

SEMESTER – I

Course I (Inorganic & Physical Chemistry)

60 hrs. (4h/w)

INORGANIC CHEMISTRY **24 h**

UNIT –I

Chemistry of p-block elements **8h**

Group 13: Preparation & structure of Diborane, Borazine

Group 14: Preparation, classification and uses of silicones

Group 15: Preparation & structures of Phosphonitrilic halides $\{(PNCl_2)_n$ where $n=3, 4$

Group 16: Oxides and Oxoacids of Sulphur (structures only)

Group 17: Pseudohalogens, Structures of Interhalogen compounds.

UNIT-II

1. Chemistry of d-block elements: **6h**

Characteristics of d-block elements with special reference to electronic configuration, variable valence, magnetic properties, catalytic properties and ability to form complexes. Stability of various oxidation states.

2. Chemistry of f-block elements: **6h**

Chemistry of lanthanides - electronic structure, oxidation states, lanthanide contraction, consequences of lanthanide contraction, magnetic properties. Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

3. Theories of bonding in metals: **4h**

Valence bond theory and Free electron theory, explanation of thermal and electrical conductivity of metals based on these theories, Band theory- formation of bands, explanation of conductors, semiconductors and insulators.

PHYSICAL CHEMISTRY **36h**

UNIT-III

Solid state **10h**

Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. The law of symmetry. Miller indices, Definition of lattice point, space lattice, unit cell. Bravais lattices and crystal systems. X-ray diffraction and crystal structure. Bragg's law. Powder method. Defects in crystals. Stoichiometric and non-stoichiometric defects.

UNIT-IV

1. Gaseous state **6h**

van der Waal's equation of state. Andrew's isotherms of carbon dioxide, continuity of state. Critical phenomena. Relationship between critical constants and vander Waal's constants. Law of corresponding states. Joule- Thomson effect. Inversion temperature.

2. Liquid state **4h**

Liquid crystals, mesomorphic state. Differences between liquid crystal and solid/liquid. Classification of liquid crystals into Smectic and Nematic. Application of liquid crystals as LCD devices.

UNIT-V

Solutions, Ionic equilibrium & dilute solutions

1. Solutions **6h**

Azeotropes-HCl-H₂O system and ethanol-water system. Partially miscible liquids-phenol-water system. Critical solution temperature (CST), Effect of impurity on consolute temperature. Immiscible liquids and steam distillation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

2. Ionic equilibrium **3h**

Ionic product, common ion effect, solubility and solubility product. Calculations based on solubility product.

3. Dilute solutions **7h**

Colligative properties- RLVP, Osmotic pressure, Elevation in boiling point and depression in freezing point. Experimental methods for the determination of molar mass of a non-volatile solute using osmotic pressure, Elevation in boiling point and depression in freezing point. Abnormal colligative properties. Van't Hoff factor.

List of Reference Books

1. Principles of physical chemistry by Prutton and Marron
2. Solid State Chemistry and its applications by Anthony R. West
3. Text book of physical chemistry by K L Kapoor
4. Text book of physical chemistry by S Glasstone

5. Advanced physical chemistry by Bahl and Tuli
6. Inorganic Chemistry by J.E.Huheey
7. Basic Inorganic Chemistry by Cotton and Wilkinson
8. A textbook of qualitative inorganic analysis by A.I. Vogel
9. Atkins,P.W.&Paula,J.deAtkin'sPhysicalChemistryEd.,Oxford University Press
10thEd(2014).
10. Castellan,G.W.PhysicalChemistry4thEd.Narosa(2004).
11. Mortimer,R. G.PhysicalChemistry3rdEd. Elsevier:NOIDA,UP(2009).
12. Barrow,G.M.PhysicalChemistry

LABORATORY COURSE -I

30hrs (2 h / w)

Practical-I Analysis of SALT MIXTURE

(At the end of Semester-I)

Qualitative inorganic analysis (Minimum of Six mixtures should be analyzed)

Analysis of SALT MIXTURE

50 M

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, Potassium and Ammonium.