NKT/KS/17/5142

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

CHEMISTRY (INORGANIC CHEMISTRY) (CH-401)

Paper—I

Time : Three Hours] [Maximum Marks : 50

Note :— (1) All **FIVE** questions are compulsory and carry equal marks.
(2) Write equations and draw diagrams wherever necessary.

1. (A) What are the postulates of Werner's theory of coordination ? How many chloride ions will be precipitated when the following complexes are treated with $AgNO_3$:
(i) $CoCl_3.5NH_3$, (ii) $CoCl_3.4NH_3$ and (iii) $CoCl_3.3NH_3$? 5

(B) Give the postulates of VBT on the basis of it explain that $[CoF_6]^{3-}$ is octahedral and paramagnetic in nature. 5

OR

(C) Write formula of the following :
(i) Potassium hexacyanoferrate (III)
(ii) Dichlorobis (ethylene diamine) cobalt (III) ion. 2½

(D) Calculate EAN in the following :
(i) $[Fe(CN)_6]^{4-}$
(ii) $[NiCl_4]^{2-}$ 2½

(E) What is chelate ? Explain the applications of chelate in quantitative analysis. 2½

(F) Distinguish between double salts and coordination compounds giving examples. 2½

2. (A) Draw diagram of stability field of water and explain where water act as oxidizing and reducing agent giving suitable example. 5

(B) (i) Explain ionization and coordination isomerism giving one example of each.
(ii) Draw the structure of isomers exhibited by $[Co(en)_2Cl_2]^+$ complex ion. 5

OR

(C) What is Frost diagram ? Draw Froast diagram of oxygen and explain why H_2O_2 tends to undergo disproportionation. 2½

(D) Draw and explain Frost diagram of nitrogen in basic medium. 2½

(E) What is disproportionation ? Explain disproportionation of Cu^+ ion in water. 2½

(F) Discuss geometrical isomerism in 4-coordinated complexes. 2½

3. (A) What are organometallic compounds ? Discuss its classification on the basis of nature of metal-carbon bond with an example. 5

(B) What is meant by back π-bonding ? Explain this concept in metal carbonyls. Give one method of preparation of each $Fe(Co)_5$ and $Cr(Co)_6$. 5

OR

(C) Write IUPAC names of the following :

(i) $(C_6H_5CH_2)_3As$

(ii) C_2H_5BeH. 2½

(D) Give any two methods of preparation of trialkylaluminium. 2½

(E) Discuss the structure and bonding in $Fe(Co)_5$. 2½

(F) What is the action of following on $Ni(Co)_4$:

(i) Na in liq. NH_3 and (ii) Br_2. 2½

4. (A) Name any four essential trace elements in biological processes. Discuss the role of calcium in biological system. Explain the working of calcium pump. 5

(B) What are hard and soft acids ? Explain the followings :

(i) AgI_2 is stable while AgF_2 is not, and

(ii) $Hg(OH)_2$ is soluble but HgS is insoluble in dil. HCl. 5

OR

(C) Identify the following as hard and soft bases :

(i) CN^-, (ii) H_2O, (iii) OH^- and (iv) SCN^-. 2½

(D) Write a note on symbosis. 2½

(E) Explain the mechanism of oxygen transfer from haemoglobin to myoglobin. 2½

(F) Write a note on hypercalcemia and hypocalcemia. 2½

5. Attempt any **TEN** of the following :

(i) Define the term complex ion.

(ii) Write the type of hybridization involve in $[Fe(CN)_6]^{3-}$ and $[FeF_6]^{3-}$.

(iii) Write the structure of chelate formed by bidentate ligand.

(iv) Write two optical isomers of cis $[Co(en)_2 (NH_3)_2]^{3+}$.

(v) Define comproportionation.

(vi) Draw latimer diagram of oxygen.

(vii) Write the structure of Zeise's salt.

(viii) Give two uses of organometallic compounds.

(ix) Write the structure of $[Cr(Co)_6]$.

(x) Draw the structure of Haemoglobin.

(xi) What is sodium pump ?

(xii) State HSAB principle. 1×10=10