will approach ideal behaviour at :
    (a) low temperature and high pressure
    (b) low temperature and low pressure
    (c) high temperature and low pressure
    (d) high temperature and high pressure

105. A colloidal system in which gas bubbles are dispersed in a liquid is known as ?
    (a) foam
    (b) aerosol
    (c) sol
    (d) emulsion

106. In which of the following, Tyndall effect is not observed?
    (a) Smoke
    (b) Emulsions
    (c) Sugar solution
    (d) Gold sol

107. Which is not correct regarding the adsorption of a gas on surface of a solid?
    (a) Enthalpy and entropy change is negative
    (b) Adsorption is more for some specific substance
    (c) On increasing temperature, adsorption increases progressively
    (d) It is a reversible reaction

108. The ionic radii of iso-electronic species N_3^-, O^{2-} and F^- are in the order :
    (a) 1.36, 1.40, 1.71
    (b) 1.36, 1.71, 1.40
    (c) 1.71, 1.40, 1.36
    (d) 1.71, 1.36, 1.40

109. Which of the following element is most electropositive?
    (a) Al
    (b) Mg
    (c) P
    (d) S

110. The compound in which carbon atom uses sp^3-hybrid orbitals for bond formation?
    (a) HCOOH
    (b) NH_2CONH_2
    (c) $(CH_3)_3COH$
    (d) CH_3CHO

111. The only molecule having dipole moment is :
    (a) 2,2-dimethylpropane
    (b) *trans*-2-pentene
    (c) *trans*-3-hexene
    (d) 2,2,3,3-tetramethylbutane

112. N_2 and O_2 are converted to N_2^+ and O_2^+ respectively. Which of the following is not correct?
    (a) In N_2^+, the N—N bond weakens
    (b) In O_2^+, O—O bond order increases
    (c) In O_2^+, paramagnetism decreases
    (d) N_2^+ becomes diamagnetic

113. The hybridisation of carbon atoms in C—C single bond of $HC \equiv C - CH = CH_2$ is :
    (a) $sp^3 \text{-} sp^3$
    (b) $sp^2 \text{-} sp^2$
    (c) $sp \text{-} sp^2$
    (d) $sp^3 \text{-} sp$

130. The correct IUPAC name of the following compound :

$$CH_3—CH_2—CH—C=C—CH—CH_2$$
$$\quad\quad\quad | \quad\quad | \quad | \quad |$$
$$\quad\quad\quad CH_3 \quad C_2H_5 \ C_2H_5$$
$$\quad\quad\quad\quad\quad\quad —CH_2—CH_2—CH_3$$
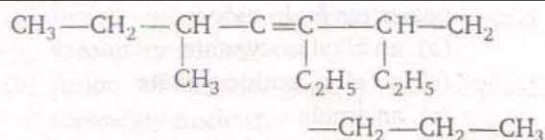
(a) 5,6-dimethyl-8-methyldec-6-ene
(b) 6-butyl-5-ethyl-3-methyloct-4-ene
(c) 5,6-diethyl-3-methyldec-4-ene
(d) 2,4,5-triethylnon-3-ene

131. The kind of delocalisation involving sigma bond orbitals is called :
(a) inductive effect
(b) hyper conjugation effect
(c) electromeric effect
(d) mesomeric effect

132. Which of the following compounds react with HBr obeying Markownikoff's rule?
(a) $CH_2=CH_2$

(b)
$$\begin{array}{cc} H_3C & CH_3 \\ & C=C \\ H & H \end{array}$$

(c)
$$\begin{array}{cc} H_3C & H \\ & C=C \\ H & CH_3 \end{array}$$

(d)
$$\begin{array}{cc} H_3C & H \\ & C=C \\ H_3C & H \end{array}$$

133. How many cyclic isomers of C_5H_{10} are possible ?
(a) Four   (b) Three
(c) Two   (d) Six

134. The (R) and (S) enantiomers of an optically active compound differ in :
(a) their reactivity
(b) their optical rotation of plane polarised light
(c) their melting point
(d) their solubility in achiral reagents

135. Which of the following organic compounds exhibit acidic character?
(a) $H_3C—C\equiv CH$ (b) $H_3C—C\equiv C—CH_3$
(c) $H_2C=CH_2$ (d) $H_3C—CH_3$
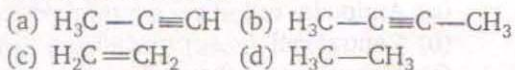
136. Methane is produced by the hydrolysis of :
(a) Al_4C_3 (b) CaC_2
(c) dry ice   (d) $n\text{-}C_3H_7MgBr$

137. In the reaction of phenol with chloroform and alkali followed by acidification, the electrophile attacking the ring is :
(a) $CHCl_3$ (b) $CHCl_2$
(c) $:CCl_2$ (d) $COCl_2$

138. Which of the following compounds can exist in optically active form?
(a) 1-butanol   (b) 2-butanol
(c) 3-pentanol   (d) 4-heptanol

139. Chloroform is slowly oxidised by air in the presence of light and air to form :
(a) formyl chloride
(b) trichloro methanol
(c) phosgene
(d) formaldehyde

140. Chlorination of toluene in the presence of light and heat followed by treatment with aqueous NaOH solution gives :
(a) o-cresol   (b) p-cresol
(c) benzoic acid   (d) 2,4-dihydroxytoluene

141. Formation of cyanohydrin from the reaction of acetone with HCN is called :
(a) electrophilic addition
(b) nucleophilic addition
(c) electrophilic substitution
(d) nucleophilic substitution

142. In the following reaction,

$$CH_3COCl \xrightarrow[Pd/H_2]{BaSO_4} X$$
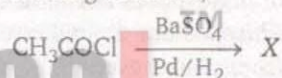
Identify X out of the following :
(a) acetaldehyde   (b) propionaldehyde
(c) acetone   (d) acetic anhydride

143. Reaction of t-butylbromide with sodium methoxide produces :
(a) isobutane
(b) isobutylene
(c) sodium-t-butoxide
(d) t-butylmethylether

144. The acid which does not contain —COOH group is :
(a) ethanoic acid   (b) picric acid
(c) lactic acid   (d) plamitic acid

145. The decreasing order of basic character of the three amines and ammonia is :
(a) $NH_3 > CH_3NH_2 > C_2H_5NH_2 > C_6H_5NH_2$
(b) $C_2H_5NH_2 > CH_3NH_2 > NH_3 > C_6H_5NH_2$
(c) $C_6H_5NH_2 > C_2H_5NH_2 > CH_3NH_2 > NH_3$
(d) $CH_3NH_2 > C_2H_5NH_2 > C_6H_5NH_2 > NH_3$

146. Aniline is treated with a mixture of sodium nitri... formed is :
(a) aniline diazonium hypophosphate
(b) benzene
(c) anilinium hypophosphite
(d) aniline diazonium hypophos-phite

147. Nitrosoamines (R_2N—N=O) are soluble in water. On heating them with conc. H_2SO_4, they give secondary amines. The reaction is called :
(a) Perkin's reaction
(b) Fries reaction
(c) Libermann nitroso reaction
(d) Etard reaction

148. The compound obtained by heating a mixture of ... ethanolic potassium hydroxide is :
(a) an alkyl isocyanide
(b) an alkyl isothiocyanate
(c) an amide
(d) an amide and nitro compound

149. Which of the following is not an amino-acid?
(a) Glycine   (b) Alanine
(c) Histidine   (d) Benzidine

150. Which of the following is a fat soluble vitamin?
(a) Vitamin A   (b) Riboflavin
(c) Pyridoxin   (d) Thiamine

Answer – Key

76.	a	77.	a	78.	d	79.	b	80.	d	81.	c	82.	a	83.	b	84.	b	85.	a
86.	b	87.	c	88.	d	89.	a	90.	b	91.	c	92.	c	93.	b	94.	a	95.	a
96.	d	97.	d	98.	d	99.	b	100.	a	101.	b	102.	c	103.	d	104.	c	105.	a
106.	c	107.	c	108.	c	109.	b	110.	c	111.	b	112.	d	113.	c	114.	c	115.	d
116.	d	117.	d	118.	d	119.	c	120.	c	121.	d	122.	c	123.	c	124.	a	125.	d
126.	b	127.	a	128.	c	129.	d	130.	c	131.	a	132.	d	133.	d	134.	b	135.	a
136.	a	137.	c	138.	b	139.	c	140.	c	141.	b	142.	a	143.	b	144.	b	145.	b
146.	b	147.	c	148.	a	149.	d	150.	a												