

**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)  $[\text{NiCl}_4]^{2-}$  is tetrahedral and paramagnetic while  $[\text{Ni}(\text{CN})_4]^{2-}$  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  $[\text{CoF}_6]^{3-}$ . 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 ( $\text{pH} = 0$ ) indicating position of  $\text{N}_2$ ,  $\text{N}_2\text{O}$ ,  $\text{NO}$ ,  $\text{HNO}_2$ ,  $\text{N}_2\text{O}_4$  and  $\text{HNO}_3$ . 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)  $\text{H}_2\text{O}$  and  
 (ii)  $\text{HCN}$  ? 5
- (B) Write any two methods of preparation of nickel carbonyl. Discuss the bonding and structure in  $\text{Ni}(\text{CO})_4$ . 5

**OR**

- (C) Explain the mechanism of homogeneous hydrogenation of alkenes.  $2\frac{1}{2}$   
 (D) Give applications of organo-metallic compounds.  $2\frac{1}{2}$   
 (E) What is meant by back  $\pi$ -bonding ? Explain this concept in metal carbonyls.  $2\frac{1}{2}$   
 (F) Discuss structure and bonding in  $\text{Fe}(\text{CO})_5$ .  $2\frac{1}{2}$
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)  $\text{CO}^{3+}$  (ii)  $\text{Cr}^{3+}$   
 (iii)  $\text{Cu}^+$  (iv)  $\text{NH}_3$   
 (v)  $\text{H}_2\text{O}$  and (vi)  $\text{CN}^-$  5

**OR**

- (C) Discuss the structure of myoglobin.  $2\frac{1}{2}$   
 (D) Describe the role of metalloporphyrins in biological system.  $2\frac{1}{2}$   
 (E) What is Symbiosis ? Explain with example.  $2\frac{1}{2}$   
 (F) By using HSAB principle, explain why  $\text{HgS}$  is insoluble and  $\text{Hg}(\text{OH})_2$  is soluble in dil  $\text{HCl}$ .  $2\frac{1}{2}$
5. Attempt any **TEN** of the following :  
 (i) What is Ligand ? 1  
 (ii) What is the oxidation state of Platinum in  $[\text{Pt}(\text{NH}_3)_4\text{Cl}_2]^{2+}$  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  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})_2]^{3+}$ . 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  $(\text{C}_2\text{H}_5)_3\text{As}$ . 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