AIEE-2002

CHEMISTRY

80. The type of isomerism present in nitropentamine chromium (III) chloride is

(a) optical

(b) linkage

(c) ionization

(d) polymerization

81. Arrangement of $(CH_3)_3-C-, (CH_3)_2-CH-, CH_3-CH_2-$ when attached to benzyl or an unsaturated group in increasing order of inductive effect is

(a) $(CH_3)_3-C- < (CH_3)_2-CH- < CH_3-CH_2$

(b) $CH_3-CH_2- < (CH_3)_2- < CH- < (CH_3)_3-C-$

(c) $(CH_3)_2-CH- < (CH_3)_3-C- < CH_3, -CH_2$

(d) $(CH_3)_3-C- < CH_3-CH_2-(CH_3)_2-CH-$

82. $CH_3-Mg-Br$ is an organo metallic compound due to

(a) $Mg-Br$ bond

(b) $C-Mg$ bond

(c) $C-Br$ bond

(d) $C-H$ bond

83. 1 M NaCl and 1 M HCl are present in an aqueous solution. The solution is

(a) not a buffer solution with $pH < 7$

(b) not a buffer solution with $pH > 7$

(c) a buffer solution with $pH < 7$

(d) a buffer solution with $pH > 7$

84. Species acting as both Bronsted acid and base is

(a) $\left(HSO_4\right)^{-1}$

(b) Na_2CO_3

(c) NH_3

(d) OH^{-1}

85. Let the solubility of an aqueous solution of $Mg\left(OH\right)_2$ be x then its k_{sp} is

(a) $4x^3$

(b) $108x^5$

(c) $27x^4$

(d) $9x$

86. Units of rate constant of first and zero order reactions in terms of molarity M unit are respectively

(a) $\sec^{-1}, M\sec^{-1}$

(b) $\sec^{-1}, M$

(c) $M\sec^{-1}, \sec^{-1}$

(d) $M, \sec^{-1}$

87. In XeF_2, XeF_4, XeF_6 the numebr of lone pairs of Xe are respectively

(a) 2, 3, 1

(b) 1, 2, 3

(c) 4, 1, 2

(d) 3, 2, 1

88. In which of the folloiwng species the interatomic bond angle is $109°28'$?

(a) $NH_3, (BF_4)^{-1}$

(b) $(NH_4)^+, BF_3$

(c) NH_3, BF_4

(d) $(NH_2)^{-1}, BF_3$

89. For the reaction $A + 2B \rightarrow C$, rate is given by $R = [A][B]^2$ then the order of the reaction is

(a) 3

(b) 6

(c) 5

(d) 7

90. RNA is different from DNA because RNA contains

(a) ribose sugar and thymine

(b) ribose sugar and uracil

(c) deoxyribose sugar and thymine

(d) deoxyribose sugar and uracil

91. Which of the following are arranged in an increasing order of their bond strengths ?

(a) $O_2^- < O_2 < O_2^+ < O_2^{2-}$

(b) $O_2^{2-} < O_2^- < O_2 < O_2^+$

(c) $O_2^- < O_2^{2-} < O_2 < O_2^+$

(d) $O_2^+ < O_2 < O_2^- < O_2^{2-}$

92. If an endothermic reaction is non- spantaneous at freezing point of water and becomes feasible at its boiling point, then

(a) ΔH is $-$ ve, ΔS is $+$ ve

(b) ΔH and ΔS both are $+ve$

(c) ΔH and ΔS both are $-$ ve

(d) ΔH is $+$ ve, ΔS is $-$ ve

93. A heat engine absorbs heat Q_1 at temperature T_1 and heat Q_2 at temperature T_2 .Work done by the engine is $J\left(Q_1+Q_2\right)$. This data

(a) violates 1^{st} t law of thermodynamics

(b) violates 1^{st} law of thermodynamics if Q_1 is $-$ ve

(c) violates 1^{st} law of thermodynamics if Q_2 is $-$ ve

(d) does not violate 1^{st} law of thermodynamics

94. Most common oxidation states of Ce (cerium) are

(a) $+2,+3$

(b) $+2,+4$

(c) $+3,+4$

(d) $+3,+5$

95. Arrange Ce^{+3}, La^{+3}, Pm^{+3} and Yb^{+3} in increasing order of their ionic radii

(a) $Yb + 3 < Pm^{+3} < Ce^{+3} < La^{+3}$

(b) $Ce^{+3} < Yb^{+3} < Pm^{+3} < La^{+3}$

(c) $Yb^{+3} < Pm^{+3} < La^{+3} < Ce^{+3}$

(d) $Pm^{+3} < La^{+3} < Ce^{+3} < Yb^{+3}$

96. KO_2 (potassium super oxide) is used in oxygen cylinders in space and submarines because it

(a) absorbs CO_2 and increases O_2 content

(b) eliminates moisture

(c) absorbs CO_2

(d) produces ozone.

97. A similarity between optical and geometrical isomerism is that

(a) each forms equal number of isomers for a given compound

(b) If in a compound one is present then so is the other

(c) both are included in stereoisomerism

(d) they have no similarity

98. Which of the following does not show geometrical isomerism?

(a) 1, 2 – dichloro – 1 – pentene

(b) 1, 3 – dichloro – 2 – pentene

(c) 1, 1 – dichloro – 1 – pentene

(d) 1, 4 – dichloro – 2 – pentene

99. In case of nitrogen, NCl_3 is possible but not NCl_5 while in case of phosphorous, PCl_3 as well as PCl_5 are possible. It is due to

(a) availability of vacant d orbitals in P but not in N

(b) lower electronegativity of P than N

(c) lower tendency of H – bond formation in P than N

(d) occurrence of P in solid while N in gaseous state at room temperature

100. For an ideal gas, number of moles per litre in terms of its pressure P, gas contant R and temperature T is

(a) PT/R

(b) PRT

(c) P/RT

(d) RT/P

101. The formation of gas at the surface of tungsten due to adsorption is the reaction of order

(a) 0

(b) 1

(c) 2

(d) insufficient data

102. The solubility of $Mg(OH)_2$ is S moles/litre. The solubility product under the same condition is

(a) $4S^3$

(b) $3S^4$

(c) $4S^2$

(d) S^3

103. How do we differentiate between Fe^{3+} and Cr^{3+} in group III?

(a) by taking excess of NH_4OH solution

(b) by increasing NH_4^+ ion concentration

(c) by decreasing OH^- ion concentration

(d) both (b) and (c)

104. In a compound C, H and N atoms are present in $9:1:35$ by weight. Molecular weight of compound is 108. Molecular formula of compound is

(a) $C_2H_6N_2$

(b) C_3H_4N

(c) $C_6H_8N_2$

(d) $C_9H_{12}N_3$

105. The functional group, which is found in amino acid is

(a) $-COOH$ group

(b) $-NH_2$ group

(c) $-CH_3$ group

(d) both (a) and (b)

106. Conductivity (unit Siemen's S) is directly proportional to area of the vessel and the concentration of the solution in it and is inversely proportional to the length of the vessel then the unit of the constant of proportionality is

(a) $Sm\ mol^{-1}$

(b) $Sm_2\ mol^{-1}$

(c) $S^{-2}m^2\ mol$

(d) $S^2m^2\ mol^{-2}$

107. In a hydrogen atom, if energy of an electron in ground state is 13.6 eV , then that in the 2^{nd} excited state is

(a) 1.51 eV

(b) 3.4 eV

(c) 6.04 eV

(d) 13.6 eV

108. Which of the following statements is true ?

(a) HF is less polar than HBr

(b) absolutely pure water does not contain any ions

(c) chemical bond formation take place when forces of attraction overcome the forces of repulsion

(d) in covalency transference of electron takes place

109. Which of the following compounds has wrong IUPAC name ?

(a) $CH_3-CH_2-CH_2-COO-CH_2CH_3$ $\rightarrow$ ethyl butanoate

(b) $CH_3-\underset{\underset{CH}{|}}{CH}-CH_2-CHO$ $\rightarrow$ 3-methyl–butanal

(c) $CH_3-\underset{\underset{OH}{|}}{CH}-\underset{\underset{CH_3}{|}}{CH}-CH_3$ $\rightarrow$ 2 - methyl–3–butanol

(d) $CH_3-\underset{\underset{CH_3}{|}}{CH}-\overset{\overset{O}{||}}{C}-CH_2-CH_3$ $\rightarrow$ 2 –methyl–3 –pentanone

110. $CH_3CH_2COOH \xrightarrow[\text{red P}]{Cl_2} A \xrightarrow{\text{alc.KOH}} B$. What is B ?

(a) CH_3CH_2COCl

(b) CH_3CH_2CHO

(c) $CH_2 = CHCOOH$

(d) $ClCH_2CH_2COOH$

111. Aluminium is extracted by the electrolysis of

(a) bauxite

(b) alumina

(c) alumina mixed with molten cryolite

(d) molten cryolite

112. The metal extracted by leaching with a cyanide is

(a) Mg

(b) Ag

(c) Cu

(d) Na

113. Value of gas constant R is

(a) 0.082 litre atm

(b) 0.987 cal $mol^{-1}K^{-1}$

(c) 8.3 J mol^{-1} K^{-1}

(d) 83 erg mol^{-1} K^{-1}

114. Freezing point of an aqueous solution is $(-0.186)°C$. Elevation of boiling point of the same solution is $K_b = 0.512°C$, $K_f = 1.86°C$, find the increase in boiling point.

(a) 0.186°C

(b) 0.0512°C

(c) 0.092°C

(d) 0.2372°C

115. EMF of a cell in terms of reduction potental of its left and right electrodes is

(a) $E = E_{left} - E_{right}$

(b) $E = E_{left} + E_{right}$

(c) $E = E_{right} - E_{left}$

(d) $E = -(E_{right} + E_{left})$

116. Uncertainity in position of aminute particle of mass 25 g in space is 10^{-5} m .What is the uncertainity in its velocity (in ms^{-1})? $\left(h = 6.6\times10^{-34}\,Js\right)$

(a) 2.1×10^{-34}

(b) 0.5×10^{-34}

(c) 2.1×10^{-28}

(d) 0.5×10^{-23}

117. Which of these will not react with acetylene?

(a) NaOH

(b) ammonical $AgNO_3$

(c) Na

(d) HCl

118. Change in volume of the system does not alter the number of moles in which of the following equilibria ?

(a) $N_2(g)+O_2(g)\,f\quad 2NO(g)$

(b) $PCl_5(g)\,f\quad PCl_3(g)+Cl_2(g)$

(c) $N_2(g)+3H_2(g)\,f\quad 2NH_3(g)$

(d) $SO_2Cl_2(g)\,f\quad +SO_2(g)Cl_2(g)$

119. For the reactions,

$$C + O_2 \rightarrow CO_2 \quad ; \Delta H = -393J$$
$$2Zn + O_2 \rightarrow 2ZnO; \Delta H = -412J$$

(a) carbon can oxidise Zn

(b) oxidation of carbon is not feasible

(c) oxidation of Zn is not feasible

(d) Zn can oxidise carbon

120. Which of the following ions has the maximum magnetic moment?

(a) Mn^{+2}

(b) Fe^{+2}

(c) Ti^{+2}

(d) Cr^{+2}

121. In which of the following species is the underlined carbon having sp^3 hybridisation?

(a) $CH_3\underline{C}OOH$

(b) $CH_3\underline{C}H_2OH$

(c) $CH_3\underline{C}OCH_3$

(d) $CH_2 = \underline{C}H - CH_3$

122. Racemic mixture is formed by mixing two

(a) isomeric compounds

(b) chiral compounds

(c) meso compounds

(d) optical isomers

123. The differential rate law for the reaction $H_2 + I_2 \rightarrow 2HI$ is

(a) $-\frac{d[H_2]}{dt} = -\frac{d[I_2]}{dt} = -\frac{d[HI]}{dt}$

(b) $\frac{d[H_2]}{dt} = \frac{d[I_2]}{dt} = \frac{1}{2}\frac{d[HI]}{dt}$

(c) $\frac{1}{2}\frac{d[H_2]}{dt} = \frac{1}{2}\frac{d[I_2]}{dt} = -\frac{d[HI]}{dt}$

(d) $-2\frac{d[H_2]}{dt} = -2\frac{d[I_2]}{dt} = -\frac{d[HI]}{dt}$

124. Number of sigma bonds in P_4O_{10} is

(a) 6

(b) 7

(c) 17

(d) 16

125. Kinetic theory of gases proves

(a) only Boyle's law

(b) only Charles' law

(c) only Avogadro's law

(d) all of these

126. A metal M readily forms its sulphate MSO_4 which is water $-$ soluble. It forms its oxide MO which becomes inert on heating. It forms an insoluble hydroxide $M(OH)_2$ which is soluble in $NaOH$ solution. Then M is

(a) Mg

(b) Ba

(c) Ca

(d) Be

127. If φ denotes reduction potential, then which is true ?

(a) $E^0_{cell} = \varphi_{right} - \varphi_{left}$

(b) $E^0_{cell} = \varphi_{left} + \varphi_{right}$

(c) $E^0_{cell} = \varphi_{left} - \varphi_{right}$

(d) $E^0_{cell} = -(\varphi_{left} + \varphi_{right})$

128. What is the product when acetylene reacts with hypochlorous acid ?

(a) CH_3COCI

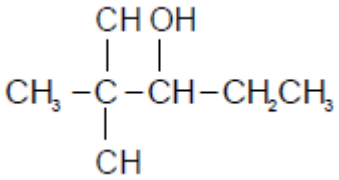
(b) $ClCH_2CHO$

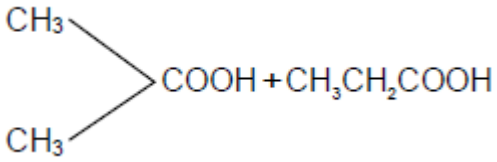
(c) Cl_2CHCHO

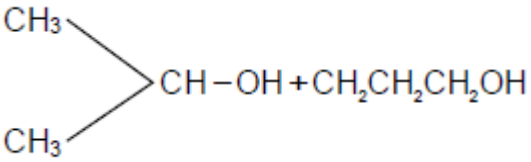
(d) ClCHCOOH

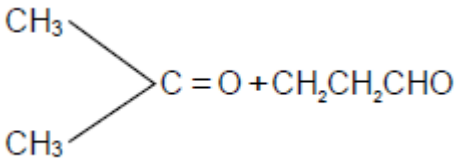
129. On vigorous oxidation by permanganate solution

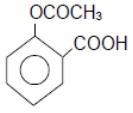
$(CH_3)_2C = CH - CH_2 - CHO$ gives

(a) 

(b) 

(c) 

(d) 

130. The compound  is used as

(a) antiseptic

(b) antibiotic

(c) analgesic

(d) pesticide

131. What will be the emf for the given cell $Pt\left|H_2\left(P_1\right)H^+\left(aq\right)\right|\left|H_2\left(P_2\right)\right|Pt$

(a) $\frac{RT}{f}\log\frac{P_1}{P_2}$

(b) $\frac{RT}{2f}\log\frac{P_1}{P_2}$

(c) $\frac{RT}{f}\log\frac{P_2}{P_1}$

(d) none of these

132. When primary amine reacts with chloroform in ethanoic KOH then the product is

(a) an isocyanide

(b) an aldehyde

(c) a cyanide

(d) an alcohol

133. Which of the following reaction is possible at anode?

(a) $2Cr^{3+} + 7H_2O \rightarrow Cr_2O_7^{2-} + 14H^+$

(b) $F_2 \rightarrow 2F^-$

(c) $(1/2)O_2 + 2H^+ \rightarrow H_2O$

(d) none of these

134. The reaction : $(CH_3)_3C-Br \xrightarrow{H_2O} (CH_3)_3-C-OH$

(a) elimination reaction

(b) substitution reaction

(c) free radical reaction

(d) displacement reaction

135. If half-life of a substance is 5 yrs , then the total amount of substance left after 15 years, when initial amount is 64 grams is

(a) 16 grams

(b) 2 grams

(c) 32 grams

(d) 8 grams

136. Cyanide process is used for the extraction of

(a) barium

(b) aluminium

(c) boron

(d) silver

137. Which is the correct order of ionic sizes ?

(a) $Ce > Sn > Yb > Lu$

(b) $Sn > Ce > Lu > Yb$

(c) $Lu > Yb > Sn > Ce$

(d) $Sn > Yb > Ce > Lu$

(Atomic Number : $Ce = 58,\ Sn = 50, Yb = 70$ and $Lu = 71$)

138. With increase of temperature, which of these changes?

(a) molality

(b) weight fraction of solute

(c) fraction of solute present in water

(d) mole fraction

139. The integrated rate equation is $Rt = \log C_0 - \log C_t$. The straight line graph is obtained by plotting

(a) time vs $\log C_t$

(b) vs $\frac{1}{\text{time}}$ vs C_t

(c) time vs C_t

(d) vs $\frac{1}{\text{time}}$ vs $\frac{1}{C_t}$

140. In which of the following reactions, increase in the volume at constant temperature does not affect the number of moles at equilibrium

(a) $2NH_3 \rightarrow N_2 + 3H_2$

(b) $C(g) + (1/2)O_2(g) \rightarrow CO(g)$

(c) $H_2(g) + O_2(g) \rightarrow H_2O_2(g)$

(d) none of these

141. When the sample of copper with zinc impurity is to be purified by electrolysis, the appropriate electrodes are

cathode	**anode**	**cathode**	**anode**
(a) pure zinc	pure copper	(b) impure sample	pure copper
(c) impure zinc	impure sample	(d) pure copper	impure sample

142. The most stable ion is

(a) $\left[Fe(OH)_3\right]^{3-}$

(b) $\left[Fe(Cl)_6\right]^{3-}$

(c) $\left[Fe(CN)_6\right]^{3-}$

(d) $\left[Fe(H_2O)_6\right]^{3+}$

143. β-particle is emitted in radioactivity by

(a) conversion of proton to neutron

(b) from outermost orbit

(c) conversion of neutron to proton

(d) β-particle is not emitted

144. In mixture A and B component show -ve deviation as

(a) $\Delta V_{mix} > 0$

(b) $\Delta H_{mix} < 0$

(c) $A-B$ interaction is weaker than $A-A$ and $B-B$ interaction

(d) $A-B$ interaction is stronger than $A-A$ and $B-B$ interaction

145. The heat required to raise the temperature of body by 1K is called

(a) specific heat

(b) thermal capacity

(c) water equivalent

(d) none of these

146. Na and Mg crystallize in BCC and FCC type crystals respectively, then the number of atoms of Na and Mg present in the unit cell of their respective crystal is

(a) 4 and 2

(b) 9 and 14

(c) 14 and 9

(d) 2 and 4

147. Number of atoms in 558.5 gram $Fe\left(\text{at.wt. of Fe} = 55.85 \text{ g mol}^{-1}\right)$ is

(a) twice that in 60 g carbon

(b) 6.023×10^{22}

(c) half that in 8g He

(d) $558.5\times6.023\times10^{23}$

148. When $KMnO_4$ acts as an oxidising agent and ultimately forms $[MnO_4]^{-1}, MnO_2, Mn_2O_3, Mn^{+2}$ then the number of electrons transferred in each case respectively is

(a) $4,3,1,5$

(b) $1,5,3,7$

(c) $1,3,4,5$

(d) $3,5,7,1$

149. Which of the following is a redox reaction?

(a) $NaCl + KNO_3 \rightarrow NaNO_3KCl$

(b) $CaC_2 + 2HCl \rightarrow CaCl_2 + H_2C_2O_4$

(c) $Mg(OH)_2\ 2NH_4Cl \rightarrow MgCl_2 + 2NH_4OH$

(d) $2Zn + 2AgCN \rightarrow 2Ag + Zn(CN)_2$

150. For the reaction $CO(g)+(1/2)O(g)=CO_2(g), K_p/Kc$ is

(a) RT

(b) $(RT)^{-1}$

(c) $(RT)^{-1/2}$

(d) $(RT)^{1/2}$