AIEE-2002

CHEMISTRY

80. Sol.

The nitro group can attach to metal through nitrogen as $(-NO_2)$ or through oxygen as nitrito $(-ONO)$

81. Sol.

$-CH_3$ group has $+I$ effect , as number of $-CH_3$ group increases, the inductive effect increases.

82. Sol.

Bond between C of organic molecule and metal atom.

84. Sol.

$(HSO_4)^-$ can accept and donate a proton

$(HSO_4)^- + H^+ \rightarrow H_2SO_4$

$(HSO_4)^- - H^+ \rightarrow H_2SO_4^{2-}$

85. Sol.

$$Mg(OH)_2 \rightarrow \underset{x}{[Mg^{2+}]} + 2\underset{2x}{[OH^-]}$$

$$K_{sp} = [Mg][OH]^2 = [x][2x]^2 = x.4x^2 = 4x^3$$

86. Sol.

$K = \left(\text{mol } L^{-1}\right)^{1-n} \sec^{-1}, n = 0,1$

87. Sol.

XeF_2	sp^3d	3 lone pairs
XeF_4	sp^3d^2	2 lone pairs
XeF_6	sp^3d^3	1 lone pair

89. Sol.

Order is the sum of the power of the concentrations terms in rate law expression.

91. Sol.

According to bond order values the given order is the answer. Bond order values are $+1, +1\frac{1}{2}, +2$ and $+2\frac{1}{2}$, higher bond order means stronger bond.

92. Sol.

$\Delta H + ve$ at low temperature and $\Delta S + ve$ at low temperature shows that reaction is non spontaneous

At high temperature (boiling point) becomes feasible

93. Sol.

Some mechanical energy is always converted (lost) to other forms of energy.

95. Sol.

According to their positions in the periods, these values are in the order :

$Yb^{+3} < Pm^{+3} < Ce^{+3} < La^{+3}$

At nos. 70 61 58 57

This is due to lanthanide contraction

96. Sol.

KO_2 is a very good oxidising agent

$_7N = 1s^2 2s^2 3p^3; _{15}P = 1s^2 2s^2 2p^6 3s^2 3p^3$

In phosphorous the $3d$ - orbitals are available,

100. Sol.

$PV = nRT$ (number of moles $= n/V$) $\therefore n/V = P/RT$

103. Sol.

NH_4^+ ions are increased to suppress release of OH^- ions, hence solubility product of $Fe(OH)_3$ is attained. Colour of precipitate is different.

104. Sol.

According to molecular weight given

107. Sol.

2^{nd} excited state will be the 3rd energy level

$$E_n = \frac{13.6}{n^2} eV \text{ or } E = \frac{13.6}{9} eV = 1.51 eV$$

110. Sol.

$$CH_3CH_2COOH \xrightarrow[\text{red P}]{Cl_2} CH_3CHClCOOH \quad \underset{-HCL}{\text{alc.KOH}} \rightarrow \underset{\text{Acrylic acid}}{CH_2 = CHCOOH}$$

111. Sol.

Alumina is mixed with cryolite which acts as an electrolyte

112. Sol.

Silver ore forms a soluble complex with $NaCN$ from which silver is precipitated using scrap zinc.

$$Ag_2S + 2NaCN \rightarrow Na\left[Ag(CN)_2\right] \xrightarrow{Zn} Na_1\left[Zn(CN_4)\right] + Ag\downarrow$$

Sod. argento – cyanide (soluble)

114. Sol.

$$\Delta T_b = K_b \times \frac{W_B}{M_B \times W_A} \times 1000; \Delta T_f = K_f \frac{W_B}{M_B \times W_A} \times 1000; \frac{\Delta T_b}{\Delta T_f} = \frac{\Delta K_b}{\Delta K_f} = \frac{\Delta T_b}{-0.186} = \frac{0.512}{1.86} = 0.0512°C$$

115. Sol.

E_{cell} = Reduction potential of cathode (right) – reduction potential of anode (left)

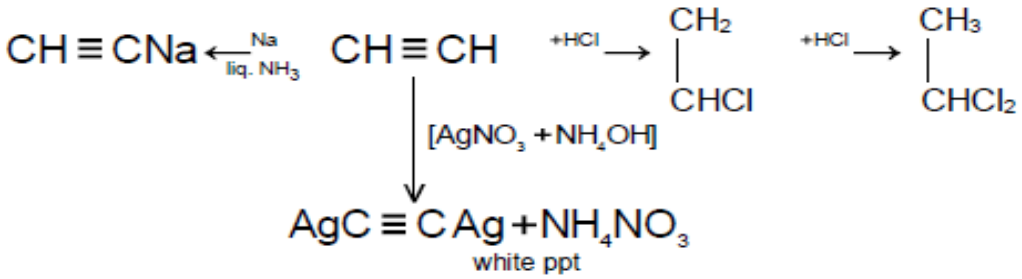
$= E_{right} - E_{left}$

116. Sol.

$$\Delta x.\Delta v \frac{h}{2\pi m}$$

117. Sol.

Acetylene reacts with the other three as



118. Sol.

In this reaction the ratio of number of moles of reactants to products is same i.e. $2:2$, hence change in volume will not alter the number of moles.

119. Sol.

ΔH negative shows that the reaction is spontaneous. Higher value for Zn shows that the reaction is more feasible.

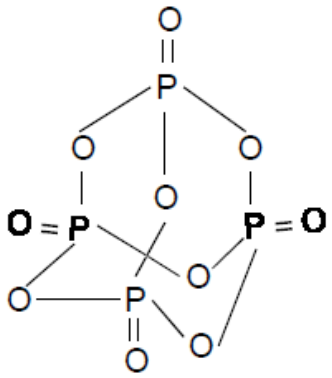
120. Sol.

Mn^{2+} has the maximum number of unpaired electrons (5) and therefore has maximum moment.

121. Sol.

Inmolecules $(a),(c)$ and (d), the carbon atom has a multiple bond, only (b) has sp^3 hybridisation

124. Sol.



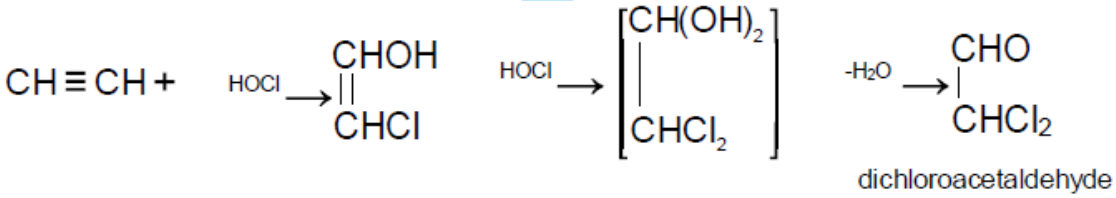
126. Sol.

Beryllium shows anomalous properties due to its small size

127. Sol.

$$E_{cell} = E_{right\ (cathode)} - E_{left(anode)}$$

128. Sol.



129. Sol.

Aldehydic group gets oxidised to carboxylic group Double bond breaks and carbon gets oxidised to carboxylic group

130. Sol.

The E^0 of cell will be zero

132. Sol.

$$C_2H_5NH_2 + CHCl_3 + 3KOH \rightarrow C_2H_5N = C + 3KCl + 3HCl$$

Ethyl isocyanide

135. Sol.

After every 5 years amount is becoming half.

$\therefore 64g \xrightarrow{5yrs} 32g \xrightarrow[(10)]{5yrs} 16g \xrightarrow[(15)]{5yrs} 8g$

after 15 years.

136. Sol.

Forms a soluble complex which is precipitated with zinc

138. Sol.

Volume increases with rise in temperature.

141. Sol.

Pure metal always deposits at cathode

142. Sol.

A more basic ligand forms stable bond with metal ion, Cl^- is most basic amongst all

143. Sol.

$${}_0n^1 \rightarrow {}_{+1}p^1 + {}_{-1}e^0$$

144. Sol.

$$\left[\Delta H_{mix} < 0\right]$$

146. Sol.

BCC - points are at corners and one in the centre of the unit cell

Number of atoms per unit cell $= 8 \times \frac{1}{8} + 1 = 2$

FCC - points are at the corners and also centre of the six faces of each cell

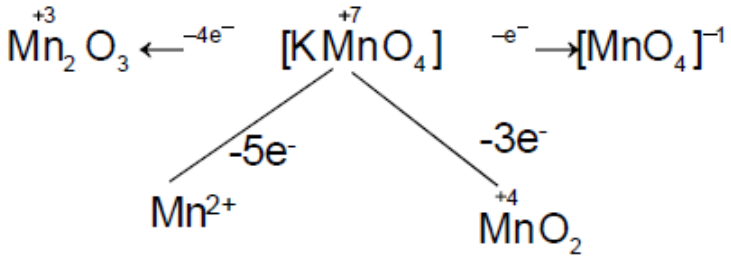
Number of atoms per unit cell $= 8 \times \frac{1}{8} + 6 \times \frac{1}{2} = 4$

147. Sol.

$$\text{Fe}\left(\text{no. of moles}\right) = \frac{558.5}{55.85} = 10\,\text{moles}$$

$$\text{C}\left(\text{no. of moles}\right) = 60/12 = 5\,\text{moles}.$$

148. Sol.



149. Sol.

The oxidation states show a change only in reaction (d)

$$\overset{0}{Zn}+w\overset{+1}{A}gCN \rightarrow 2A\overset{0}{g}+\overset{+2}{Zn}(CN)^{2}$$

150. Sol.

$$K_p = K_c(RT)^{\Delta n};\ \Delta n = 1-\left(1+\frac{1}{2}\right)=1-\frac{3}{2}=-\frac{1}{2}$$

$$\therefore \frac{K_p}{K_c}=(RT)^{-1/2}$$