KNT/KW/16/5142

Bachelor of Science (B.Sc.) Semester—IV (C.B.S.) Examination

CHEMISTRY (Inorganic Chemistry)

Paper—I

Time : Three Hours] [Maximum Marks : 50

N.B. :— (1) All **FIVE** questions are compulsory and carry equal marks.

(2) Write equation and draw diagram wherever necessary.

1. (A) Discuss :

(i) Postulates of Werner's theory of coordination compounds.

(ii) $[NiCl_4]^{2-}$ is tetrahedral and paramagnetic while $[Ni(CN)_4]^{2-}$ is square planar and diamagnetic. 5

(B) What are Chelates ? Give the classification of Chelates formed by bidentate ligands with examples. 5

OR

(C) Discuss Sidwick's electronic interpretation of the metal complexes. 2½

(D) Write the formula of the following complexes :

(i) Hexammine Cobalt (III) Chloride

(ii) Hexacyano Ferrate (II) ion. 2½

(E) What is effective atomic number ? Calculate EAN of $[CoF_6]^{3-}$. 2½

(F) Differentiate between double salt and coordination compounds. 2½

2. (A) Define stereoisomerism. What are its types ? Explain geometrical isomerism in four coordinated complexes. 5

(B) What are Frost diagrams ? Construct and explain Frost diagram for nitrogen under standard condition (pH = 0) indicating position of N_2, N_2O, NO, HNO_2, N_2O_4 and HNO_3. 5

OR

(C) Explain optical isomerism in four coordinated complexes. 2½

(D) Explain the following types of structural isomerism :

(i) Ionization isomerism and

(ii) Ligand isomerism. 2½

(E) Draw the Pourbaix diagram for naturally occurring compounds of iron. 2½

(F) Discuss the redox stability field of water. 2½

3. (A) Give one method of preparation of alkyl and aryl lithium. What is the action of alkyl lithium on :
   (i) H_2O and
   (ii) HCN ? 5
   (B) Write any two methods of preparation of nickel carbonyl. Discuss the bonding and structure in $Ni(CO)_4$. 5

OR

   (C) Explain the mechanism of homogeneous hydrogenation of alkenes. 2½
   (D) Give applications of organo-metallic compounds. 2½
   (E) What is meant by back π-bonding ? Explain this concept in metal carbonyls. 2½
   (F) Discuss structure and bonding in $Fe(CO)_5$. 2½

4. (A) What do you know about the role of essential elements in biological systems ? Discuss in detail. 5
   (B) What is meant by hard and soft acids ? Identify following as hard and soft acids and bases :
   (i) CO^{3+} (ii) Cr^{3+}
   (iii) Cu^{+} (iv) NH_3
   (v) H_2O and (vi) CN^{-} 5

OR

   (C) Discuss the structure of myoglobin. 2½
   (D) Describe the role of metalloporphyrins in biological system. 2½
   (E) What is Symbiosis ? Explain with example. 2½
   (F) By using HSAB principle, explain why HgS is insoluble and $Hg(OH)_2$ is soluble in dil HCl. 2½

5. Attempt any **TEN** of the following :
   (i) What is Ligand ? 1
   (ii) What is the oxidation state of Platinum in $[Pt(NH_3)_4Cl_2]^{2+}$ ion ? 1
   (iii) What do you mean by inner orbital octahedral complexes ? 1
   (iv) Explain coordination isomerism. 1
   (v) Draw and label cis and trans forms of the $[CO(NH_3)_4(H_2O)_2]^{3+}$. 1
   (vi) Draw Frost diagram for oxygen in acidic medium. 1
   (vii) Draw the molecular structure of Zeise's salt. 1
   (viii) Give the names of organo-metallic compound $(C_2H_5)_3As$. 1
   (ix) What are metal carbonyls ? 1
   (x) What do you mean by Sodium-pump ? 1
   (xi) What is hypercalcemia ? 1
   (xii) Give any two limitations of HSAB concept. 1