

CH 401: Organic Chemistry I (3-1-0: 4)

Electronic effects

Electronic effect in organic molecules, concept of aromaticity, non-aromaticity, antiaromaticity and homoaromaticity. Aromaticity in non-benzenoid compounds (tropolone, azulene, ferrocene, fullerenes and annulenes etc.) and polycyclic aromatic compounds

Acids and bases: Strength of acid and bases, hard and soft acids and bases, symbiosis

Stereochemistry

Recognition of symmetry elements and chiral structures, R-S nomenclature, stereoisomerism in acyclic and cyclic-system; Concept of stereogenic centre – chirotopic and achirotopic centre; homotopic and heterotopic ligands and faces. E-Z isomerism, optical isomerism, optical purity and optical activity in absence of chiral atom. Stereoselective synthesis: diastereoselective and enantioselective reactions.

Reactive Intermediates and reaction mechanism

Structure, stability and reactions of organic reaction intermediates: carbocations, carbanions, free radicals, radical anions and cations, arynes, carbenes and nitrenes. Nucleophilic substitution reactions: (S_N1 , S_N2 , mixed S_N1 and S_N2 and S_Ni); elimination reactions: (E1, E2, E1CB reactions); addition reaction: mechanism and stereochemical aspects of addition reaction in carbon-carbon and carbon-oxygen bonds. Nucleophilic addition to aldehydes and acyclic ketones

Linear free energy relationships: (Hammett equations, Hammett plots, Taft equation), partial rate factor, kinetic and thermodynamic control reactions, kinetic isotope effects

Molecular rearrangement reactions

Wagner-Meerwein rearrangement, Pinacol rearrangement, Benzilic acid rearrangement, Demjanov rearrangement, Favorskii rearrangement, Wittig Rearrangement, Neber Rearrangement, Sommelet-Hauser rearrangement, Hoffman rearrangement, Curtius rearrangement, Wolff rearrangement, Schmidt rearrangement, Lossen rearrangement, Hoffmann-Löffler-Freytag rearrangement, Baeyer-Villiger rearrangement, Dakin reactions, Benzidine rearrangement, Fries rearrangement, Photo-Fries rearrangement and Reimer Tiemann reactions.

References:

1. Advanced Organic Chemistry: Reaction Mechanism and Structure – Jerry March, Wiley Eastern.
2. A Guidebook to Mechanism in Organic Chemistry– Peter Sykes, Longman, New York.
3. Stereochemistry of Organic Compounds – D. Nasipuri, Wiley Eastern.
4. Stereochemistry of Carbon Compounds – Earnest E. Eliel, Tata McGraw Hill.
5. Organic Reactions and Their Mechanisms – P S Kalsi, New Age International.
6. Modern Physical Organic Chemistry- Eric V. Anslyn / Dennis A. Dougherty, University Science Books, Sausalito, California