

III -SEMESTER

COURSE CODE 8: INORGANIC AND PHYSICAL CHEMISTRY

Credits: 03

I. Course outcomes:

At the end of the SEMESTER the student will be able to:

- 1) Apply IUPAC nomenclature for Coordination compounds
- 2) Understand the various theories, structure and stereo chemistry of coordination compounds.
- 3) Explain the reaction mechanism in complexes.
- 4) Apply the 18 electron rule.
- 5) Discuss the basic concepts of thermodynamics.

II. Syllabus;

Unit I Coordination Chemistry-I (9 h)

IUPAC nomenclature of Coordination compounds, structural and stereo isomerism in complexes with coordination numbers 4 and 6. Valence Bond Theory(VBT):Postulates-magnetic properties- Inner and outer orbital complexes. Limitations of VBT, CFT- Postulates - Splitting in Octahedral, tetrahedral, tetragonal and square planar fields. Crystal field stabilization energy(CFSE), Crystal field effects for weak and strong fields. Factors affecting the magnitude of crystal field splitting energy, Spectro chemical series, Tetragonal distortion of octahedral geometry, Jahn-Teller distortion.

UNIT-II Coordination Chemistry II (9 h)

1. Inorganic molecular Reaction Mechanism: (6 h)

Introduction to inorganic reaction mechanisms. Concept of reaction pathways, transition state, intermediate and activated complex. Labile and inert complexes, ligand substitution reactions – SN_1 and SN_2 , Substitution reactions in square planar complexes, Trans-effect, theories of trans effect and its applications

2. Stability of metal complexes: (3 h)

Thermodynamic stability and kinetic stability, factors affecting the stability of metal complexes, chelate effect, determination of composition of complex by Job's method and mole ratio method.

Unit III Organo metallic compounds (9 h)

Definition and classification of organo metallic Compounds on the basis of bond type, Metalcarbonyls:18electron rule, electron count of mononuclear, poly nuclear and substituted metal carbonyls of 3d series. General methods of preparation of mono and binuclear carbonyls of 3d series. π -acceptor behaviour of CO (MO diagram of CO to be discussed), synergic effect and use of IR data to explain extent of back bonding.

Unit IV Thermodynamics- I (9 h)

Concept of heat(q), work(w), internal energy(U), State function and Path function- statement of first law; enthalpy(H), relation between heat capacities, calculations of q, w, U and H for reversible, irreversible processes, Joule-Thomson effect- coefficient, Calculation of work for the expansion of perfect gas under isothermal and adiabatic conditions for reversible processes. Temperature dependence of enthalpy of formation- Kirchoff's equation.

Unit V Thermodynamics II (9 h)

Second law of thermodynamics Different Statements of the law, Carnot cycle and its efficiency, Carnot theorem, Concept of entropy, entropy as a state function, entropy changes in reversible and irreversible processes. Entropy changes in spontaneous and equilibrium processes. Third law of thermodynamics, Nernst heat theorem, Spontaneous and non-spontaneous processes, Helmholtz and Gibbs equation - Criteria for spontaneity.

III. List of Reference Books:

- 1) Concise coordination chemistry by Gopalan and Ramalingam
- 2) Coordination Chemistry by Basalo and Johnson
- 3) Text book of physical chemistry by S Glasstone

- 4) Concise Inorganic Chemistry by J.D.Lee
- 5) Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
- 6) A Text Book of Physical Chemistry by K.L.Kapoor Vol 2, 6th edition, 2019.

III - SEMESTER

COURSE CODE 8: QUALITATIVE INORGANIC ANALYSIS

Credits: 01

Qualitative inorganic analysis

(Minimum of Six mixtures should be analyzed)

Course outcomes:

At the end of the course, the student will be able to:

- 1) Understand the basic concepts of qualitative analysis of inorganic mixture.
- 2) Use glassware, equipment and chemicals and follow experimental procedures in the laboratory.
- 3) Apply the concepts of common ion effect, solubility product and concepts related to qualitative analysis.

Analysis of Mixture

50M

Analysis of mixture salt containing two anions and two cations (From two different groups) from the following:

Anions: Carbonate, Sulphate, Chloride, Bromide, Acetate, Nitrate, Borate, Phosphate.

Cations: Lead, Copper, Iron, Aluminium, Zinc, Nickel, Manganese, Calcium, Strontium, Barium, magnesium and Ammonium.

Minimum of Six mixtures should be analyzed.

Co-curricular activities and Assessment Methods

- 1) Continuous Evaluation: Monitoring the progress of student's learning
- 2) Class Tests, Worksheets and Quizzes

- 3) Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality
- 4) SEMESTER - End Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the SEMESTER .

List of Text books:

1. A textbook of qualitative inorganic analysis by A.I. Vogel.