

AIEEE Entrance Test - 2005

CHEMISTRY SOLUTION

76. Which of the following oxides is amphoteric in character ?

- (1) CaO (2) CO₂ (3) SiO₂ (4) SnO₂

Sol: Ans [4]

77. Which one of the following species is diamagnetic in nature ?

- (1) He₂⁺ (2) H₂ (3) H₂⁺ (4) H₂⁻

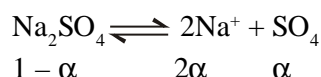
Sol: Ans [2]

According to M.O. theory.

78. If α is the degree of dissociation of Na₂SO₄ the vant Hoff's factor (i) used for calculating the molecular mass is

- (1) 1 + α (2) 1 - α (3) 1 + 2 α (4) 1 - 2 α

Sol: Ans [3]



Particles after dissociation $1 - \alpha + 2\alpha + \alpha = 1 + 2\alpha$.

79. The oxidation state of Cr in [Cr(NH₃)₄Cl₂]⁺ is

- (1) +3 (2) +2 (3) +1 (4) 0

Sol: Ans [1]

80. Hydrogen bomb is based on the principle of

- (1) nuclear fission (2) natural radioactivity
(3) nuclear fusion (4) artificial radioactivity

Sol: Ans [3]

81. An ionic compound has a unit cell consisting of A ions at the corners of a cube and B ions on the centres of the faces of the cube. The empirical formula for this compound would be

- (1) AB (2) A₂B (3) AB₃ (4) A₃B

Sol: Ans [3]

$$\text{For A} = 8 \times \frac{1}{8} = 1$$

$$\text{For B} = 6 \times \frac{1}{2} = 3 \quad \text{hence AB}_3$$

82. For a spontaneous reaction, the ΔG , equilibrium constant (K) and E_{cell}° will be respectively

- (1) -ve, >1, +ve (2) +ve, >1, -ve (3) -ve, <1, -ve (4) -ve, >1, -ve

Sol: Ans [1]

83. Which of the following is a polyamide?
(1) Teflon (2) Nylon-66 (3) Terylene (4) Bakelite

Sol: Ans [2]

Nylon - 66, it has $-\text{NH}-\overset{\text{O}}{\parallel}{\text{C}}-$ group

84. Which one of the following types of drugs reduces fever ?
(1) Analgesic (2) Antipyretic (3) Antibiotic (4) Tranquiliser

Sol: Ans [2]

85. Due to the presence of an unpaired electron, free radicals are :
(1) Chemically reactive (2) Chemically inactive (3) Anions (4) Cations

Sol: Ans [1]

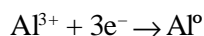
86. Lattice energy of an ionic compound depends upon
(1) Charge on the ion only (2) Size of the ion only
(3) Packing of ions only (4) Charge on the ion and size of the ion

Sol: Ans [4]

87. The highest electrical conductivity of the following aqueous solutions is of
(1) 0.1 M acetic acid (2) 0.1 M chloroacetic acid
(3) 0.1 M fluoroacetic acid (4) 0.1 M difluoroacetic acid

Sol: Ans [4]

88. Aluminium oxide may be electrolysed at 1000°C to furnish aluminium metal (at. mass = 27 amu; 1 Faraday = 96,500 Coulombs). The cathode reaction is



To prepare 5.12 kg of aluminium metal by this method would require

- (1) 5.49×10^7 C of electricity (2) 1.83×10^7 C of electricity
(3) 5.49×10^4 C of electricity (4) 5.49×10^1 C of electricity

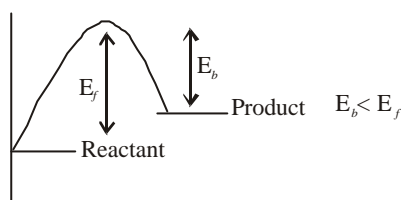
Sol: Ans [1]

According to Faraday's law of equivalence.

89. Consider an endothermic reaction $\text{X} \rightarrow \text{Y}$ with the activation energies E_b and E_f for the backward and forward reactions, respectively. In general

- (1) $E_b < E_f$
(2) $E_b > E_f$
(3) $E_b = E_f$
(4) there is no definite relation between E_b and E_f

Sol: Ans [1]



90. Consider the reaction : $N_2 + 3H_2 \rightarrow 2NH_3$ carried out at constant temperature and pressure. If ΔH and ΔU are the enthalpy and internal energy changes for the reaction, which of the following expressions is true ?

(1) $\Delta H = 0$ (2) $\Delta H = \Delta U$ (3) $\Delta H < \Delta U$ (4) $\Delta H > \Delta U$

Sol: Ans [3]

$$\Delta H = \Delta U + \Delta n_g RT = 0 - 2RT$$

Hence $\Delta H < \Delta U$

91. Which one of the following statements is NOT true about the effect of an increase in temperature on the distribution of molecular speeds in a gas ?

(1) The most probable speed increases
 (2) The fraction of the molecules with the most probable speed increases
 (3) The distribution becomes broader
 (4) The area under the distribution curve remains the same as under the lower temperature

Sol: Ans [2]

92. The volume of a colloidal particle, V_c as compared to the volume of a solute particle in a true solution V_s , could be

(1) $\frac{V_c}{V_s} \approx 1$ (2) $\frac{V_c}{V_s} \approx 10^{23}$ (3) $\frac{V_c}{V_s} \approx 10^{-3}$ (4) $\frac{V_c}{V_s} \approx 10^3$

Sol: Ans [4]

$$\frac{V_c}{V_s} \approx \frac{10^{-4}}{10^{-7}} \approx 10^3$$

93. The solubility product of a salt having general formula MX_2 , in water is : 4×10^{-12} . The concentration of M^{2+} ions in the aqueous solution of the salt is

(1) $2.0 \times 10^{-6} \text{ M}$ (2) $1.0 \times 10^{-4} \text{ M}$ (3) $1.6 \times 10^{-4} \text{ M}$ (4) $4.0 \times 10^{-10} \text{ M}$

Sol: Ans [2]

$$K_{sp} = 4S^3 ; S = 1.0 \times 10^{-4} \text{ M}$$

94. Benzene and toluene form nearly ideal solutions. At 20°C , the vapour pressure of benzene is 75 torr and that of toluene is 22 torr. The partial vapour pressure of benzene at 20°C for a solution containing 78 g of benzene and 46 g of toluene in torr is

(1) 50 (2) 25 (3) 37.5 (4) 53.5

Sol: Ans [1]

According to Raoult's law, partial pressure of benzene = $p^\circ.X$

95. The exothermic formation of CF_3 is represented by the equation :



Which of the following will increase the quantity of CF_3 in an equilibrium mixture of Cl_2 , F_2 and CF_3 ?

- (1) Increasing the temperature (2) Removing Cl_2
 (3) Increasing the volume of the container (4) Adding F_2

Sol: Ans [4]

According to Le-Chatellier's principle

96. Two solutions of a substance (non electrolyte) are mixed in the following manner. 480 ml of 1.5 M first solution + 520 mL of 1.2 M second solution. What is the molarity of the final mixture ?

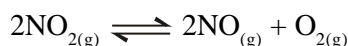
- (1) 1.20 M (2) 1.50 M (3) 1.344 M (4) 2.70 M

Sol: Ans [3]

Applying $M_1V_1 + M_2V_2 = M_3V_3$

$$M_3 = 1.344 \text{ M}$$

97. For the reaction



$$(K_C = 1.8 \times 10^{-6} \text{ at } 184^\circ\text{C})$$

$$(R = 0.0831 \text{ kJ / (mol.K)})$$

When K_p and K_C are compared at 184°C it is found that

- (1) K_p is greater than K_C
 (2) K_p is less than K_C
 (3) $K_p = K_C$
 (4) Whether K_p is greater than, less than or equal to K_C depends upon the total gas pressure

Sol: Ans [1]

Applying $K_p = K_C(RT)^{\Delta n}$, $K_p = K_C(RT) = K_C = \frac{K_p}{RT}$

98. Hydrogen ion concentration in mol/L in a solution of pH = 5.4 will be :

- (1) 3.98×10^8 (2) 3.88×10^6 (3) 3.68×10^{-6} (4) 3.98×10^{-6}

Sol: Ans [4]

$$\text{pH} = 5.4 \quad H^+ = 10^{-5.4} = 3.98 \times 10^{-6}$$

99. A reaction involving two different reactants can never be

- (1) unimolecular reaction (2) first order reaction
 (3) second order reaction (4) bimolecular reaction

Sol: Ans [1]

100. If we consider that $1/6$, in place of $1/12$, mass of carbon atom is taken to be the relative atomic mass unit, the mass of one mole of substance will

- (1) decrease twice
- (2) increase two fold
- (3) remain unchanged
- (4) be a function of the molecular mass of the substance

Sol: Ans [2]

101. In a multi-electron atom, which of the following orbitals described by the three quantum number will have the same energy in the absence of magnetic and electric fields ?

- | | |
|---------------------------|---------------------------|
| (a) $n = 1, l = 0, m = 0$ | (b) $n = 2, l = 0, m = 0$ |
| (c) $n = 2, l = 1, m = 1$ | (d) $n = 3, l = 2, m = 0$ |
| (e) $n = 3, l = 2, m = 0$ | |
- (1) (a) and (b) (2) (b) and (c) (3) (c) and (d) (4) (d) and (e)

Sol: Ans [4]

102. During the process of electrolytic refining of copper, some metals present as impurity settle as 'anode mud'. These are

- (1) Sn and Ag (2) Pb and Zn (3) Ag and Au (4) Fe and Ni

Sol: Ans [3]

Electrolyte	KCl	KNO ₃	HCl	NaOAc	NaCl
103. Λ^∞ (S cm ² mol ⁻¹)	149.9	145.0	426.2	91.0	126.5

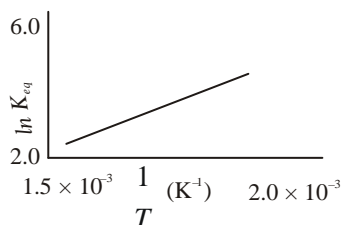
Calculate Δ_{HOAc}^∞ using appropriate molar conductances of the electrolytes listed above at infinite dilution in H₂O at 25°C

- (1) 517.2 (2) 552.7 (3) 390.7 (4) 217.5

Sol: Ans [3]

Applying Kohlrausch's law

104. A schematic plot of $\ln K_{eq}$ versus inverse of temperature for a reaction is shown below



The reaction must be

- | | |
|---|--|
| (1) exothermic | (2) endothermic |
| (3) one with negligible enthalpy change | (4) highly spontaneous at ordinary temperature |

Sol: Ans [1]

This is applied for Exothermic reaction

105. The disperse phase in colloidal iron (III) hydroxide and colloidal gold is positively and negatively charged, respectively. Which of the following statements is NOT correct?

- (1) Magnesium chloride solution coagulates, the gold sol more readily than the iron (III) hydroxide sol.
- (2) Sodium sulphate solution causes coagulation in both sols
- (3) Mixing the sols has no effect
- (4) Coagulation in both sols can be brought about by electrophoresis

Sol: Ans [3]

106. Based on lattice energy and other considerations which one of the following alkali metal chlorides is expected to have the highest melting point ?

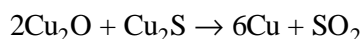
- (1) LiCl
- (2) NaCl
- (3) KCl
- (4) RbCl

Sol: Ans [1]

107. Heating mixture of Cu_2O and Cu_2S will give

- (1) $\text{Cu} + \text{SO}_2$
- (2) $\text{Cu} + \text{SO}_3$
- (3) $\text{CuO} + \text{CuS}$
- (4) Cu_2SO_3

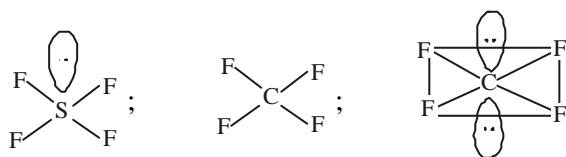
Sol: Ans [1]



108. The molecular shapes of SF_4 , CF_4 and XeF_4 are

- (1) the same with 2, 0 and 1 lone pairs of electrons
- (2) the same with 1, 1 and 1 lone pair of electrons on the central atoms, respectively
- (3) different with 0, 1 and 2 lone pairs of electrons on the central atom, respectively
- (4) different with 1, 0 and 2 lone pairs of electrons on the central atom, respectively

Sol: Ans [4]



109. The number and type of bonds between two carbon atoms in calcium carbide are

- (1) One sigma, one pi
- (2) One sigma, two pi
- (3) Two sigma, one pi
- (4) Two sigma, two pi

Sol: Ans [2]



110. The oxidation state of chromium in the final product formed by the reaction between KI and acidified potassium dichromate solution is

- (1) +4
- (2) +6
- (3) +2
- (4) +3

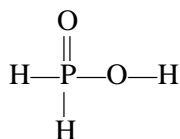
Sol: Ans [4]

Acidic $\text{K}_2\text{Cr}_2\text{O}_7$ acts as oxidising agent itself reduced from Cr(+6) to Cr(+3).

111. The number of hydrogen atom(s) attached to phosphorus atom in hypophosphorous acid is

- (1) zero (2) two (3) one (4) three

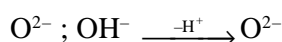
Sol: Ans [2]



112. What is the conjugate base of OH^- ?

- (1) O_2 (2) H_2O (3) O^- (4) O^{2-}

Sol: Ans [4]



113. The correct order of the thermal stability of hydrogen halides ($\text{H}-\text{X}$) is

- (1) $\text{HI} > \text{HBr} > \text{HCl} > \text{HF}$ (2) $\text{HF} > \text{HCl} > \text{HBr} > \text{HI}$
 (3) $\text{HCl} < \text{HF} > \text{HBr} < \text{HI}$ (4) $\text{HI} > \text{HCl} < \text{HF} > \text{HBr}$

Sol: Ans [2]

114. Heating an aqueous solution of aluminium chloride to dryness will give

- (1) AlCl_3 (2) Al_2Cl_6 (3) Al_2O_3 (4) $\text{Al}(\text{OH})\text{Cl}_2$

Sol: Ans [3]

115. Calomel (Hg_2Cl_2) on reaction with ammonium hydroxide gives

- (1) HgNH_2Cl (2) $\text{NH}_2-\text{Hg}-\text{Hg}-\text{Cl}$ (3) Hg_2O (4) HgO

Sol: Ans [1]

116. In which of the following arrangements the order is NOT according to the property indicated against it ?

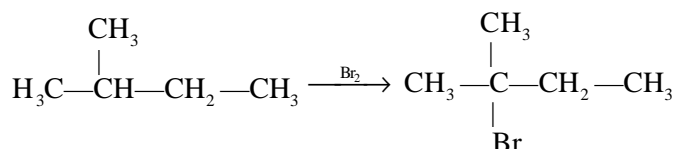
- (1) $\text{Al}^{3+} < \text{Mg}^{2+} < \text{Na}^+ < \text{F}^-$:
 Increasing ionic size (2) $\text{B} < \text{C} < \text{N} < \text{O}$:
 Increasing first ionization enthalpy
 (3) $\text{I} < \text{Br} < \text{F} < \text{Cl}$:
 Increasing electron gain enthalpy
 (with negative sign) (4) $\text{Li} < \text{Na} < \text{K} < \text{Rb}$:
 Increasing metallic radius

Sol: Ans [2]

117. In silicon dioxide

- (1) each silicon atom is surrounded by four oxygen atoms and each oxygen atom is bonded to two silicon atoms
 (2) each silicon atom is surrounded by two oxygen atoms and each oxygen atom is bonded to two silicon atoms
 (3) silicon atom is bonded to two oxygen atoms
 (4) there are double bonds between silicon and oxygen atoms

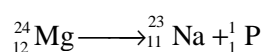
Sol: Ans [2]



124. A photon of hard gamma radiation knocks a proton out of ${}^{24}_{12}\text{Mg}$ nucleus to form

- (1) the isotope of parent nucleus (2) the isobar of parent nucleus
 (3) the nuclide ${}^{23}_{11}\text{Na}$ (4) the isobar of ${}^{23}_{11}\text{Na}$

Sol: Ans [3]



125. The best reagent to convert pent-3-en-2-ol into pent-3-en-2-one is

- (1) Acidic permanganate (2) Acidic dichromate
 (3) Chromic anhydride in glacial acetic acid (4) Pyridinium chloro-chromate

Sol: Ans [4]

126. Tertiary alkyl halides are practically inert to substitution by S_N2 mechanism because of

- (1) insolubility (2) instability (3) inductive effect (4) steric hindrance

Sol: Ans [4]

127. In both DNA and RNA, heterocyclic base and phosphate ester linkages are at

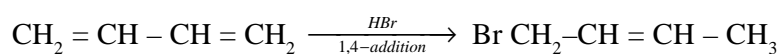
- (1) C'_5 and C'_2 respectively of the sugar molecule
 (2) C'_2 and C'_5 respectively of the sugar molecule
 (3) C'_1 and C'_5 respectively of the sugar molecule
 (4) C'_5 and C'_1 respectively of the sugar molecule

Sol: Ans [3]

128. Reaction of one molecule of HBr with one molecule of 1, 3-butadiene at 40°C gives predominantly

- (1) 3-bromobutene under kinetically controlled conditions
 (2) 1-bromo-2-butene under thermodynamically controlled conditions
 (3) 3-bromobutene under thermodynamically controlled conditions
 (4) 1-bromo-2-butene under kinetically controlled conditions

Sol: Ans [2]



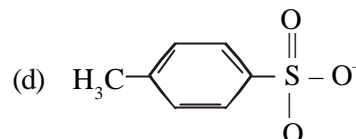
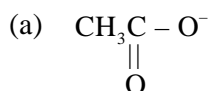
129. Among the following acids which has the lowest pK_a value ?

- (1) CH_3COOH (2) HCOOH
 (3) $(\text{CH}_3)_2\text{CH} - \text{COOH}$ (4) $\text{CH}_3\text{CH}_2\text{COOH}$

Sol: Ans [2]

$\begin{array}{c} \text{O} \\ || \\ \text{H}-\text{C}-\text{OH} \end{array}$ is strongest among the given acids hence lowest pK_a value.

130. The decreasing order of nucleophilicity among the nucleophiles



- (1) (a), (b), (c), (d) (2) (d), (c), (b), (a) (3) (b), (c), (a), (d) (4) (c), (b), (a), (d)

Sol: Ans [3]

131. Which one of the following methods is neither meant for the synthesis nor for separation of amines ?

- (1) Hinsberg method (2) Hofmann method (3) Wurtz reaction (4) Curtius reaction

Sol: Ans [3]

Wurtz reaction is used for synthesis of alkanes.

132. Which of the following is fully fluorinated polymer ?

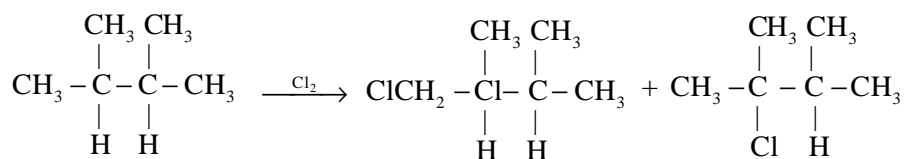
- (1) Neoprene (2) Teflon (3) Thiokol (4) PVC

Sol: Ans [2]

133. Of the five isomeric hexanes, the isomer which can give two monochlorinated compounds is

- (1) n-hexane (2) 2, 3-dimethylbutane (3) 2, 2-dimethylbutane (4) 2-methylpentane

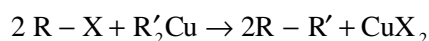
Sol: Ans [2]



134. Alkyl halides react with dialkyl copper reagents to give

- (1) alkenes (2) alkyl copper halides (3) alkanes (4) alkenyl halides

Sol: Ans [3]



135. Acid catalyzed hydration of alkenes except ethene leads to the formation of

- (1) primary alcohol (2) secondary or tertiary alcohol
(3) mixture of primary and secondary alcohols (4) mixture of secondary and tertiary alcohols

Sol: Ans [2]

Except ethene, other alkenes on acid catalysed hydration form 2° or 3° alcohols, due to the formation of more stable carbocation

136. Amongst the following the most basic compound is

- (1) benzylamine (2) aniline (3) acetanilide (4) p-nitroaniline

Sol: Ans [1]

In benzyl amine $\left(\begin{array}{c} \text{CH}_2\text{NH}_2 \\ | \\ \text{C}_6\text{H}_5 \end{array} \right)$ the lone pair of electrons is not involved in resonance with phenyl ring as in all other cases.

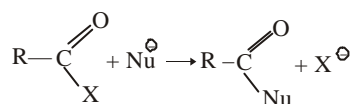
137. Which types of isomerism is shown by 2, 3-dichlorobutane ?

- (1) Diastereo (2) Optical (3) Geometric (4) Structural

Sol: Ans [2]

The given compound has 2 chiral centres and forms 3 stereoisomers *d*, *l* and meso.

138. The reaction



is fastest when X is

- (1) Cl (2) NH₂ (3) OC₂H₅ (4) OCOR

Sol: Ans [1]

-Cl being weakest base is a good leaving group.

139. Elimination of bromine from 2-bromobutane results in the formation of

- (1) equimolar mixture of 1 and 2-butene (2) predominantly 2-butene
(3) predominantly 1-butene (4) predominantly 2-butyne

Sol: Ans [2]

Saytzeff rule

140. Equimolar solutions in the same solvent have

- (1) Same boiling point but different freezing point (2) Same freezing point but different boiling point
(3) Same boiling and same freezing points (4) Different boiling and different freezing points

Sol: Ans [3]

Factual, based on the fact that colligative properties depend upon the number of particles

141. Which of the following statements in relation to the hydrogen atom is correct ?

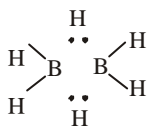
- (1) 3s orbital is lower in energy than 3p orbital
(2) 3p orbital is lower in energy than 3d orbital
(3) 3s and 3p orbitals are of lower energy than 3d orbital
(4) 3s, 3p and 3d orbitals all have the same energy

Sol: Ans [1]

142. The structure of diborane (B_2H_6) contains

- (1) four 2c-2e bonds and two 3c-2e bonds (2) two 2c-2e bonds and four 3c-2e bonds
 (3) two 2c-2e bonds and two 3c-3e bonds (4) four 2c-2e bonds and four 3c-2e bonds

Sol: Ans [1]



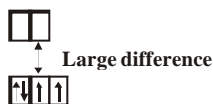
Diborane has 4 two centre-two electron bonds and 2 three centre-two electron bonds.

143. The value of the 'spin only' magnetic moment for one of the following configurations is 2.84 BM. The correct one is

- (1) d^4 (in strong ligand field) (2) d^4 (in weak ligand field)
 (3) d^3 (in weak as well as in strong fields) (4) d^5 (in strong ligand field)

Sol: Ans [1]

According to CFT, splitting between t_{2g} and e_g groups is large in strong field and fourth electron gets paired with 3rd electron corresponding to 2 unpaired electrons.



144. Which of the following factors may be regarded as the main cause of lanthanide contraction ?

- (1) Poor shielding of one of 4f electron by another in the subshell
 (2) Effective shielding of one of 4f electrons by another in the subshell
 (3) Poorer shielding of 5d electrons by 4f electrons
 (4) Greater shielding of 5d electron by 4f electrons

Sol: Ans [3]

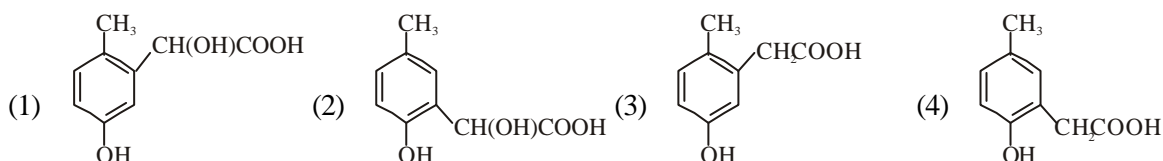
f orbitals have poor shielding effect.

145. Reaction of cyclohexanone with dimethylamine in the presence of catalytic amount of an acid forms a compound if water during the reaction is continuously removed. The compound formed is generally known as

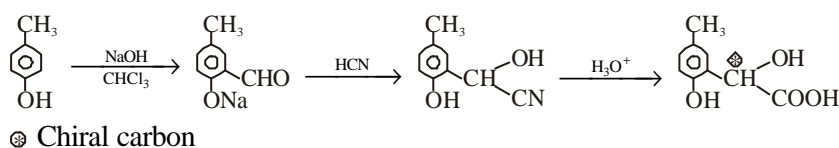
- (1) a Schiff's base (2) an enamine (3) an imine (4) an amine

Sol: Ans [2]

146. *p*-cresol reacts with chloroform in alkaline medium to give the compound A which adds hydrogen cyanide to form, the compound B. The latter on acidic hydrolysis gives chiral carboxylic acid. The structure of the carboxylic acid is



Sol: Ans [2]



147. An organic compound having molecular mass 60 is found to contain C = 20%, H = 6.67% heating it gives NH_3 alongwith a solid residue. the solid residue give violet colour with alkaline copper sulphate solution. The compound is

- (1) CH_3NCO (2) CH_3CONH_2 (3) $(\text{NH}_2)_2\text{CO}$ (4) $\text{CH}_3\text{CH}_2\text{CONH}_2$

Sol: Ans [3]

Ammonia satisfies all the aforesaid data and also the emperical formula is $\text{CH}_4\text{N}_2\text{O}$

148. If the bond dissociation energies of XY , X_2 and Y_2 (all diatomic molecules) are in the ratio of 1 : 1 : 0.5 and $\Delta_f H$ for the formation of XY is $-200 \text{ kJ mole}^{-1}$. The bond dissociation energy of X_2 will be

- (1) 100 kJ mol^{-1} (2) 200 kJ mol^{-1} (3) 300 kJ mol^{-1} (4) 400 kJ mol^{-1}

Sol: Ans [2]

XY and X_2 have dissociation energies in the ratio 1 : 1 hence heat of formation of XY = dissociation enrgy of X_2 (with opp. sign).

149. $t_{\frac{1}{4}}$ can be taken as the time taken for the concentration of a reactant to drop to $\frac{3}{4}$ of its initial value. If

the rate constant for a first order reaction is K , the $t_{\frac{1}{4}}$ can be written as

- (1) $0.10 / K$ (2) $0.29 / K$ (3) $0.69 / K$ (4) $0.75 / K$

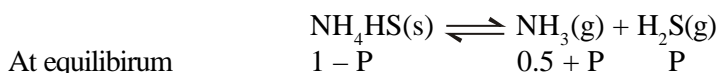
Sol: Ans [2]

$$Kt_{1/4} = 2.303 \log \frac{1}{3/4}$$

150. An amount of solid NH_4HS is placed in a flask already containing ammonia gas at a certain temperature and 0.50 atm. pressure. Ammonium hydrogen sulphide deocomposes to yield NH_3 and H_2S gases in the flask. When the decomposition reaction reaches equilibrium, the total pressure in the flask rises to 0.84 atm. The equilibrium constant for NH_4HS decomposition at this temperature is

- (1) 0.30 (2) 0.18 (3) 0.17 (4) 0.11

Sol: Ans [4]



At equilibrium

$$1 - P \qquad 0.5 + P \qquad P$$

Total pressure at equilibrium

$$0.5 + P + P = 0.84$$

or $P = 0.17$

$$K_p = (0.5 + P) P = 0.17 \times 0.67 = 0.11$$

