LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

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

THIRD SEMESTER – **NOVEMBER 2024**

PCH3ME02 – ORGANOMETALLIC CHEMISTRY

Date: 19-11-2024 Dept. No. Max. : 100 Marks

Time: 01:00 pm-04:00 pm

	SECTION A – K1 (CO1)	
	Answer ALL the questions	**(5 x 1 = 5)**
1	**Fill in the blanks.**	
a)	The M-C bond dissociation enthalpy _____ on descending the group for main group metals.	
b)	Electron transfer reaction produces a cation radical by _____.	
c)	In metal carbonyls, _____bonding interaction exists to strengthen the M-C bond.	
d)	The shape of rotaxane is _____.	
e)	The coenzyme involved in DNA repair is _____.	
	SECTION A – K2 (CO1)	
	Answer ALL the questions	**(5 x 1 = 5)**
2	**Answer the following.**	
a)	Predict the products formed in the decomposition of metal alkyls carrying at least one H-atom in the β-position.	
b)	Mention any one difference between k_1 and k_2 path in organometallic reactions.	
c)	Comment on the stability of $V_2(CO)_{12}$ prepared by the direct condensation of V and CO.	
d)	What is the principle of molecular switches?	
e)	Write any one biological significance of iron-sulfur clusters.	
	SECTION B – K3 (CO2)	
	Answer any THREE of the following.	**(3 x 10 = 30)**
3	Explain the syntheses and structural characteristics of organometallic compounds of aluminium.	
4	Articulate the mechanism of a) Heck reaction and b) Negishi coupling.	
5	Outline the bonding, synergic interaction and the evidences of back bonding in metal carbonyls.	
6	Write a note on the following: a) Differences between linear molecules and dendrimers. b) Decarbonylation through methyl migration.	
7	Present the role of organometallic compounds as an antimalarial drug.	

	SECTION C – K4 (CO3)	
	Answer any TWO of the following.	**(2 x 12.5 = 25)**
8	Construct a qualitative MO energy level diagram of ferrocene and explain the bonding and magnetic characteristics.	
9	Illustrate the mechanism of a) Oxo process and b) Wacker's process.	(6 + 6.5)
10	a) Write a short note on the following regarding metal carbonyls. i) Nucleophilic addition ii) Electrophilic addition iii) Migratory insertion of carbonyl iv) LNCC v) HNCC	(5 × 2.5)
11	Discuss the non-covalent interactions involved in supramolecular chemistry.	
	SECTION D – K5 (CO4)	
	Answer any ONE of the following.	**(1 x 15 = 15)**
12	a) Discuss the different types of insertion reactions involving CO. b) Illustrate the isolobal relationship in the metal carbonyls with suitable examples.	(8+7)
13	a) Outline the mechanism of Monsanto acetic acid process. b) Illustrate the compounds that mimic vitamin B_{12} with respect to their structure, physical and chemical properties.	(5+10)
	SECTION E – K6 (CO5)	
	Answer any ONE of the following.	**(1 x 20 = 20)**
14	a) Illustrate the Fischer and Schrock carbene metal complexes. How do they differ with respect to the nature of carbon? b) Describe the fluxional behavior with suitable examples.	(12+8)
15	a) Comment on the ring slippage in η^5- Cp system. b) Discuss the characteristics of molecular machines. c) What are organometallic drugs? Explain any two of them used in the treatment of cancer.	(5+7+8)
