

Faculty of Science and Humanities

M.Sc.(Chemistry) Semester -I

Effective from Academic Year 2026-27

Branch Name:	M.Sc. Chemistry
Program Code:	SC203
Course Name:	Chemistry of Metal Complexes-I
Course Code:	2SC2030101
Pre-requisite Course:	Basics inorganic chemistry up to B.Sc.

Course Objectives:

- The objective of the course is to appraise the students about the role of metal complexes in chemistry.
- To learn about synthesis, structure, bonding and common organometallic reactions aspects metal-organic framework.
- To develop an appreciation for the scope, diversity, and application of organometallic chemistry.
- General overview of the many very fundamental tasks performed by inorganic elements in living systems.

Teaching and Examination Scheme:

Teaching Scheme(Hours per week)					Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit		Theory(Marks)		Practical(Marks)		Total (Marks)
			T	P	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
4	-	-	4	-	50	50	-	-	100

Subject Contents:

Unit	Contents	Lecture	Weightage
1	Chemistry of Organometallic compounds Definition, classification, 18 e ⁻ rule for O.M.C, Grignard reagents, Organolithium compounds, Organocopper compounds, Organozinc compounds, Organosilicone compounds, Organomercury compounds, Organopalladium compounds, Organoiron compounds.	12	25%
2	Metal complexes in Organic synthesis Introduction, Oxidative-addition reaction, Reductive-elimination reaction, Insertion reaction. Homogeneous catalysis: General features, types & catalytic steps, Hydrogenation of alkenes, Ziegler-Natta polymerization of alkenes, The wacker process, Monsanto acetic acid synthesis, Water-gas shift reaction, The Fischer-Tropsch synthesis.	12	25%
3	Metal clusters Introduction, Carbonyl cluster: Low nuclearity carbonyl clusters, High nuclearity carbonyl clusters, Electron counting scheme for HnCCS, Wade rules, framework classification. Halide type cluster: Dinuclear clusters, Trinuclear clusters, Tetranuclear clusters, Hexanuclear clusters. Chabrel phases and Zintl ions, carboranes, metalloboranes, Metallocarborane.	12	25%

4	Bio-Inorganic Chemistry Metalloporphyrins (enzymes) definition, hemoglobin and myoglobin, cytochrome, vitamin B12 (cyanocobalamin), zinc metallo enzymes, nitrogen fixation, essential and trace elements in biological system, biochemistry of non- metals K, Na pump (action of bath ions), toxic metals and their toxicity. Co- ordination compounds in medicine, Chelation therapy, gold compounds and rheumatoid arthritis, anticancer drugs – platinum complexes, gold complexes, metallocenesetc, antimicrobial agents, metal complexes as radiodiagnostic agents, magnetic resonance imaging.	12	25%
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Text Books:

1. Organometallic & Bioinorganic chemistry by Ajay Kumar, Aaryush aducation.

Reference Books:

1. Organometallic Compounds by Indrajit Kumar, Pragati Prakashan.
2. Organometallic & Bioinorganic chemistry by Ajai Kumar, Aaryush aducation.
3. A Logical approach to Modern Organic Chemistry by Jagdamba singh & S. Anandvardhan, A Pragati prakashan
4. Advanced in inorganic chemistry by Puri, Sharma and Kaliya,2019

List of Open Source Software/learning website:

1. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=13G8VouhmrFfuhs6rkiyTA==>
2. https://youtu.be/8XF6xWaGxHY?si=3VzaXbuSc_Mk2Dx6

Course Learning Outcomes (CLO):On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	To understand terminology, classification and some concepts about organometallic compounds	1. Remembering 2. Understanding
CLO2	To understand chemistry of different types of organometallic compounds.	2. Understanding
CLO3	To understand and analyse reactions of Metal complexes in Organic synthesis.	2. Understanding 4. Analyzing
CLO4	To understand metal clusters including Chevrel phases, Zintl ions and different types of boranes.	2. Understanding
CLO5	Understand importance of inorganic elements in vital systems	2. Understanding
CLO6	Explain metal ion binding to biomolecules and their medicinal applications.	2. Understanding 3. Applying

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Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)																PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1	2
CLO1																	1	1
CLO2	1				1	1											1	2
CLO3	2					2											2	3
CLO4					1	1				2							2	3
CLO5										2							1	1
CLO6																	1	2

3:High, 2:Medium, 1:Low