Roll No. : 2230300260004

CHES4621A

M.Sc., Semester Fourth

Examination, 2024-25

CHEMISTRY

Paper - First (A)

[General and Organometallic Chemistry]

[Time : 3 Hours] **[Maximum Marks : 75]**

Note : The Question paper contain two sections. Section A contains 08 short answer type questions. Attempt any 05 questions from this section. Each question carries 06 marks. Section B contains 05 long answer type questions. Attempt any 03 question from this section. Each question carries 15 marks.

SECTION - A
(Short Answer Type Questions)

Note: Attempt any 05 questions from the following 08 questions. Each question carries 06 marks.

(5×6=30)

1. Describe the following with suitable reactions;
   (a) Homogenous catalytic Hydrogenation using Wilkinson's catalyst.
   (b) Synthesis of alkyl and aryl Transition metal complexes.

2. Write notes on the followings;
   (a) How do photodissociation and thermal decomposition contribute to the formation of NH and NH_2 radicals?
   (b) Synthesis and applications of clays

3. Discuss the general methods of synthesis of Li- and Mg- alkoxides and their synthetic applications.

4. Write notes on the followings;

   (a) Chemical bondings in Metal-β-diketonates and any suitable reaction.
   (b) Structures of four different unsaturated ligands forming π-bonded organo-metallic complexes.

5. Explain Oxidative addition and π-insertion processes for any known catalytic cycle of your choice-give structural features of complexes.

6. Define Hydroformylation reaction; give the structure of the active Cobalt catalyst and show major steps involved in this catalytic cycle.

7. Give a descriptive account of Zeigler-Natta polymerization reaction.

8. Discuss comparative accounts of synthesis and electronic states of the following two distinct category of free radicals;
   (a) Amino/Azanyl
   (b) Nitrenes

SECTION - B
(Long Answer Type Questions)

Note: Attempt any 03 questions from the following 05 questions. Each question carries equal marks.

(3×15=45)

9. Discuss in detail the fluxionality in organo-metallic compounds containing cyclopentadienyl rings as ligands; explain the 1,2- and 1,3-shifting of metal atom over the ring and their characterization.

10. Giving brief features of the catalyst and reaction conditions,describe the mechanism of Zeigler-Natta catalysis and its application in HDPE synthesis (HDPE:High Density Polyethene)

11. Discuss bonding features,two reactions in each case showing synthesis of these complexes and mention the types of ligand substitution reactions for the following π-bonding unsaturated ligands;

(a) Cyclopentadienyl

(b) Arene complexes

12.(a) Give a brief classification, structure and properties of naturally occurring aluminosilicates.

(b) General chemical composition of Zeolites and their catalytic applications.

13.(a) With suitable chemical reactions,describe the synthesis of few selected s-block metal alkoxides;also enumerate their synthetic applications.

(b) Give brief descriptions on the Organo copper compounds as catalysts.