

Course No: PGCHM17C201

Title: Inorganic Chemistry

Max. Marks: 100

Duration: 64 Contact hours

Continuous Assessment: 20 Marks

End Term: 80 Marks

Unit-I Reaction Mechanism in Coordination Complexes I (16 Contact hours)

Types of substitution reactions mechanistic classification of substitution reactions (Dissociative, Associative, Dissociative conjugate base and Interchange). Empirical criteria to differentiate the mechanism of substitution.

Substitution in octahedral complexes: Classification of metal ions based on water exchange rates. Metal-complex formation- the Eigen-Wilkins mechanism and anation reactions.

Hydrolysis Reactions: Simple Acid hydrolysis, Acid catalysed and Base hydrolysis.

Stereochemical changes in octahedral substitution reactions. Substitution reactions without metal-ligand bond breaking.

Unit-II Reaction Mechanism in Coordination Complexes II (16 Contact hours)

Complementary and Non-complementary reactions. Classification as outer sphere and inner sphere redox reactions. Mechanism of outer sphere and inner sphere electron transfer reactions: the elementary steps involved, formation of precursor and successor complexes, rate laws. Characterization of redox reactions as outer and inner sphere.

Factors Affecting the Rate of Electron Transfer: Chemical activation, sigma and pi nature of donor/ acceptor orbitals, electron configuration of oxidant/reductant. Bridging ligand effects in inner-sphere reactions.

Square-Planar Complexes: Significance of the two-term rate-law, mechanism, and steric course of the substitution reactions. Factors affecting the rate of substitution: Entering and leaving groups, nucleophilicity of entering group, npt scale, central metal ion, solvent and the non-leaving groups. Theories, applications in synthesis.

Unit-III Bonding in Novel inorganic Clusters (16 Contact hours)

Structural classification and topology, types of bonds, isolobal analogy, empirical rules for bonding in boron clusters, selected examples of bonding in higher boranes, Carboranes and Metallocarboranes. Boranes as ligands. Bonding in Boron-Nitrogen Compounds (Borazine), Phosphorous-Nitrogen (Cyclophosphazenes, polyphosphazenes and phosphonitrilic halides), Sulphur-Nitrogen compounds (polythiazyls and Sulphur Nitrides)

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Unit-IV Bonding in Metal Clusters and Polymetallates

(16 Contact hours)

Metal Clusters, Metal-Metal bond, Factors favouring metal-metal bond, Evidence for existence of metal-metal bonding, (Spectral and Magnetic) bonding in di- and trinuclear metal clusters, cotton rationale and quadruple bonding, selected examples of bonding in homo dinuclear metal clusters . Bonding in transition metal poly and hetero-polymetallates.

Books Recommended

1. Inorganic Chemistry; 4th edn. ; J. E. Huheey, E. A. Keiter; Harper Collins; 2009.
2. Mechanisms of Inorganic Reactions; D. Katakis, G. Gordon; Wiley; 1987.
3. Mechanisms of Inorganic Reactions; 2nd edn. ; F. Basolo, R.G. Pearson; Wiley; 1967.
4. Reaction Mechanism of Inorganic and Organometallic Systems; 3rd edn. ; R. B. Jordan; Oxford; 2007
5. Principles of Inorganic Chemistry; 1st edn.; Brain W. Pfennig; Wiley; 2015.
6. Advanced Inorganic Chemistry; F.A. Cotton & G. Wilkinson; 3rd & 5th edn; Wiley; 1988/1999.
7. Chemistry of Elements; N. N. Greenwood & E. A. Earnshaw; 2nd edn; Pergamon Press; 1997.
8. Inorganic Chemistry; K. F. Purcell, L. C. Kotz; Saunders; 1977.
9. Electronic Spectra of Transition Metal Complexes; D. Sutton; McGraw Hill; 1968.
10. Elements of Magnetochemistry; R. L. Dutta, A. Syamal; Affiliated East- West; 1993.
11. Inorganic and Organometallic Reaction Mechanisms; 2nd edn.; Jim D. Atwood; Wiley; 1997.

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