Name.............................

Reg.No..........................

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

(Regular/Improvement/Supplementary)

CHEMISTRY

FCHE3C10 - ORGANOMETALLIC AND BIOINORGANIC CHEMISTRY

Time: 3 Hours **Maximum Weightage: 30**

Section A: Short answer questions. Answer any *eight* questions. Each carries *one* weightage.

1. What is hapticity? What must be the hapticity of Cp if the compound $[W(Cp)_2(CO)_2]$ follows the 18 e-rule?
2. How does the electron density of a ligand affect the reactivity of an organometallic compound?
3. What is the significance of the metal-ligand bond strength in organometallic chemistry?
4. Define organometallic compounds. Which of the following is an organometallic compound? $Li(CH_3)]_4$, CH_3COONa and $[SiH(C_2H_5)_3$.
5. What is meant by reductive carbonylation? Explain with an example.
6. Which is more reactive: Fischer carbene or Schrock carbene ? Substantiate your answer.
7. Discuss the structure and bonding in metal-acetylene complexes.
8. Calculate the number of metal-metal bonds in: i) $Co_4 (CO)_{12}$; and ii) $Ru_3(CO)_{12}$.
9. What is superoxide dismutase ? Explain its structure and function.
10. Differentiate between active and passive transport across cell membrane.
11. Explain an isolobal analogy with example.
12. What does it mean by a Chevrel phases? Explain.

(8 × 1 = 8 weightage)

Section B: Short essay question. Answer any *four* questions. Each carries *three* weightage.

13. State and explain 16-electron and 18-electron rules as applied to organometallic compounds.
14. Describe the catalytic process and the mechanism of the reactions involved in Monsanto acetic acid process.
15. Discuss the factors that favour the formation of metal clusters.
16. Explain the role of calcium in blood clotting process.
17. Describe the mechanism of the action of *cis*-platin as an anticancer drug. What are the side effects of this drug?

(P.T.O.)

18. Discuss the structure and functions of cytochrome P450.

19. Write a note on the synthesis, structure and bonding of any two metal carbonyls.

(4 × 3 = 12 weightage)

Section C: Essay questions. Answer any *two* questions. Each carries *five* weightage.

20. Give an account of the synthesis, structure and important reactions of ferrocene.

21. Describe the mechanisms involved in oxidative addition, reductive elimination and insertion reaction of organometallic compounds, giving suitable examples.

22. What is biological nitrogen fixation ? Explain the structure and functions of M-cluster and P-cluster of nitrogenase in nitrogen fixation. Mention the role of metal-dinitrogen complexes in nitrogen fixation.

23. Write accounts on:

    a) Sodium-potassium pump in biological systems.

    b) Physiology of myoglobin and hemoglobin.

    c) Hydroformylation of alkene.

(2 × 5 = 10 weightage)