

Organic Chemistry II(2.0 credits)

Code	: 10159
Course Type	: Basic Specialized Courses
Class Format	: Lecture
Course Name	: Chemistry
Starts 1	: 2 Spring Semester
Elective/Compulsory	: Compulsory
Lecturer	: Jiyoung SHIN Designated Professor

•Course Purpose

The main purpose of this course is to acquire a logical framework for understanding fundamental organic chemistry. Many chemical reactions of organic compounds begin with nucleophile-electrophile interactions. This framework provides an influence for chemical reactions of the organic molecules having π -bonds. On the basis of the knowledge educated following the course contents, the students will be able to solve progressive problems sequentially.

•Prerequisite Subjects

Fundamental Chemistries I and II, Organic Chemistry I

•Course Topics

Class 1. Electron Configuration of Unsaturated Hydrocarbons and Their Reaction Trends --- Difference of Reactivity between Saturated and Unsaturated Aliphatic Hydrocarbons as well as Aromatic Hydrocarbons

Class 2. Nuclear Magnetic Resonance (NMR) Spectroscopy of Organic Molecules --- Level of Energy Source for Various Spectroscopy; Larmor Frequency and Quantized Energy; Spin Spinning and Applied Magnetic Field; Zeeman Effect and Resonances; Shielding and Deshielding; Downfield and Upfield; Chemical Shifts, Integration, and Peak Splitting; [N+1] rule

Class 3. Preparations of Alkenes and Sequence of Electrophilic Additions of Alkenes --- Potential Energy Stability of Unsaturated Aliphatic Compounds and Electrophilic Additions; Preparations by E2 Elimination and Dehydration; Hydrogenation; Halogenations (toward Monohaloalkane, Dihaloalkane, Halohydrin, and Allylic halide) of Simple Alkenes and Conjugated Dienes

Class 4. Electrophilic Additions of Alkenes --- Hydration; Carbene Addition; Oxidation; Radical Addition; Heck Coupling; Polymerization

Class 5. Assessment of the Classes 1-4 with Practice Problems

Class 6. Reactions of delocalized π -systems (Diels-Alder Reactions and Electrocyclization) --- Efficient Dienes and Dienophiles; Stereochemistry in Diels-Alder Reactions (Endo/Exo cycloadditions and Endo Rule); Thermal and Photochemical Cyclization for Even- and Odd-Numbered Double Bonds

Class 7. Preparations of Alkynes and Sequence of Electrophilic Additions of Alkenes --- Hydrogenation; Halogenation; Hydration

Class 8. Delocalized π -Systems and Reactivity of Benzene --- Stability of Extended Conjugations and the Electron Configuration of Delocalized π -Systems (Nonaromatic/Aromatic/Antiaromatic Compounds); Projection of Resonances

Class 9. Reaction of Benzene --- Electrophilic Aromatic Substitutions (Halogenation, Nitration, Sulfonation, Friedel-Crafts Alkylation, Friedel-Crafts Acylation, Wolff-Kishner and Clemmensen Reductions)

Class 10. Assessment of the Classes 6-9 with Practice Problems

Class 11. Electrophilic Substitutions of Substituted Benzenes --- ortho & para- and meta-Directing Groups and the Reactivities

Class 12. Nucleophilic Substitutions of Benzene (via Benzyne Formation or through Inductive Effects of Substituents)

Class 13. Preparations of Multiply Substituted Benzenes --- Protection/Deprotection of amine; Reduction/Oxidation

Class 14. Electrophilic Substitutions of Fused Aromatic Compounds (Naphthalene and Anthracene)

Class 15. Assessment of the Overall Classes (1-14) with Practice Problems

•Textbook

Organic Chemistry: Structure and Function (Seventh Edition), Peter C. Vollhardt and Neil E. Schore, (W. H. Freeman and Company), New York, 2014, Chapters 11-16 and 22

•Additional Reading

Organic Chemistry (second edition), Jonathan Clayden, Nick Greeves, and Stuart Warren (Oxford University Press), 2012 ISBN-10:0199270295.

•Grade Assessment

Examination [total 70%: two midterms(20% for each) and one final (30%)], Attendance (10%), and Assignment of Homework (20%): S($x \geq 90$), A($90 > x \geq 80$), B($80 > x \geq 70$), C($70 > x \geq 60$), and F($60 > x$)

•Notes

In the cases of any unavoidable reasons such as sickness, accident, or no attendance school, the student may get a grade of 'Absent' through the judgment of the course instructor and the student, when the student submits a 'Course Withdrawal Request Form' to receive the 'Absent' grade. No submission of sickness/absence reports and lack of attendance score will result in 'F' grade: It is for the protection of other attendances in the corresponding course from the frequent absences of the specific/uncertain student(s).

•Contacting Faculty

Students can communicate with the course instructor face-to-face either in the class or through the appointment. Communication through email (instructor's e-mail: jyshin@chembio.nagoya-u.ac.jp) is also available.

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