LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

SIXTH SEMESTER – **NOVEMBER 2023**

UCH 6501 – COORDINATION CHEMISTRY

Date: 30-10-2023 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

Part-A

Answer ALL questions. **(10 x 2 = 20)**

1. Calculate CFSE for d^7 high-spin octahedral complex.
2. What is nephelauxetic effect?
3. Draw the structure of Vaska's complex.
4. What are non-complementary electron transfer reactions?
5. State the EAN rule.
6. What are π–acceptor ligands?
7. Draw the structure of Wilkinson's catalyst.
8. What is hematin?
9. What are apoenzymes?
10. Mention any two applications of radiopharmaceuticals.

Part-B

Answer any EIGHT questions. **(8 x 5 = 40)**

11. Explain Werner's theory on coordination complexes with an example.
12. Describe the splitting of metal *d*-orbitals in octahedral and tetrahedral symmetries.
13. Explain the associative mechanism of ligand substitution reactions.
14. Illustrate the ionization-, hydrate-, and coordination isomerisms with suitable examples.
15. Cite the evidences of covalency in transition metal complexes.
16. Describe the structure and bonding in ferrocene.
17. Draw and explain the structure of $Fe(CO)_5$.
18. Explain the mechanism of alkene hydrogenation.
19. Describe the *trans*-effect in the synthesis of square planar complexes.
20. How do you prepare Schiff bases using template synthesis? Explain with two examples.
21. Discuss the function of superoxide dismutase.
22. Give the importance of contrast agents in MRI.

Part-C

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

23a. Identify the suitable metal orbitals and LGOs for σ- and π-bonding in octahedral geometry.
b. Construct a qualitative MO energy level diagram for $[Co(NH_3)_6]^{3+}$. (5+5)

24a. Explain the mechanism of outer-sphere electron transfer reaction with suitable examples.
b. Write a short note on oxidative addition and reductive elimination. (5+5)

25a. Write a note on hydroformylation. (5)
b. Describe the mechanism of Ziegler-Natta catalysis. (5)

26a. Explain the *cis*-effect with two examples. (5)
b. Describe the template synthesis of metal phthalocyanins. (5)

27a. Explain the structure and bonding in carbenes. (5+5)
b. How is haemoglobin involved in the oxygen transport process in a mammalian system?

28a. Explain the *in vitro* and *in vivo* nitrogen fixation.

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