Semester VI

# GROUP –B (Theory) ORGANIC CHEMISTRY Credit 3: Lecture 45

## Pericyclic Reactions: Lecture 12

Mechanism, stereochemistry, regioselectivity in case of

*Electrocyclic reactions:* FMO approach involving 4π- and 6π-electrons (thermal and photochemical) and corresponding cycloreversion reactions.

*Cycloaddition reactions:* FMO approach, Diels-Alder reaction, photochemical [2+2] cycloadditions.

*Sigmatropic reactions:* FMO approach, sigmatropic shifts and their order; [1,3]- and [1,5]-H shifts and [3,3]-shifts with reference to Claisen and Cope rearrangements.

## Retrosynthetic analysis and functional group interconversion Lecture 12

Basic concept on retrosynthesis, disconnection approach towards synthesis of bifunctional molecules (both cyclic and acyclic), concept of synthons, synthetic equivalents, functional group interconversion, Protection and deprotection of common functional groups in synthetic route, activation of synthetic equivalents, Disconnection and synthesis of (1,3),(1,4) and (1,5)-dioxygenated compounds, Some specific examples indicating the retrosynthetic approach to design a total synthesis.

## Nucleic Acids, Enzymes and Lipids 12 Lectures

Components of nucleic acids, Nucleosides and nucleotides;

Structure, synthesis and reactions of: Adenine, Guanine, Cytosine, Uracil and Thymine;

Structure of polynucleotides.

Introduction, classification and characteristics of enzymes. Salient features of active site of

enzymes. Mechanism of enzyme action (taking trypsin as example), factors affecting enzyme action, coenzymes and cofactors and their role in biological reactions, specificity of enzyme action (including stereospecificity), enzyme inhibitors and their importance, phenomenon of inhibition (competitive, uncompetitive and non-competitive inhibition including allosteric inhibition). Introduction to oils and fats; common fatty acids present in oils and fats, Hydrogenntion of fats and oils, Saponification value, acid value, iodine number. Reversion and rancidity.

## Concept of Energy in Biosystems and Pharmaceutical Compounds 9 Lectures

Cells obtain energy by the oxidation of foodstuff (organic molecules).

Introduction to metabolism (catabolism, anabolism).

ATP: The universal currency of cellular energy, ATP hydrolysis and free energy change.

Agents for transfer of electrons in biological redox systems: NAD+, FAD.

Conversion of food to energy: Outline of catabolic pathways of carbohydrate- glycolysis, fermentation, Krebs cycle.

Overview of catabolic pathways of fat and protein.

Interrelationship in the metabolic pathways of protein, fat and carbohydrate.

Caloric value of food, standard caloric content of food types.

Classification, structure and therapeutic uses of antipyretics: Paracetamol (with synthesis), Analgesics: Ibuprofen (with synthesis), Antimalarials: Chloroquine (with synthesis). An elementary treatment of Antibiotics and detailed study of chloramphenicol, Medicinal values of curcumin (haldi), azadirachtin (neem), vitamin C and antacid (ranitidine).

# Learning Objective

- To gain knowledge on the special class of reactions that occurs under the control of moleculear orbital symmetry.

- To understand the synthon approach in designing complex structure. Students will also learn the functional group interversion which is mandatory for designing a synthesis.

- To gain the knowledge on the fundamental biomolecular processes on which the survival of animals and plants depend.

- To gain knowledge on the structure activity relationship and the syntheses of several drug molecules.

# Learning Outcome

- While completing this course the students will have the ability to understand the basic electronic property for explaining the organic reactions. The famous orbital symetry rule enables them to interprete the behaviour of several pericyclic processes. They also have sufficient knowledge on designing a target molecule based on synthon approach. In addition students also learn several bio-molecular feature that controls the dynamics of living system.

# Recommended Texts

1. Clayden J., Greeves N., Warren S. & Wothers P. “Organic Chemistry”
2. Warren, S., "Organic Synthesis: The Disconnection Approach"

3. Silverman and Holladay, "The Organic Chemistry of Drug Design and Drug Action"

1. Berg, J. M., Tymoczko, J. L. and Stryer, L., "Biochemistry"