



STRUCTURE, STEREOCHEMISTRY AND REACTIVITY OF ORGANIC COMPOUNDS AND INTERMEDIATES: A PROBLEM-SOLVING APPROACH

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TYPE OF COURSE : Rerun | Core | UG

COURSE DURATION : 8 Weeks (24 Jan' 22 - 18 Mar' 22)

EXAM DATE : 27 Mar 2022

PRE-REQUISITES : Preferably taken a basic Organic Chemistry course at the first UG level and also the Stereochemistry course by NPTEL

INTENDED AUDIENCE : Chemistry, Biochemistry, Biotechnology, Pharmacy undergraduate students

INDUSTRIES APPLICABLE TO : Speciality Chemical and Pharmaceutical Companies

COURSE OUTLINE :

Organic chemistry has been synonymous with Chemistry of Carbon Compounds (other than simple salts, oxides and carbides). Besides carbon, organic compounds are mainly made of hydrogen, nitrogen, oxygen, phosphorous and smaller amounts of a few other elements and are thus distinct from other materials. Most of the mass in living things is made up of organic compounds. The purpose of this course entitled Structure, Stereochemistry and Reactivity of Organic Compounds and Intermediates: A Problem-solving Approach is to provide a solid foundation on organic chemistry through a problem solving technique which centers on structure, stereochemistry and a mechanistic approach.

ABOUT INSTRUCTOR :

Prof. Amit Basak offering this course at the first year level at IIT Kharagpur for many years. Before that, He had taught UG students of Presidency University for more than 10 years. Due to his interaction with Sir Prof J. Baldwin (His PhD supervisor at Oxford) and Prof Talapatra (PhD supervisor, both of whom are renowned stereochemists, his interest in teaching stereochemistry at UG and PG level grew up immensely.

COURSE PLAN:

Week 1: Structure and stereochemistry: A brief introduction to different types of chirality: Tetrahedral, Axial, Planar, Helical including assignment of absolute configuration. Pseudoasymmetry and Reflection Invariance Issue.

Week 2: Conformations of saturated fused ring systems (decalins), heterocycles (sugars) and polynuclear hydrocarbons (perhydrophenanthrene, anthracene and steroid)

Week 3: 3D Structure determination of Chiral Molecules: Chiroptical properties: ORD and CD; Cotton effect; axial haloketone and octant rules; determination of conformation and configuration

Week 4: Stereoelectronic control on conformation and reactivity; Intramolecular Cyclizations: Baldwin rules

Week 5: Organic Intermediates: Alkynes, Arynes, Allenes, Ketenes and methods of their generation, structures and reactivity

Week 6: Organic Intermediates: C-Radicals: structure and stability; classification: nucleophilic, electrophilic and captodative; inter and intramolecular additions to C=C, C?C. C?N, C=NOH; Umpolung reactions; Barton reaction

Week 7: Asymmetric Reactions of Carbonyls: Stereochemistry of nucleophilic addition to carbonyls and unsaturated carbonyls; Asymmetric alkylation

Week 8: Asymmetric Reactions of Carbonyls: Aldol reactions: Zimmerman-Traxler model, chiral auxiliary and catalytic approaches