D 121215 **(Pages : 2)** **Name.....**

Reg. No.....

FOURTH SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, APRIL 2025

(CBCSS)

Chemistry

CHE 4E 08—ORGANOMETALLIC CHEMISTRY

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

Section A

Answer any **eight** *questions.*
Each question carries a weightage of 1.

1. How is trimethylaluminium(III) prepared ? Draw its structure.
2. Explain reductive carbonylation with an example.
3. Fischer carbenes are generally less reactive than Schrock carbenes ; why ?
4. Draw the structure of the possible isomers of $Cp_2Fe_2(CO)_4$.
5. What is the effect of increase of pressure of CO and H_2 on hydroformylation of alkene ?
6. Bring out the mechanism of the insertion reaction involving ethylene.
7. What is hydrosilation? Explain with an example.
8. Explain the formation of organometallic polymers by ring opening polymerization.
9. Cobalt does not form a mononuclear carbonyl; but it forms a mononuclear carbonylnitrosyl with composition $\left[Co(CO)_4 NO\right]$. Explain.
10. Arrange the following in the increasing order of stability ;

    $[FeCp_2]$, $[NiCp_2]$, $[CoCp_2]$. Give reasons.

(8 × 1 = 8 weightage)

Turn over

Section B

Answer any **six** *questions.*
Each question carries a weightage of 2.

11. How is methyllithium prepared ? Explain how this compound forms molecular aggregate:-,
12. Explain the mechanism involved in migratory insertion reaction of metal carbonyls, giving suitable example
13. Give an account of the synthesis and structure of carbene organometallics.
14. What are fluxional organometallics ? How ^{1}H NMR spectroscopy can be used to study the structure of such compounds ?
15. Describe the mechanism of oxidative addition reaction of organometallic compounds with suitable example.
16. Write note on σ-bond metathesis.
17. What is Fischer-Tropsch synthesis ? Explain.
18. Write briefly on organometallic dendrimers.

(6 × 2 = 12 weightage)

Section C

Answer any **two** *questions.*
Each question carries a weightage of 5.

19. Give an account of the structure and bonding in metal carbonyls. Explain how IR spectroscopy can be used to study the different bonding modes of CO groups in metal carbonyls.
20. Discuss the mechanism of the reactions involved in Ziegler-Natta catalysis. Compare the properties of the polyethylene produced by Ziegler-Natta catalysis with that produced by free radical polymerization.
21. Discuss the synthesis, structure and reactivity of ferrocene.
22. Write briefly on :
    a) Carbyne organometallics ;
    b) Oxidative coupling reaction ; and
    c) Water-gas shift reaction.

(2 × 5 = 10 weightage)