

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2021  
(Regular/Improvement/Supplementary)

## CHEMISTRY

## FCHE3C10 - ORGANOMETALLIC AND BIOINORGANIC CHEMISTRY

Time: Three Hours

Maximum Weightage: 30

**Section A: Short answer questions. All questions can be answered.****Each carries one weightage (Ceiling 6 weightage).**

1. Dinitrogen complexes are very rare even though  $N_2$  is isoelectronic with CO, which forms a number of complexes. Give reasons.
2. The complex  $[M(\eta^6-C_6H_6)(CO)_2]_2$  obeys the 18-electron rule and has two metal-metal bond. Predict M and sketch the probable structure of the complex.
3. Explain the term hapticity with suitable examples.
4. What are metallocenes? How they are prepared?
5. Distinguish between 1,1 and 1,2 migratory insertion with suitable examples.
6. What are carbonylate anions? How are they prepared?
7. Ethylene is commonly chosen to illustrate homogeneous hydrogenation with Wilkinson's catalyst but the process is very slow. Explain why?
8. Calculate the number of M-M bonds in  $(\eta^4-C_4H_4)_2Fe_2(CO)_3$ .
9. Based on Wade-Mingos rules determine the probable geometry of  $[Fe_5C(CO)_{15}]$  and  $Rh_4(CO)_{12}$ .
10. What do you mean by bulk elements and trace elements? Give examples.
11. Mention the importance of alkali metal ions in biological systems.
12. Give the functions of superoxide dismutase and tyrosinase in biological system.

**Section B: Short essay question. All questions can be answered.****Each carries four weightage (Ceiling 12 weightage).**

13. What are metal carbenes? How will you synthesise Fischer & Schrock carbenes.
14. Discuss the synthesis, structure and bonding in metal-allyl complexes.
15. Briefly discuss olefene metathesis with suitable examples.
16. Explain Monsanto Acetic acid process.
17. Write a note on Zintl ions with suitable examples.
18. Briefly discuss the classification and important functions of iron sulphur proteins.
19. Explain the structure and functions of hemerythrin.

(PTO)

**Section C: Essay questions. Answer *All* questions can be answered.  
Each carries six weightage (Ceiling 12 weightage).**

20. (a) Give the catalytic cycle for the production of acetaldehyde from ethylene by using Wacker process.  
(b) Discuss the biological importance of ferritin and transferrin.
21. (a). Discuss the structure and bonding in  $[\text{Re}_2\text{Cl}_8]^{2-}$ .  
(b). Explain the role of photosystems I and II in photosynthesis.
22. (a) Explain the fluxional behaviour of organometallic compounds with suitable examples.  
(b) Discuss the bonding in metal carbonyls.
23. (a) Explain the structure and bonding in ferrocene.  
(b) What are cytochromes? Give their structural features and biochemical functions.