

20MSC502T					Inorganic Chemistry I					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	--	--	100

COURSE OBJECTIVES

- To acquire the basic knowledge of advanced inorganic chemistry
- To develop the concepts of inorganic rings, chains, cages, clusters frameworks
- To gain the knowledge on molecular materials and learn about their applications
- To develop an insight into the chemistry of transition metals and inner-transition elements
- To attain an understanding of magnetic properties of transition and inner-transition elements
- To understand the basic concepts of bioinorganic chemistry and the application of metals in medicine

UNIT 1: Inorganic Chains, Rings, Cages, Clusters & Framework.**12 Hrs.**

Introduction; Boranes; Carboranes; Metallocarboranes; Borazines; Phosphazenes; Phosphorus-Oxygen; Phosphorus-Sulfur; Sulfur-Nitrogen Compounds; Silicates; Silicones. Iso-and Hetero-poly anions; Framework Structures; Organic-Inorganic Hybrid Materials; Porous Materials; Molecular Clusters to Materials; Applications in Energy Storage; Hydrogen Economy; CO₂ Sequestration.

UNIT 2: Chemistry of Transition Metals.**8 Hrs.**

Nomenclature; Isomerism; Chelate Effect; Macrocyclic Ligands. Bonding in Coordination Complexes: Crystal-Field Theory; d-orbital Splitting in Octahedral, Tetrahedral, Square Planar Geometries; Molecular Orbital Theory; p-bonding; Jahn-Teller effect; Electronic Spectra: d-d transitions; Orgel and Tanabe-Sugano Diagrams; Charge-Transfer Spectra.

UNIT 3: Magnetic Properties and Inner Transition Elements.**12 Hrs.**

Paramagnetism; Ferro-and Antiferro-magnetism; Diamagnetism; Pascal Constants; Curie Equation; Russell-Sander's Terms; Determination of Magnetic Susceptibility; Magnetic Properties of First Transition Series Metal Ions and Lanthanides. CFT and its Limitations; Calculations of Dq, B and b-parameters; Anomalous Magnetic Moment; Magnetic Exchange Coupling and Spin Crossover.

Comparison of Characteristics of Inner Transition and Transition metals. Magnetic Properties and Absorption Spectra of Lanthanides and Actinides. Lower Oxidation State Compounds. General Chemistry of Actinides.

UNIT 4: Bioinorganic Chemistry.**8 Hrs.**

Introductions; Oxygen Carriers; Porphyrins; Metalloporphyrins; Structure and Functions of Hemoglobin and Myoglobin; Synthetic Oxygen Carrier Model Systems; Nitrogen Fixation: Biological Nitrogen Fixation; Nitrogenase; Model for Nitrogenase; Metal-N₂ Complexes; Photosynthesis and Chlorophyll. Metal Transport and Storage: Transferrin; Ferritin; Siderophores; Metals in Medicine.

Max. 40 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

CO1 – Understand the concepts of inorganic rings, chains, cages, clusters frameworks.

CO2 – Demonstrate the theoretical knowledge of inorganic compounds, molecular materials and evaluate their applications.

CO3 – Knowledge of transition metals and inner-transition elements.

CO4 – Apply the theoretical knowledge to interpret the spectroscopic characteristics of transition metal complexes.

CO5 – Explain the magnetic properties of the transition and inner-transition elements.

CO6 – Illustrate the importance of bioinorganic chemistry and metals in medicine for diagnostic/therapeutic use.

TEXT/REFERENCE BOOKS

1. Inorganic Chemistry: Principles of Structure and Reactivity by J. E. Huheey; E. A. Keiter and R. L. Keiter; 4th ed. Harper Collins 1993
2. Concepts and Models of Inorganic Chemistry by B. E. Douglas; D. H. McDaniel and J. J. Alexander; John Wiley; 1993; 3rd ed.
3. Organotransition metal chemistry; Fundamental concept and applications; A. Yamamoto; John Wiley; 1986.
4. The organometallic Chemistry of transition metals; R.H. Crabtree; John Wiley; 1994.
5. Organometallic chemistry: A unified concept; R C Melhotra; New Age International; 2007
6. Chemistry of the Elements by N. N. Greenwood and A. Earnshaw; Pergamon; 1985.
7. Advanced Inorganic Chemistry by F. A. Cotton; G. W. Wilkinson; 5th edition; John-Wiley & Sons; 1988.
8. Physical Methods in Chemistry by R. S. Drago; Saunders; 1992
9. Organometallic Photochemistry by G. L. Geoffrey and M. S. Wrighton; Academic Press; 1979.
10. Fundamentals of Photochemistry by K. K. Rohatagi-Mukherjee; Wiley Eastern; 1978.
11. Inorganic and Organometallic Photochemistry by M. S. Wrighton; ACS Pub.; 1978.
12. Photochemistry of Co-ordination compounds by V. Balzani and V. Carasiti; Academic Press; 1970.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

- Part A/Question: 10 multiple choice questions 1 mark each
Part B/Question: 10 short answer type questions of 2 marks each with internal choice
Part C/Question: 4 Questions of 15 marks each with internal choice
Part D/Question: 1 Questions of 10 marks with internal choice

Exam Duration: 3 Hrs

- 10 Marks
20 Marks
60 Marks
10 Marks