22CHP206N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION DECEMBER 2025
(Second Semester)

Branch - **CHEMISTRY**

ORGANOMETALLIC CHEMISTRY

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	The bonding in metal alkyls involves a) Metal- carbon σ – bond b) Metal – carbon π-bond c) Metal – carbon σ -π-bonds d) Metal – carbon σ -π—δ bonds	K1	CO1
	2	The hybridization of lithium and carbon atoms in lithium alkyl cluster is a) sp^3 b) sp^2 c) sp^3d d) sp	K2	CO1
2	3	Identify the correct statement regarding Heck reaction a) Carbonylation reaction b) Platinum -catalyzed cross-coupling reaction c) A polymerization reaction d) Forms carbon-carbon bond between an alkene and an unsaturated halide	K1	CO2
	4	The function of Cu (II) salt in Wacker's process is a) Co-catalyst b) Catalyst c) Reducing agent d) Oxidizing agent	K2	CO2
3	5	Which one of the following statement about ferrocene is false? a) It obeys 18 electron rule b) It is diamagnetic c) It has two unpaired electrons d) It resist to electrophilic substitution	K1	CO3
	6	Oxidation occur very easily in the case of a) $(\eta^6C_6H_6)_2Fe$ b) $(\eta^6C_6H_6)_2Co$ c) $(\eta^6C_6H_6)_2Ru$ d) $(\eta^6C_6H_6)_2Co^+$	K2	CO3
4	7	Which one of the metal carbonyl does not obey EAN rule? a) $Cr(CO)_6$ b) $Fe(CO)_5$ c) $Ni(CO)_4$ d) $V(CO)_4$	K1	CO4
	8	The number of metal-metal bonds in $Ir_4((CO)_{12}$ a) 2 b) 4 c) 6 d) 8	K2	CO4
5	9	Supramolecular chemistry is primarily concerned with... a) Non-covalent bonding b) Atomic forces c) Covalent bonding d) Ionic bonding	K1	CO5
	10	Supramolecular chemistry has been defined as a) The study of large molecule b) Chemistry beyond the molecule c) Chemistry of atoms d) The study of covalent bonds	K2	CO5

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SECTION - B (35 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	i) What do you understand by organometallic compound? (2 Marks) ii) Classify organometallic compounds (5 Marks)	K2	CO1
		(OR)		
	11.b.	i) Explain why are transition metal- alkyl kinetically less stable than main group-alkyls compounds (3 Marks) ii) Show the difference between Fischer and Schrock carbenes (4 Marks)		
2	12.a.	i) Develop one method of preparation of Zeise's salt (2 Marks) ii) Make use of Dewar-Chatt approach to explain bonding feature of Zeise's salt (5 Marks)	K3	CO2
		(OR)		
	12.b.	Build the Ziegler-Natta catalytic cycle of olefin polymerization.		
3	13.a.	The reaction of $NiBr_2$ with allyl magnesium bromide produces $\eta 3$ – diallylnickel (0). Draw the structure of product and explain its bonding nature.	K6	CO3
		(OR)		
	13.b.	Discuss the important features of i) Bent sandwich complex (3.5 Marks) ii) Multidecker complex (3.5 Marks)		
4	14.a.	Compare the bonding of linear and bent nitrosyls.	K5	CO4
		(OR)		
	14.b.	Explain the concept of isolobality? What is the significance of this concept? What are Isolobal fragments and frontier orbitals?		
5	15.a.	Build the Lock and key analogy of supramolecules.	K3	CO5
		(OR)		
	15.b.	Develop the applications of supramolecules in i) Electrochemical sensor ii) Photonic devices		

SECTION -C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Outline the preparation of metal alkyls using i) Oxidative addition ii) Nucleophilic attack on the co-ordinated ligand	K2	CO1
2	17	Develop the mechanistic details of oxo process using $HCo(CO)_4$ as catalyst.	K3	CO2
3	18	Elaborate the structure and bonding features of ferrocene.	K6	CO3
4	19	Interpret Wades' rules. Explain the applications of these rules in classifying boranes into closo, nido and arachno boranes.	K5	CO4
5	20	Construct the various types of non-covalent interaction present in supramolecules .	K3	CO5

Z-Z-Z END