



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – CHEMISTRY

THIRD SEMESTER – APRIL 2024

PCH3ME02 – ORGANOMETALLIC CHEMISTRY

Date: 17-04-2024

Dept. No.

Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

SECTION A – K1 (CO1)

Answer ALL the questions

(5 x 1 = 5)

1 Answer the following

- Comment on agostic interaction.
- Give an example for a reaction passing through K2 path.
- Draw the butterfly geometry of $[\text{Re}_4(\text{CO})_{16}]^{2-}$.
- Draw the structure of cryptands.
- Mention any two differences between organometallic enzymes and traditional enzymes.

SECTION A – K2 (CO1)

Answer ALL the questions

(5 x 1 = 5)

2 Answer the following

- Comment on the electron spin states in carbenes.
- Represent the change of NO^+ mode of coordination to NO^- mode of coordination.
- What are ring whizzers?
- Mention any two characteristics of molecular machine.
- Write the toxic effects of mercury.

SECTION B – K3 (CO2)

Answer any THREE of the following

(3 x 10 = 30)

- Illustrate the synthesis, bonding, structure and fluxional behavior in allyl complexes.
- Articulate the mechanism of oxidative addition reaction with an example.
- Outline the methods of preparation, π -back-bonding and its evidences in metal carbonyls.
- Present the differences between dendrimers and linear molecules.
- Determine the role and mechanism of Ferrocifen as an anticancer agent.

SECTION C – K4 (CO3)

Answer any TWO of the following

(2 x 12.5 = 25)

- Explain the bonding in metallocenes using molecular orbital theory and construct a qualitative molecular orbital diagram for ferrocene.
- Illustrate the mechanism of olefin insertion reaction with a suitable example.
- Construct the molecular orbital energy level diagram for CO and explain the following.
 - CO binds with the metal through carbon.
 - CO is a good σ -donor and π -acceptor.
- Explain the synthesis of supramolecules using template directed synthesis.

SECTION D – K5 (CO4)**Answer any ONE of the following****(1 x 15 = 15)**

- 12 a) Compare and contrast Fischer and Schrock carbenes.
b) Explain the ring slippage in η^5 -Cp system in brief. (8+7)
- 13 a) Explain the need and concept of polyhedral skeletal electron pair theory in characterizing metal carbonyl clusters.
b) What are molecular switches? Explain its working mechanism. (8+7)

SECTION E – K6 (CO5)**Answer any ONE of the following****(1 x 20 = 20)**

- 14 a) Outline the synthesis, properties, structure, and uses of organometallic compounds of lithium.
b) Compare the reactivity of $[M(CO)_6]$ and $[M(CO)_5L]$. Discuss the statement using π -bonding interaction. (10+10)
- 15 a) Classify the organometallic polymers and illustrate the condensation polymers involving ferrocene.
b) Explain the mimic compounds of vitamin B₁₂ with examples. (10+10)
