76. Which of the following could act as apropellant for rockets?

    (a) Liquid oxygen + liquid argon   (b) Liquid hydrogen + liquid oxygen

    (c) Liquid nitrogen + liquid oxygen   (d) Liquid hydrogen + liquid nitrogen

77. The reaction of chloroform with alcoholic KOH and p-toluidine forms

    (a) $H_3C-\langle O \rangle-N_2Cl$ (b) $H_3C-\langle O \rangle-NHCHCl_2$ (c) $H_3C-\langle O \rangle-NC$ (d) $H_3C-\langle O \rangle-CN$

78. Nylon threads are made of

    (a) polyester polymer   (b) polyamide polymer   (c) polyethylene polymer   (d) polyvinyl polymer

79. The correct order of increasing basic nature for the bases NH_3, CH_3NH_2 and $(CH_3)_2NH$ is

    (a) $(CH_3)_2NH < NH_3 < CH_3NH_2$ (b) $NH_3 < CH_3NH_2 < (CH_3)_2NH$

    (c) $CH_3NH_2 < (CH_3)_2NH < NH_3$ (d) $CH_3NH_2 < NH_3 < (CH_3)_2NH$

80. Bottles containing C_6H_5I and $C_6H_5CH_2I$ lost their original labels. They were labelled A and B for testing A and B were separately taken in test tubes and boiled with NaOH solution. The end solution in each tube was made acidic with dilute HNO_3 and then some $AgNO_3$ solution was added. Substance B gave a yellow precipitate. Which one of the following statements is true for this experiment?

    (a) A and $C_6H_5CH_2I$ (b) B and C_6H_5I

    (c) Addition of HNO_3 was unnecessary   (d) A was C_6H_5I

81. The internal energy change when a system goes from state A to B is 40 kJ/mole. If the system goes from A to B by a reversible path and returns to state A by an irreversible path what would be the net change in internal energy?

    (a) > 40 kJ   (b) < 40kJ   (c) Zero   (d) 40 kJ

82. If at 298 K the bond energies of C-H, C-C, C = C and H-H bonds are respectively 414, 347, 615 and 435 kJ mol^{-1}, the value of enthalpy change for the reaction $H_2C = CH_2(g) + H_2(g) \rightarrow H_3C - CH_3(g)$ at 298 K will be

    (a) -250 kJ   (b) + 125 kJ   (c) -125 kJ   (d) + 250 kJ

83. The radionucleide $^{234}_{90}Th$ undergoes two successive β-decays followed by one α-decay. The atomic number and the mass number respectively of the resulting radionucleide are

    (a) 94 and 230   (b) 90 and 230   (c) 92 and 230   (d) 92 and 234

84. The half-life of a radioactive isotope is three hours. If the initial mass of the isotope were 256 g, the mass of it remaining undecayed after 18 hours would be

    (a) 8.0 g   (b) 12.0 g   (c) 16.0 g   (d) 4.0 g

85. If liquids A and B form an ideal solution

    (a) the entropy of mixing is zero   (b) the free energy of mixing is zero

    (c) the free energy as well as the entropy of mixing are each zero   (d) the enthalpy of mixing is zero

86. The radius of La^{3+} (Atomic number of La = 57) is 1.06Å. Which one of the following given values will be closest to the radius of Lu^{3+} (Atomic number of Lu = 71) ?

    (a) 1.40Å   (b) 1.06Å   (c) 0.85Å   (d) 1.60Å

87. Ammonia forms the complex ion $[Cu(NH_3)_4]^{2+}$ with copper ions in alkaline solutions but not in acidic solutions. What is the reason for it?

    (a) In acidic solutions protons coordinate with ammonia molecules forming NH_4^+ ions and NH_3 molecules are not available

    (b) In alkaline solutions insoluble $Cu(OH)_2$ is precipitated which is soluble in excess of any alkali

    (c) Copper hydroxide is an amphoteric substance

    (d) In acidic solutions hydration protects copper ions.

88. One mole of the complex compound $Co(NH_3)_5Cl_3$, gives 3 moles of ions on dissolution in water. One mole of the same complex reacts with two moles of $AgNO_3$ solution to yield two moles of AgCl (s). The structure of the complex is

(a) $[Co(NH_3)_3Cl_3].2NH_3$ (b) $[Co(NH_3)_4Cl_2]Cl.NH_3$ (c) $[Co(NH_3)_4Cl]Cl_2.NH_3$ (d) $[Co(NH_3)_5Cl]Cl_2$

89 In the coordination compound, $K_4[Ni(CN)_4]$, the oxidation state of nickel is

(a) 0   (b) +1   (c) +2   (d) -1

90. In curing cement plasters water is sprinkled from time to time. This helps in

(a) developing interlocking needle-like crystals of hydrated silicates

(b) hydrating sand and gravel mixed with cement

(c) converting sand into silicic acid   (d) keeping it cool

91. Which one of the following statements is not true?

(a) pH + pOH = 14 for all aqueous solutions   (b) The pH of 1×10^{-8} M HCl is 8

(c) 96,500 coulombs of electricity when passed through a $CuSO_4$ solution deposits 1 gram equivalent of copper at the cathode

(d) The conjugate base of $H_2PO_4^-$ is HPO_4^{2-}

92. On mixing a certain alkane with chlorine and irradiating it with ultravioletlight, it forms only one monochloroalkane. This alkane could be

(a) pentane   (b) isopentane   (c) neopentane   (d) propane

93. Butene-1 may be converted to butane by reaction with

(a) Sn - HCl   (b) Zn - Hg   (c) Pd/H_2 (d) Zn - HCl

94. What may be expected to happen when phosphine gas is mixed with chlorine gas?

(a) PCl_3 and HCl are formed and the mixture warms up

(b) PCl_5 and HCl are formed and the mixture cools down

(c) $PH_3.Cl_2$ is formed with warming up   (d) The mixture only cools down

95. The number of d-electrons retained in Fe^{2+} (At.no.of Fe = 26) ion is

(a) 4   (b) 5   (c) 6   (d) 3

96. Concentrated hydrochloric acid when kept in open air sometimes produces a cloud of white fumes. The explanation for it is that

(a) oxygen in air reacts with the emitted HCl gas to form a cloud of chlorine gas

(b) strong affinity of HCl gas for miosture in air results in forming of droplets of liquid solution which appears like a cloudy smoke.

(c) due to strong affinity for water, concentrated hydrochloric acid pulls moisture of air towards it self. This moisture forms droplets of water and hence the cloud.

(d) concentrated hydrochloric acid emits strongly smelling HCl gas all the time.

97. An ether is more volatile than an alcohol having the same molecular formula. This is due to

(a) alcohols having resonance structures   (b) inter-molecular hydrogen bonding in ethers

(c) inter-molecular hydrogen bonding in alcohols   (d) dipolar character of ethers

98. Graphite is a soft solid lubricant extremely difficult to melt. The reason for this anomalous behaviour is that graphite

(a) is an allotropic form of diamond   (b) has molecules of variable molecular masses like polymers

(c) has carbon atoms arranged in large plates of rings of strongly bound carbon atoms with weak interplate bonds

(d) is a non-crystalline substance

99. According to the Periodic Law of elements, the variation in properties of elements is related to their

(a) nuclear masses (b) atomic numbers (c) nuclear neutron-proton number ratios (d) atomic masses

100. Which one of the following statements is correct?

    (a) From a mixed precipitate of AgCl and AgI, ammonia solution dissolves only AgCl

    (b) Ferric ions give a deep green precipitate on adding potassium ferrocyanide solution

    (c) On boiling a solution having K^+, Ca^{2+} and HCO_3^- ions we get a precipitate of $K_2Ca(CO_3)_2$.

    (d) Manganese salts give a violet borax bead test in the reducing flame

101. Glass is a

    (a) super-cooled liquid   (b) gel   (c) polymeric mixture   (d) micro-crystalline solid

102. The orbital angular momentum for an electron revolving in an orbit is given by $\sqrt{l(l+1)}.\dfrac{h}{2\pi}$. This momentum

    for an s-electron will be given by

    (a) zero   (b) $\dfrac{h}{2\pi}$ (c) $\sqrt{2}.\dfrac{h}{2\pi}$ (d) $+\dfrac{1}{2}.\dfrac{h}{2\pi}$

103. How many unit cells are present in a cubeshaped ideal crystal of NaCl of mass 1.00 g?
    [Atomic masses: Na = 23, Cl = 35.5]

    (a) 5.14×10^{21} unit cells   (b) 1.28×10^{21} unit cells

    (c) 1.71×10^{21} unit cells   (d) 2.57×10^{21} unit cells

104. In the anion $HCOO^-$ the two carbon-oxygen bonds are found to be of equal length. What is the reason for it?

    (a) The C = O bond is weaker than the C-O bond

    (b) The anion $HCOO^-$ has two resonating structures

    (c) The anion is obtained by removal of a proton from the acid molecule

    (d) Electronic orbitals of carbon atom are hybridised

105. Which one of the following characteristics is not correct for physical adsorption?

    (a) Adsorption increases with incresae in temperature

    (b) Adsorption is spontaneous   (c) Both enthalpy and entropy of adsorption are negative

    (d) Adsorption on solids is reversible

106. For a cell reaction involving a two-electron change, the standard e.m.f. of the cell is found to be 0.295 V at 25^0C. The equilibrium constant of the reaction at 25^0C will be

    (a) 29.5×10^{-2} (b) 10   (c) 1×10^{10} (d) 1×10^{-10}

107. In an irreversible process taking place at constant T and P and in which only pressure-volume work is being done, the change in Gibbs free energy (dG) and change in entropy (dS), satisfy the criteria

    (a) $(dS)_{V,E} > 0, (dG)_{T,P} < 0$ (b) $(dS)_{V,E} = 0, (dG)_{T,P} = 0$ (c) $(dS)_{V,E} = 0, (dG)_{T,P} > 0$ (d) $(dS)_{V,E} < 0, (dG)_{T,P} < 0$

108. The solubility in water of a sparingly soluble salt AB_2 is 1.0×10^{-5} mol L^{-1}. Its solubility product number will be

    (a) 4×10^{-10} (b) 1×10^{-15} (c) 1×10^{-10} (d) 4×10^{-15}

109. What volume of hydrogen gas, at 273 K and 1 atm, pressure will be consumed in obtaining 21.6 g of elemental boron (atomic mass = 10.8) from the reducti on of boron trichloride by hydrogen?

    (a) 67.2 L   (b) 44.8 L   (c) 22.4 L   (d) 89.6 L

110. For the reaction equilibrium N_2O_4 (g) $\rightleftharpoons$ $2\,NO_2$(g) the concentrations of N_2O_4 and NO_2 at equilibrium are 4.8×10^{-2} and 1.2×10^{-2} mol L^{-1} respectively. The value of K_c for the reaction is

    (a) 3×10^{-1} mol L^{-1} (b) 3×10^{-3} mol L^{-1} (c) 3×10^3 mol L^{-1} (d) 3.3×10^2 mol L^{-1}

111. Consider the reaction equilibrium $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$; $\Delta H^0 = -198\,kJ$. On the basis of Le Chatelier's principle, the condition favourable for the forward reaction is

    (a) increasing temperature as well as pressure   (b) lowering the temperature and increasing the pressure

    (c) any value of temperature and pressure   (d) lowering of temperature as well as pressure

112. Which one of the following is an amphoteric oxide?

(a) Na_2O (b) SO_2 (c) B_2O_3 (d) ZnO

113. A red solid is insoluble in water. However it becomes soluble if some KI is added to water. Heating the red solid in a test tube results in liberation of some violet coloured fumes and droplets of a metal appear on the cooler parts of the test tube. The red solid is

(a) HgI_2 (b) HgO (c) Pb_3O_4 (d) $(NH_4)_2Cr_2O_7$

114. Standard reduction electrode potentials of three metals A,B&C are respectively +0.5 V, -3.0 V & -1.2 V. The reducing, powers of these metals are

(a) A > B > C (c) C > B > A (c) A > C > B (d) B > C > A

115. Which one of the following substances has the highest proton affinity?

(a) H_2S (b) NH_3 (c) PH_3 (d) H_2O

116. In a 0.2 molal aqueous solution of a weak acid HX the degree of ionization is 0.3. Taking k_f for water as 1.85, the freezing point of the solution will be nearest to

(a) -0.360^0C (b) -0.260^0C (c) $+0.480^0C$ (d) -0.480^0C

117. When during electrolysis of a solution of $AgNO_3$ 9650 coulombs of charge pass through the electroplating bath, the mass of silver deposited on the cathode will be

(a) 10.8 g (b) 21.6 g (c) 108 g (d) 1.08 g

118. For the redox reaction $Zn(s) + Cu^{2+}(0.1\ M) \rightarrow Zn^{2+}(1M) + Cu(s)$ taking place in a cell, E^0_{cell} is 1.10 volt. E_{cell} for the cell will be $\left(2.303\dfrac{RT}{F} = 0.0591\right)$

(a) 1.80 volt (b) 1.07 volt (c) 0.82 volt (d) 2.14 volt

119. In respect of the equation $k = Ae^{-E_a/RT}$ in chemical kinetics, which one of the following statements is correct?

(a) A is adsorption factor (b) E_a is energy of activation
(c) R is Rydberg's constant (d) k is equilibrium constant

120. A reduction in atomic size with increase in atomic number is a characteristic of element of

(A) d-block (b) f-block (c) radioactive series (d) high atomic masses

121. The IUPAC name of $CH_3COCH(CH_3)_2$ is

(a) 2-methyl-3-butanone (b) 4-methylisopropyl ketone (c) 3-methyl-2-butanone (d) Isopropylmethyl ketone

122. When $CH_2 = CH - COOH$ is reduced with $LiAlH_4$, the compound obtained will be

(a) $CH_2 = CH - CH_2OH$ (b) $CH_3 - CH_2 - CH_2OH$
(c) $CH_3 - CH_2 - CHO$ (d) $CH_3 - CH_2 - COOH$

123. According to the kinetic theory of gases, in an ideal gas, between two successive collisions a gas molecule travels

(a) in a wavy path (b) in a straight line path (c) with an accelerated velocity (d) in a circular path

124. The general formula $C_nH_{2n}O_2$ could be for open chain

(a) carboxylic acids (b) diols (c) dialdehydes (d) deketones

125. Among the following four structures I to IV.

$\underset{\text{(i)}}{C_2H_5\text{-}\overset{\overset{CH_3}{|}}{CH}\text{- }C_3H_7}$ $\underset{\text{(ii)}}{CH_3\text{-}\overset{\overset{O}{\|}}{C}\text{ - }\overset{\overset{CH_3}{|}}{CH}\text{-}C_2H_5}$ $\underset{\text{(iii)}}{H\text{ - }\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}^{\oplus}}$, $\underset{\text{(iv)}}{C_2H_5\text{-}\overset{\overset{CH_3}{|}}{CH}\text{-}C_2H_5}$. It is true that
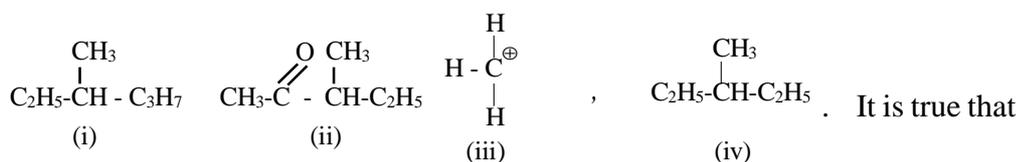
(a) only I and II are chiral compounds (b) only III i a chiral compound
(c) only II and IV are chiral compounds (d) all four are chiral compounds

126. What would happen when a solution of potassium chromate is treated with an excess of dilute nitric acid?

(a) $Cr_2O_7^{2-}$ and H_2O are formed
(b) CrO_4^{2-} is reduced to +3 state of Cr
(c) CrO_4^{2-} is oxidized to +7 state of Cr
(d) Cr^{3+} and $Cr_2O_7^{2-}$ are formed

127. For making good quality mirrors, plates of float glass are used. These are obtained by floating molten glass over a liquid metal which does not solidify before glass. The metal used can be

(a) tin
(b) sodium
(c) magnesium
(d) mercury

128. The substance not likely to contain $CaCO_3$ is

(a) calcined gypsum
(b) sea shells
(c) dolomite
(d) a marble statue

129. Complete hydrolysis of cellulose gives

(a) D-ribose
(b) D-glucose
(c) L-glucose
(d) D-fructose

130. Which one of the following nitrates will leave behind a metal on strong heating?

(a) Copper nitrate
(b) Manganese nitrate
(c) Silver nitrate
(d) Ferric nitrate

131. During dehydration of alcohols to alkenes by heating with conc. H_2SO_4 the initiation step is

(a) formation of carbocation
(b) elimination of water
(c) formation of an ester
(d) protonation of alcohol molecule

132. The solubilities of carbonates decrease down the magnesium group due to a decrease in

(a) hydration energies of cations
(b) inter-ionic attraction
(c) entropy of solution formation
(d) lattice energies of solids

133. When rain is accompanied by a thunderstorm, the collected rain water will have a pH value

(a) slightly higher than that when the thunderstorm is not there

(b) uninfluenced by occurence of thunderstorm

(c) which depends on the amount of dust in air

(d) slightly lower than that of rain water without thunderstorm

134. The reason for double helical structure of DNA is operation of

(a) dipole-dipole interaction
(b) hydrogen bonding
(c) electrostatic attractions
(d) van der Waals' forces

135. 25 ml of a solution of barium hydroxide on titration with a 0.1 molar solution of hydrochloric acid gave a litre value of 35 ml. The molarity of barium hydroxide solution was

(a) 0.14
(b) 0.28
(c) 0.35
(d) 0.07

136. The correct relationship between free energy change in a reaction and the corresponding equilibrium constant K_c is

(a) $-\Delta G = RT \, ln \, K_c$
(b) $\Delta G^0 = RT \, ln \, K_c$
(c) $-\Delta G^0 = RT \, ln \, K_c$
(d) $\Delta G = RT \, ln \, K_c$

137. The rate law for a reaction between the substances A and B is given by Rate $= k[A]^n [B]^m$ On doubling the concentration of A and halving the concentration of B, the ratio of the new rate to the earlier rate of the reaction will be as

(a) $(m + n)$
(b) $(n - m)$
(c) $2^{(n-m)}$
(d) $\dfrac{1}{2^{(m+n)}}$

138. Ethyl isocyanide on hydrolysis in acidic medium generates

(a) propanoic acid and ammonium salt
(b) ethanoic acid and ammonium salt
(c) methylamine salt and ethanoic acid
(d) ethylamine salt and methanoic acid

139. The enthalpy change for a reaction does not depend upon

(a) use of different reactants for the same product
(b) the nature of intermediate reaction steps
(c) the differences in initial or final temperatures of involved substances
(d) the physical states of reactants and products

140. A pressure cooker reduces cooking time for food because
    (a) boiling point of water involved in cooking is increased
    (b) the higher pressure inside the cooker crushes the food material
    (c) cooking involves chemical changes helped by a rise in temperature
    (d) heat is more evenly distributed in the cooking space

141. For the reaction system: $2NO(g) + O_2(g) \rightarrow 2NO_2(g)$ volume is suddenly reduce to half its value by increasing the pressure on it. If the reaction is of first order with respect to O_2 and second order with respect to NO, the rate of reaction will
    (a) diminish to one-eighth of its initial value
    (b) increase to eight times of its initial value
    (c) increase to four times of its initial value
    (d) diminish to one-fourth of its initial value

142. Several blocks of magnesium are fixed to the bottom of a ship to
    (a) make the ship lighter
    (b) prevent action of water and salt
    (c) prevent puncturing by under-sea rocks
    (d) keep away the sharks

143. Which one of the following pairs of molecules will have permanent dipole moments for both members?
    (a) NO_2 and CO_2 (b) NO_2 and O_3 (c) SiF_4 and CO_2 (d) SiF_4 and NO_2

144. Which one of the following groupings represents a collection of isoelectronic species? (At. nos,: 55, Br:35)
    (a) N^{3-}, F^-, Na^+ (b) Be, Al^{3+}, Cl^- (c) Ca^{2+}, Cs^+, Br   (d) Na^+, Ca^{2+}, Mg^{2+}

145. Which one of the following processes will produce hard water?
    (a) Saturation of water with $MgCO_3$
    (b) Saturation of water with $CaSO_4$
    (c) Addition of Na_2SO_4 to water
    (d) Saturation of water with $CaCO_3$

146. Which one of the following compounds has the smallest bond angle in its molecule?
    (a) OH_2 (b) SH_2 (c) NH_3 (d) SO_2

147. The pair of species having identical shapes for molecules of both species is
    (a) XeF_2, CO_2 (b) BF_3, PCl_3
    (c) PF_5, IF_5 (d) CF_4, SF_4

148. The atomic numbers of vanadium (V), Chromium (Cr), manganese (Mn) and iron (Fe) are respectively 23, 24, 25 and 26. Which one of these may be expected to have the highest second ionization enthalpy?
    (a) Cr   (b) Mn   (c) Fe   (d) V

149. In Bohr series of lines of hydrogen spectrum, the third line from the red end corresponds to which one of the following inter-orbit jumps of the electron for Bohr orbits in an atom of hydrogen
    (a) $5 \rightarrow 2$ (b) $4 \rightarrow 1$ (c) $2 \rightarrow 5$ (d) $3 \rightarrow 2$

150. The de Broglie wavelength of a tennis ball of mass 60 g moving with a velocity of 10 metres per second is approximately
    (a) 10^{-31} metres
    (b) 10^{-16} metres
    (c) 10^{-25} metres
    (d) 10^{-33} metres Planck's constant, $h = 6.63 \times 10^{-34}$ Js.