LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **CHEMISTRY**

THIRD SEMESTER – **APRIL 2025**

PCH3ME02 – ORGANOMETALLIC CHEMISTRY

Date: 07-05-2025 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 PM

	SECTION A – K1 (CO1)
	Answer ALL the questions **(5 x 1 = 5)**
1	**Fill in the blanks**
a)	The energy barrier for rotation of the rings about the metal to ring axis in ferrocene is _____ kJ mol^{-1}.
b)	$\Delta H_2^{\#}$ is significantly less than $\Delta H_1^{\#}$ in dissociative activation due to _____.
c)	The molecular formula of the Collman's reagent is _____.
d)	Lower generation dendrimers are in _____ shape.
e)	Vitamin B_{12} is also called as _____.
	SECTION A – K2 (CO1)
	Answer ALL the questions **(5 x 1 = 5)**
2	**Answer the following.**
a)	Comment on the availability of electron density on the carbon present in Schrock carbene metal complexes.
b)	Why does the replacement of a stronger π-acid ligand by a weaker π -acid ligand enhance the electron density on the metal center?
c)	The stretching frequency of the CO bond is closely related to the overall charge of the metal carbonyls. Rationalize.
d)	Mention any one function performed by the molecular machine.
e)	Write any one difference between poisoning and inhibition of enzymes.
	SECTION B – K3 (CO2)
	Answer any THREE of the following **(3 x 10 = 30)**
3	Outline the synthesis and structural characteristics of organometallic compounds of tin.
4	Illustrate the mechanism of a) Sonagashira and b) Suzuki coupling reaction.
5	Explain the role of PSEPT in predicting the structure of metal carbonyl clusters.
6	Explain the template directed synthesis of supramolecules with an example.
7	Write a note on the Correnoid dependent enzymatic reactions involving MeCbl.

	SECTION C – K4 (CO3)	
	Answer any TWO of the following	**(2 x 12.5 = 25)**
8	a) Discuss the synthesis and nature of bonding in metal carbene complexes. b) Illustrate the properties and structure of organometallic compounds of lithium.	(6.5+6)
9	Outline the reason for the following: a) In $[M(CO)_5L]$ (C_{4v} symmetry, L = is a π -donor ligand), the equatorial M-CO bonds are relatively weaker than the trans-axial M-CO bond. b) $[M(CO)_5L]$ (L = π -donor ligand) experiences a stereospecific substitution to give a cis-product.	
10	How are the metal carbynes synthesized? Explain their bonding and structural features.	
11	Discuss the principle and working of molecular switches in detail.	
	SECTION D – K5 (CO4)	
	Answer any ONE of the following.	**(1 x 15 = 15)**
12	a) Illustrate the cyclometalation in σ-bonded organometallics of transition elements. b) Write a note on the synthesis and bonding features in metal-allyl complexes.	(7+8)
13	a) Discuss the mechanism of oxidative addition by free radical and associative pathway. b) Investigate the anticancer properties of any two organometallic drugs.	(6+9)
	SECTION E – K6 (CO5)	
	Answer any ONE of the following.	**(1 x 20 = 20)**
14	a) Classify the organometallic compounds based on the metal-carbon bond and explain their characteristics. b) Construct the molecular orbital energy level diagram for CO and rationalize the following. i) CO binds with the metal through carbon. ii) CO is a good σ-donor and π-acceptor.	(10+10)
15	a) Comment on the carbonylation and decarbonylation in the optically active tetrahedral complexes. b) Differentiate between lower and higher-generation dendrimers. c) Explain the compounds that mimic vitamin B_{12} with respect to their structure, physical and chemical properties.	(5+5+10)
