

**19P408**

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Name: .....

Reg. No.....

**FOURTH SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2021**

(CBCSS - PG)

**CC19P CHE4 E08 - ORGANOMETALLIC CHEMISTRY**

(Chemistry - Elective Course)

(2019 Admission - Regular)

Time: Three Hours

Maximum: 30 Weightage

**Section A**

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

1. Explain the ionic and covalent counting models in organometallic compounds, taking ferrocene as a representative example.
2. Identify **M**, if it is a first row transition element and  $[\mathbf{M}(\eta^3\text{-C}_5\text{H}_5(\text{CO})_5)]$  is a stable compound.
3. Complete the following reactions,  
(a)  $\text{Cp}_2\text{Co} + \text{K} + 2\text{C}_2\text{H}_4 \rightarrow \dots$  (b)  $\text{W}(\text{CO})_6 + \text{PPh}_3 \xrightarrow{h\nu} \dots$
4. What is Collman's reagent? Write one synthetic application of the reagent.
5. Explain the structure and aromatic behavior of  $(\text{COT})^{2-}$
6. Give one example for reductive elimination of an organometallic compound.
7. Draw the terminal, bridging ( $\mu_2$ ), and bridging ( $\mu_3$ ) bonding modes of CO
8. Write an example for Disproportionation reaction in metal carbonyls
9. Write short note on oxidative addition in organometallic compounds
10. Write the decreasing order of back bonding and appropriate stretching vibration of the following carbonyl complexes,  $\text{Mn}(\text{CO})_6^+$ ,  $\text{V}(\text{CO})_6^-$ ,  $\text{Cr}(\text{CO})_6$ ;  $\nu_{\text{CO}}$  ( $\text{cm}^{-1}$ ) 2000, 2090, 1860.

**(8 x 1 = 8 Weightage)**

**Section B**

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

11. Discuss the features of ethylene ligand in Zeise's salt.
12. Discuss the bonding in the Nitrosyl (NO) metal complexes with appropriate examples.
13. Explain the synthesis and bonding of butadiene complexes with suitable examples.
14. Describe the mechanism of Wacker process.
15. Write short note on carbenes and carbynes complexes.

16. Briefly discuss the general features of migratory insertion reactions and write one example.
17. Explain briefly the Zeigler-Natta polymerization.
18. Write the Direct and Reductive synthetic methods of metal carbonyls with suitable examples.

**(6 x 2 = 12 Weightage)**

### **Section C**

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

19. Illustrate the bonding in ferrocene. Explain on the basis of molecular orbital energy level diagram, the cause for kinetic stability of ferrocene.
20. Explain the Hydrocyanation and hydrosilylation of alkenes with suitable example.
21. (a) With suitable diagrams, discuss the  $\sigma$  and  $\pi$  bonding in metal carbonyls.  
(b) Explain the Monsanto acetic acid process.
22. (a) Explain the catalytic cycle for hydroformylation using Rhodium catalyst.  
(b) Briefly explain the fluxional property of allyl complexes.

**(2 x 5 = 10 Weightage)**

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