



SYLLABUS

A. Course Description

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level	Language
CHM	327	Organic Reactions Mechanism	3	3	0	0	6	CHM 224	6	English

This course provides students with an Introduction for Organic Reactions Mechanism, which covers all aspects; kinetic and physical methods to determine organic reaction mechanism; classifications of reaction mechanism; Substitution; Addition; Elimination; Radical Addition Reaction and Rearrangement.

B. References: Required Textbook & Internal Website

I shall use

A Guidebook to Mechanism in Organic Chemistry, Peter Sykes, Pearson; (6th Ed.), 1996, | ISBN-10: 0582446953.

Students are required to purchase the textbook/materials (it is an obligation). The book contains the lecture notes as well as activities for the students to take part in; the book serves as a workbook. Other references:

- *Arrow-Pushing in Organic Chemistry: An Easy Approach to Understanding Reaction*, John Wiley & Sons, Inc., 2011, ISBN10: 978-1-118-21045-1
- *MARCH'S Advanced Organic Chemistry, Reactions, Mechanisms, and Structure*, Michael B. Smith, Jerry March, (7th Ed.), John Wiley & Sons, Inc., 2007. ISBN: 978-0-470-46259-1

Google Classroom Webpage: <http://www.imamm.org/>

C. Topics Outline

Disclaimer: this is a very fast-paced course. There will be little time—if any—for review. What follows is an approximate outline of the pace of the course. We may go faster or slower, contingent on the class response. The tentative list of topics to cover:

1. **An Overview of Organic Reactions:** Understanding Organic Reaction, kinds of organic reactions, How Organic Reactions occur: Mechanisms, Steps in Mechanisms, Types of Steps in Reaction Mechanisms, Energy diagram of any Reaction, Kinetics of the Reaction, Hybridization, Conjugation, Aromaticity, Inductive Effect, Mesomeric Effect
2. **Nucleophilic Substitution:** Relation of Kinetics to mechanism, Effect of solvent, Effect of structure, Stereochemical implications of mechanism, Stability of Carbocations, SN1 Mechanism, Sources of Carbocations Stability, Effect of Entering and Leaving Groups, SN2 Mechanism Inversion of Configuration, Determination of Relative Configuration, Effect of Entering and Leaving Groups, Other Nucleophilic Displacements. Electrophilic Aromatic Substitution: Electrophilic Attack on Benzene (π, σ complexes), Nitration, Halogenations, Sulphonation, Friedle- Crafts Reactions (Alkylation, Acylation), Diazo Coupling, Electrophilic



Attack on C_6H_5Y ($Y = +NR_3, CCl_3, NO_2, CHO, COOH$ etc., $Y = OCOR, NHCOR, OR, OH, NH_2, NR_2$, Partial Rate Factors and Selectivity, O,P Ratios, Electrophilic Substitution of Other Aromatic

- 3. Electrophilic and Nucleophilic Addition Reaction:** Electrophilic and Nucleophilic Addition Reaction to $C=C$, Addition of Halogens, Effect of Substitutions on Rate of Addition, Orientation of Addition, Other Addition Reactions (Further Halogen Derivatives, Hydration, Carbocations, Hydroxylation, Hydrogenation, Ozonolysis), Addition to Conjugated Dienes (Electrophilic addition, Diels- Alder Reaction).
- 4. Elimination Reaction:** 1,2-(β -) Elimination, E1 Mechanism, E1Cb Mechanism, E2 Mechanism (Stereoselectivity in E2, Orientation in E2 Saytzev v. Hoffmann), Elimination v. Substitution, Effect of activating groups, Other 1,2-Elimination, 1,2-(α -) Elimination, Pyrolytic Syn Elimination.
- 5. Reaction Intermediate:** Carbocation, Carboanion and Free Radical Formation, Carbene Formation and Reaction, Nitrene Formation and reactions, Arene-benzyne Formation and Reaction
- 6. Radical Addition Reactions, Radical and Radicals Reaction and its application in biology:** Production of Radicals, Reaction of Radicals, Homolytic Bond Dissociation, Reaction of Alkanes with Halogen, Chlorination of Methane, Radicals in Biology, Superoxide SOD and Antioxidant, Drugs based on Radicals.
- 7. Rearrangement and Fragmentation Reaction:** Cationic Rearrangement, Anionic Rearrangement, Radical Rearrangement, Factors Influence these Rearrangements.

D. Exams & Grading System

The semi-official dates of the exams for this course, with all the caveats, that the word “semi-official” entails, can be found here:

- **Midterm 1:** 6th or 7th week & **Midterm 2:** 11th or 12th week
- **Quizzes & Homeworks:** During the semester

Your course grade will be based on Final Exam, Midterms, Homework, Quizzes, Participation, Attendance and Project.

Midterm 1: 20 %	Midterm 2: 20 %	Final Exam: 40 %
Quizzes; Homework & Attendance & Participation: 20 %		

Grading distribution:

A+: [95, 100], A: [90, 95], B+: [85, 90], B: [80, 85], C+: [75, 80], C: [70, 75], D+: [65, 70], D: [60, 65], F: [0, 60].



E. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. (“Immediate family” is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

[Executive Rules for Study Regulations and Exams](https://examsgoo.gl/ykm7t3)
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