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**ACS 504**

**Third Semester M.Sc. Degree Examination, December 2018
(CBCS : 2016-17 Syllabus)**

**Applied Chemistry
ORGANOMETALLIC CHEMISTRY**

Time : 3 Hours

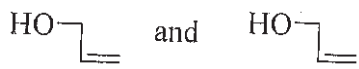
Max. Marks : 70

Instructions : i) Answer Part – A and **any four** questions from Part – B.
ii) Figures to the **right** indicate marks.

PART – A

1. Answer the following questions : (9×2=18)

- a) What are transition metal hydrides ? Mention their properties.
- b) The cis isomer of 1, 3 - butadiene is more suitable conformer than trans isomer to act as a 4 electron ligand. Justify.
- c) Find the hapticity of $C_5H_5^-$ moieties in the complex $(C_2H_5)_2W(CO)_2(C_2H_5)$.
(Given : The compound obeys $18e^-$ rule).
- d) Write any two nucleophilic reactions on coordinated ligands.
- e) Mention the advantage of using $HRh(Co)(PPh_3)_2$ over $[HCo(CO)_4]$ for hydroformylation reaction.
- f) What are hydrosilation reactions ? Give an example.
- g) Give the IUPAC nomenclature for the following complexes.
 - i) $[IrClH_2(CO)(P(CH_3)_3)_2]$
 - ii) $Ru(\eta^3\text{-allyl})(PPh_3)_2(CO)$
- h) How many ways the allyl group can be attached to transition metal ion ?
Show this with illustrative examples.
- i) Which one of the following will be more easily hydrogenated by Wilkinson's catalyst ?



PART – B

2. a) What is hapticity of an organometallic compound ? How are these compounds classified based on hapticity ?
- b) Distinguish between Fischer and Schrock carbenes. Explain structure and bonding in them.

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- c) Following are the 18 electron rule as a guide, determine 'x' in the following complexes.
- $[\text{Re}(\text{CO})_5(\text{PF}_3)]^x$
 - $[(\eta^5\text{-C}_5\text{H}_5)\text{Fe}(\text{CO})_2]^x$
 - $[\text{PtCl}_3(\text{C}_2\text{H}_4)]^x$ **(5+5+3=13)**
3. a) Explain, how does metal hydride species bring about isomerization of alkenes ?
- b) Discuss the bonding in metal carbyne complexes.
- c) Mention any two uses of Zinc dialkyls. **(5+5+3=13)**
4. a) Discuss isolobal concept ? Write the organic fragments for the following species
- $\text{Co}(\text{CO})_3$
 - $\text{Mn}(\text{CO})_5$
 - $[\text{Os}(\text{CO})_5]^+$
- b) Discuss the fluxional isomerism in η^5 -cyclopentadienyl complexes.
- c) What are Green-Davies-Mingos rules ? Mention their significance. **(5+5+3=13)**
5. a) With the help of MOT, explain the nature of bonding in cyclobutadiene complexes.
- b) Discuss the preparation of bis-arene-chromium complexes. Explain their structure and reactivity.
- c) Ferrocene is more reactive than benzene. Give any two reactions of ferrocene in support of the statement. **(5+5+3=13)**
6. a) Explain the mechanism involved in hydroformylation of an alkene using $\text{Co}_2(\text{CO})_8$ as the catalyst.
- b) Discuss the role of homogenous catalysis in Monsanto acetic acid synthesis.
- c) Give an example each for the following class of reactions.
- Reductive elimination reactions.
 - Insertion reactions.
 - Deinsertion reactions. **(5+5+3=13)**
7. a) What is Ziegler Natta catalytical system ? Discuss its role in the production of syndiotactic and isotactic polymers.
- b) Write a catalytic cycle for the production of acetaldehyde from ethylene using Wacker process.
- c) Give the industrial importance of water gas shift reaction. **(5+5+3=13)**
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