

PCH002
CHEMISTRY COURSE -II

UNIT – I

Basics of organic reactions: Meaning and importance of reaction mechanism, classification and examples for each class.

Aliphatic substitution reactions:

Nucleophilic substitution reactions: Kinetics, mechanism and stereochemical factors affecting the rate of reactions, Neighbouring group participation.

Electrophilic substitution reactions: S_E^1 and S_E^2 reactions

Aromatic substitution reactions:

Nucleophilic substitution reactions: S_N^1 , S_N^2 and benzyne mechanism, Bucherer reaction.

Electrophilic substitution reactions: Mechanism of Friedel-Crafts alkylation and acylation, Mannich reaction, chloromethylation, Vilsmeier-Haack reaction.

UNIT-II

Electrophilic addition to carbon carbon double bond: Stereoselective addition to carbon carbon double bond; *anti* addition- Bromination and epoxidation followed by ring opening. *Syn* addition of OsO_4 and $KMnO_4$.

Elimination reactions Elimination reactions E_2 , E_1 , E_1cB mechanisms. Orientation and stereoselectivity in E_2 eliminations. Pyrolytic *syn* elimination and α -elimination, elimination Vs substitution.

Mechanism of hydrolysis of carboxylic acid derivatives: Hydrolysis of esters, amides and acid chlorides.

Elimination reactions: Mechanism and stereochemistry of eliminations - E_1 , E_2 , E_1cB . *cis* elimination, Hofmann and Saytzeff eliminations, competition between elimination and substitution, decarboxylation reactions. Chugaev reaction.

UNIT-III

Preparation of coordination compounds: Introduction, Preparative methods - simple addition reactions, substitution reactions, oxidation-reduction reactions, thermal dissociation reactions, reactions of coordinated ligands, the trans-effect, other methods.

Geometries of metal complexes: coordination numbers 2-10.

Stability of coordination compounds: Introduction, trends in stepwise stability constants, factors influencing the stability of metal complexes with reference to the nature of metal ion and ligands, the Irving-William series, chelate effect.

Determination of stability constants: Theoretical aspects of determination of stability constants of metal complexes by spectrophotometric, *pH* metric and polarographic methods.

UNIT IV

Reaction Mechanisms in Transition Metal Complexes: Energy profile of a reaction, inert and labile complexes, kinetics of octahedral substitution and mechanistic aspects. Acid hydrolysis, factors affecting acid hydrolysis, base hydrolysis, conjugate base mechanism and evidences in its favour. Anation reactions, reactions without M-L bond cleavage.

Substitution reactions in square planar complexes, trans effect, mechanisms of substitution.

Electron transfer reactions- inner sphere and outer sphere reactions, the Marcus theory, complimentary and non-complimentary reactions.

Thermodynamic and related aspects of ligand fields: Hydration, ligation and lattice energies.

References:

1. Inorganic Chemistry, 3rd edition. James E. Huheey, Harper and Row Publishers (1983).
2. Inorganic Chemistry, 3rd edition. G.L. Miessler and D.A. Tarr, Pearson Education (2004).
3. Inorganic Chemistry, 4th edition. P. Atkins, T. Overton, J. Rourke, M. Weller and F. Armstrong, Oxford University Press (2004).
4. Inorganic Chemistry, 2nd edition. C.E. Housecroft and A.G. Sharpe, Pearson Education Ltd. (2005).
5. Basic Organometallic Chemistry - B.D. Gupta and A.J. Elias, Universities Press (2010).
6. H. Pine, Hendrickson, Cram and Hammond, Organic Chemistry, Mc Graw Hill, New York, 1987.
7. Organic Chemistry by Morrison & Boyd.
8. I.L. Finar, Organic Chemistry, ELBS Longmann, Vol. I & II, 1984.
9. Basic Principles of Organic Chemistry by Roberts & Caserio
10. R.K. Bansal, Organic Reaction Mechanism, Wiley Eastern Limited, New Delhi, 1993.
11. J. March, Advanced Organic Chemistry, Wiley Interscience, 1994.
12. E.S. Gould, Mechanism and Structure in Organic Chemistry, Halt, Rinhart & Winston, New York, 964.
13. A Guide Book to Mechanism in Organic Chemistry by Petersykes
14. Text book of Organic Chemistry by P.S. Kalsi.
15. F.A. Carey and Sundberg, Advanced Organic Chemistry – Part A & B, 3rd edition, Plenum Press, New York, 1990.
16. S.K. Ghosh, Advanced General Organic Chemistry, Book and Alleied (P) Ltd, 1998.