

Name of Faculty	:	Faculty of Science
Name of Program	:	Master of Science
Course Code	:	2MSO01
Course Title	:	Inorganic Chemistry
Type of Course	:	Basic Science
Year of Introduction	:	2023-24

Prerequisite	:	Knowledge about basics of quantum mechanics and complexes.
Course Objective	:	Inorganic chemistry aims to impart to the student, knowledge of postulates of quantum theory and advanced theories of bonding in complexes along with their stereochemistry. Mechanisms of substitution reactions involving coordination compounds.
Course Outcomes	:	At the end of this course, students will be able to:
	CO1	Understand modern methods of electronic structure
	CO2	Apply symmetry to know geometry, similarity, equality, periodicity, harmony order and order of molecule.
	CO3	Analyze formation as well as uses of organometallic compounds of transition elements.
CO4	Learn mechanism and kinetics of substitution reaction in square planar complexes	

Teaching and Examination Scheme

Teaching Scheme (Contact Hours)			Credits	Examination Marks				
L	T	P		Theory Marks		Practical Marks		Total Marks
			C	SEE	CIA	SEE	CIA	
4	0	0	4	70	30	-	-	100

Legends: L-Lecture; T-Tutorial/Teacher Guided Theory Practice; P- Practical, C - Credit, SEE - Semester End Examination, CIA - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.

Course Content

Unit No.	Topics	Teaching Hours	Weightage	Mapping With COs
1	Quantum Chemistry: Quantum theory and Atomic Structure Postulates of quantum mechanics, setting up of different observables, eigen value of angular momenta and commutation relations, step-up and step-down operators, angular momenta in many electron atoms.	15	25%	CO1

	<p>Schrodinger wave equation and applications: particle on a ring and the simple harmonic oscillator.) equations, quantum numbers, $\psi(\phi)$ and $\theta(\theta)$ H-atom wave functions, solutions of $R(r)$ angular and radial wave function, shapes of the orbitals, angular momentum of inner quantum number j, physical interpretation of hydrogenic orbitals; space quantization of electronic orbits; electron spin. Approximation methods: Variation method and application to H atom. Perturbation theory (first order and non-degenerate, application to the Helium atom.</p>			
2	<p>Application of symmetry: Application of symmetry to hybrid orbital, molecular orbitals, hybridization schemes for bonding and molecular orbital for AB_n type of molecules. π orbitals, σ Application of symmetry to molecular vibrations, interpretation of IR and Raman spectral data.</p>	15	25%	CO2
3	<p>Organometallic Compounds: Organometallic compounds of transition elements, stability of metal carbon bond in bonding π complexes. Synthesis, uses and structure of organometallic compounds of organic ligands, 2-electron ligands, olefinic and acetylinic complexes, compound with 3 electron ligand - allylic complexes, compounds. With 4 - electron ligands butadiene complexes, n_4 complexes of cyclopentadiene, compounds with 5 electron ligands - cyclopentadienyl, compounds with 6 electron ligands, n_6 complexes of benzene and its derivatives. Role of organometallic compounds in catalytic reaction.</p>	15	25%	CO3
4	<p>Reaction Mechanism: Mechanism of substitution reaction in square planar complexes. Kinetics of substitution reaction of platinum (II) complexes Effect of leaving group, effect of charge, steric effect, solvent effect, effect of nucleophile, effect of temperature and other effects. Oxidation-Reduction reaction, electron transfer, tunnelling effect, Marcus -Hush theory, one and two electron transfer inner sphere and outer sphere, effect of ions on rate, electron transfer through extended bridges, unstable oxidation states, hydrated electron.</p>	15	25%	CO4

Suggested Distribution of Theory Marks Using Bloom's Taxonomy						
Level	Remembrance	Understanding	Application	Analyse	Evaluate	Create
Weightage	25	25	25	25	-	-

NOTE: This specification table shall be treated as a general guideline for the students and the teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Suggested Learning Websites

Sr. No.	Name of Website
1	https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Inorganic_Chemistry_(LibreTexts)/12%3A_Coordination_Chemistry_IV_Reactions_and_Mechanisms/12.06%3A_Substitutions_in_Square_Planar_Complexes/12.6.01%3A_Kinetics_and_Stereochemistry_of_Square_Planar_Reactions
2	https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Inorganic_Chemistry_(LibreTexts)/04%3A_Symmetry_and_Group_Theory/4.04%3A_Examples_and_Applications_of_Symmetry

Reference Books

Sr. No.	Name of Reference Books
1	Introduction to Quantum Chemistry, A. K. Chandra, Tata MacGraw Hill
2	Quantum Chemistry, Ira N. Levine, Prentice Hall
3	Quantum Chemistry by R. K. Prasad, New Age International Publishers (1985)
4	Elementary Quantum Chemistry by D. L. Pilar, Mc Graw Hill Book Co, New York (1968)
5	Molecular Quantum Mechanics, Third Edition, P. W. Atkins and R.S. Friedman 8. Group theory and symmetry in chemistry, L. H. Hall(McGraw Hill)
6	D. A. McQuarrie Quantum Chemistry, OUP 1983
7	M. W. Hanna, Quantum Mechanics in Chemistry, The Benjamin Pub.
8	Group theory and symmetry in chemistry, L. H. Hall(McGraw Hill)
9	Coulson's Valence, R. McWeeny, ELBS
10	F. A. Cotton, Chemical Applications of Group theory, Wiley Eastern 2nd Edn.1992
11	V. Ramkrishnan & M. S. Gopinadhan, Group theory in Chemistry Vishal Pub.1996.
12	Inorganic Chemistry, Third Edition, Alan G. Sharpe 12. Theoretical Inorganic Chemistry, M. C. Day, J. Shellin
13	Chemistry, Fifth Edition, John E. McMurry, Robert C. Fay
14	An Introduction to Theoretical Chemistry, Jack Simons, Cambridge
15	Progress in inorganic Chemistry, Vols 18 and 38 ed. J. J. Lippard, Wiley.
16	Mechanism of Inorganic Reactions, F. Basolo and R. G. Persons, Wiley Pub.
17	Reaction Mechanism of Coordination Compounds, C. H. Langford and H. B. Gray.
18	Inorganic Reaction Mechanisms, M. L. Tobe, Nelson Pub.
19	Inorganic Chemistry, K. F. Purcell and J. C. Kotz.
20	Principles of Bioinorganic Chemistry, S. J. Lippard and J. M. Berg
21	Mehrotra R. C. and Singh A. Organo Metallic Chemistry, Willey Eastern Ltd., New Delhi



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22	Coates G. E. Green MIH Wade, K and Aylett B. J. Organo Metallic Compounds Chapman and Hall, London
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