Semester I

# COURSE: CCCH2A( 5+1):Group A (Theory, Organic Chemistry)

Credit (2+1)

## Basics of Organic Chemistry: 12 Lectures

*Organic Compounds:* Classification, and Nomenclature, Hybridization, Shapes of molecules, Influence of hybridization on bond properties.

*Electronic Displacements:* Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications; Dipole moment; Organic acids and bases; their relative strength.

*Reaction Mechanism:* Homolytic and Heterolytic fission with suitable examples; Curly arrow rules, formal charges; Electrophiles and Nucleophiles; Nucleophlicity and basicity; Types, shape and their relative stability of Carbocations, Carbanions, Free radicals and Carbenes.

Introduction to types of organic reactions and their mechanism: Addition, Elimination and Substitution reactions.

## Stereochemistry: 18 Lectures

Concept of constitution, configuration and conformation of Organic molecules, Geometrical isomerism, enantiomerism and diastereomerism, chirality and optical activity, elements of symmetry, asymmetry and dissymmetry, R/S, E/Z, D/L, syn/anti, cis/trans, meso/dl, threo/erythro –nomenclature system, Fischer, Sawhorse, Flying Wedg, Newman formulae, Racemization and resolution, resolution of racemic acids, bases and alcohols; optical purity/enetiomeric excess. Axial chirality of allenes, biphenyls, conformation of cyclohexane systems, Topicity of ligands and faces (elementary idea); homotopic, enantiotopic and diastereotopic ligands and faces, prochirality, pro-R/Pro-S and re/si descriptors, Conformational isomerism – eclipsed, staggered gauche and anti; concept of dihedral and torsion angle, energy diagram during variation of torsion angle.

# Learning Objective

1. To make a connection between shape and electronic structure of molecule

2. To predict the basic structural effects like inductive, steric and resonance effect

1. To predict the reactivity of the molecule with other reagents

4. To represent the movement of electrons in bond breaking and bond making processes by curely arrows

5. To classify the reactions as the combination of some fundamental processes like substitution, addition and elimination steps.

1. To predict a relatively complex mechanism of some unknown reaction
2. To gain knowledge on the basic 3-D structure of a molecule
3. To relate the 3-D structure with its optical properties.
4. To gain knowledge on the stereoisomerism.

# Learning outcome

At the end of this course the students can correlate the electronic structure of a molecule to its specific geometry. He can also predict the reactivity on the basis of it structural properties. He also gain knowledge on how to draw reaction mechanism and divide a complete reaction on several elementary steps. He do also have an idea on the 3-D structure and the related properties of a molecule.

# Recommended Texts

1. Clayden J., Greeves N., Warren S. & Wothers P. “Organic Chemistry”
2. Sykes, P. “Mechanism in Organic Chemistry” (6th ed.)