LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **CHEMISTRY**

FIFTH SEMESTER – **NOVEMBER 2024**

16/17/18UCH5MC01 – COORDINATION CHEMISTRY

Date: 07-11-2024 Dept. No. Max. : 100 Marks

Time: 09:00 am-12:00 pm

Section-A

Answer any FOUR questions. **(4 × 10 = 40)**

1 a. Define EAN. How is it related to the stability of a complex? (5)

b. Compute CFSE for d^8, low and high spin octahedral and tetrahedral complexes. (5)

2. Describe the bonding and magnetic properties of $[Co(H_2O)_6]^{3+}$ using CFT theory.

3 a. What are the experimental evidences for outer sphere electron transfer mechanism? (5)

b. Write a note on the hydroformylation. (5)

4. Outline the characteristics of metal carbenes and carbynes.

5. Illustrate the synthesis and structural features of ferrocene.

6. Compare and contrast complementary and non-complementary electron transfer reactions.

7. How does *trans*-effect facilitate the design and synthesize of square planar complexes? Explain with two examples.

8 a. Write a brief note on contrast agents in MRI. (5)

b. Draw the structure of carboxypeptidase-A and explain its biological importance. (5)

Section-B

Answer any THREE questions. **(3 × 20 = 60)**

9 a. How do *d*-orbitals split up for the formation of tetrahedral and octahedral complexes? (10)

b. Describe the structural, optical and geometrical isomerisms exhibited by coordination compounds. (10)

10 a. Highlight the postulates of VB theory and discuss the geometry of the paramagnetic $[FeF_6]^{4-}$ and diamagnetic $[Fe(CN)_6]^{4-}$. (10)

b. Construct a qualitative MO energy level diagram for σ-bonding in octahedral geometry. (10)

11 a. Discuss the oxidative addition and reductive elimination reactions with examples. (10)

b. Explain the associative and dissociative mechanisms of ligand substitution reactions in octahedral complexes. (10)

12 a. Describe the importance of Zeigler-Natta catalyst in the polymerization of olefins. (10)

b. Illustrate the Monsanto acetic acid process. (10)

13 a. Outline the *in vivo* and *in vitro* nitrogen fixation processes with examples. (10)

b. Sketch the structure of hemoglobin and describe the process of oxygen transport in mammalian system. (10)

14. State Jahn-Teller distortion theorem and explain the crystal field splitting in tetragonally distorted octahedral and square planar geometries.
