

CH-914 Asymmetric Synthesis

Credit Hours: 3-0

Prerequisite: Nil

Course Objectives

- a. To improve comprehension of PG students (i.e. budding future professionals) about stereoselective synthesis of various compounds to be applied in pharmaceutical industries, R & D organizations and other technical fields of economy.
- b. To equip students with sound applied knowledge and develop skill to enable them to synthesize economically important and challenging molecules.
- c. To prepare manpower for executing research in globally demanding field of asymmetric synthesis

Course Outcomes

At the end of this course, students should be able to understand principles of stereoselective synthesis and their applications in various industries and subsequently to carry out research work in different domains for various applications.

Course Contents

Introduction to asymmetric synthesis: The Significance of Chirality and Stereoisomeric Discrimination, Asymmetry, Determining Enantiomer Composition, Determining Absolute Configuration.

α -Alkylation and Catalytic Alkylation of Carbonyl Compounds: Chirality Transfer, Preparation of Quaternary Carbon Center, Preparation of α -Amino Acids, Nucleophilic Substitution of Chiral Acetal, Chiral Catalyst-Induced Aldehyde Alkylation: Asymmetric Nucleophilic Addition, Catalytic Asymmetric Addition, Enantioselective Formation of Tertiary Alcohols, Asymmetric Cyanohydrination.

Aldol and Related Reactions: Substrate-Controlled Aldol Reaction, Reagent-Controlled Aldol Reactions, Chiral Catalyst-Controlled Asymmetric Aldol Reaction, Double Asymmetric Aldol Reactions.

Asymmetric Oxidations: Asymmetric Epoxidation of Allylic Alcohols: Sharpless Epoxidation, Enantioselective Dihydroxylation of Olefins, Asymmetric Aminohydroxylation, Asymmetric Oxidation of Enolates for the Preparation of Optically Active α -Hydroxyl Carbonyl Compounds.

Asymmetric Diels-Alder and Other Cyclization Reactions: Intramolecular Diels-Alder Reactions, Retro Diels-Alder Reactions, Asymmetric Dipolar Cycloaddition, Asymmetric Cyclopropanation, Double Asymmetric Cycloaddition.

Asymmetric Catalytic Hydrogenation and Other Reduction

Reactions: Asymmetric Catalytic Hydrogenation, Asymmetric Reduction of Carbonyl Compounds, Asymmetric Reduction of Imines, Asymmetric Transfer Hydrogenation, Asymmetric Hydroformylation.

Applications of Asymmetric Reactions: The Synthesis of Antibiotics, Analgesics and anticancer drugs and Natural Products.

Recommended Books

1. G. S. Zweifel, Michael Henantz, Modern Organic Synthesis, 2nd Edition, 2007, ISBN 0-7167-7266-3. Wiley Publisher, Price 120 Euro.
2. F. A. Carey, Richard J. Sundberg. Advanced Organic Chemistry. Part B: Reactions and Synthesis, 5th Edition, 2007. ISBN-13: 978-0-387-68354-6 Springer Publisher, Price 60 US\$
3. G. Q. Lin, Y. M. Li, A. S. C. Chan, Principles and Applications of Asymmetric Synthesis, 2001, ISBN 0-471-40027-0.