



## SYLLABUS

### A. Course Description

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level	Language
CHM	221	Organic Chemistry (2)	4	2	2	2	8	CHM 121	2	English

The course covers an introduction to Stereochemistry, the Electrophilic Aromatic Substitution, Organic Functional Groups of Alcohols, Aldehydes, Ketones, Ethers, Epoxides, Carboxylic Acids, Carboxylic Acid Derivatives, Amines, Biomolecules as Amino Acids, Protein and Lipids will be included. A mechanistic Approach to Reactions will be in Short cut. The Chemistry Laboratory is taken simultaneously with the course and cover the following experiments which is in direct relation with the course.

*At the end of this course the student will be able to:*

- To define the aromaticity of aromatic systems..
- To list of chemical behavior of aromatic systems to a variety of reagents.
- To outline the functional groups of organic compounds.
- To state the reactivity of functional groups.
- To recognize the potential importance of the organic chemistry in biomolecules
- To name organic compounds according to IUPAC system.

### B. References: Required Textbook & Internal Website

I shall use

**Organic Chemistry**, John E. McCurry. Mary Finch, (8<sup>th</sup> Ed.), Cengage Group, 2012, | ISBN-10: 0495118370 | ISBN-13: 978-0495118374.

**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:

- **Organic Chemistry**. PaulaYurkanis Bruice, (2<sup>nd</sup>Ed.), Prentice Hall, Upper saddle River New Jersey 07458), 1998, ISBN-10: 0321803221.
- **Organic Chemistry**, Morrison, R. T.; Boyd, R. N., (6<sup>th</sup> Ed.), Prentice Hall of India, 1996, ISBN-10: 0136436692.
- **Vogel's' Textbook of Practical Organic Chemistry**, Vogel, A.I., Tatchell, A.R., Furnis, B.S , Smith, P.W.G,(5<sup>th</sup> Ed.), Longman Group UK Limited, 1989 ISBN 978-0-582-46236-6

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:

*a: Theory*

1. **Stereochemistry:** Enantiomers and the Tetrahedral Carbon, The Reason for Handedness in Molecules (Chirality Optical Activity) Pasteur's discovery of Enantiomers, Sequence Rule for Specifying Configuration, Diastereomers, Meso-Compounds, Racemic Mixtures and the Resolution of Enantiomers, Stereochemistry of Reactions: addition of H<sub>2</sub>O to an Achiral Alkene, Stereochemistry of Reactions: addition of H<sub>2</sub>O to an a chiral Alkene, Chirality at nitrogen, phosphorus and Sulfur, Chirality in Nature and Chiral Environments.
2. **Alcohols and Phenols:** Naming Alcohols, Properties of Alcohols and Phenols: Hydrogen Bonding, Properties of Alcohols and Phenols: Acidity and Basicity, Preparation of Alcohols: an Overview, Alcohols from Reduction of Carbonyl Compounds, Alcohols from Reaction of Carbonyl Compounds with Grignard Reagents, Some Reactions of Alcohols, Oxidation of Alcohols, Protection of Alcohols, Preparation and Uses of Phenols, Reactions of Phenols, Spectroscopy of Alcohols and Phenols.
3. **Ethers and Epoxides; Thiols and Sulfides:** Naming Ethers, Structure, Properties, and Sources of Ethers, The Williamson Ether Synthesis, Alkoxymercuration of Alkenes, Reactions of Ethers: Acidic Cleavage, Reactions of Ethers: Claisen Rearrangement, Cyclic Ethers: Epoxides, Ring-Opening Reactions of Epoxides, Crown Ethers, Thiols and Sulfides,
4. **Aldehydes and Ketones:** Naming Aldehydes and Ketones, Preparation of Aldehydes and Ketones, Oxidation of Aldehydes and Ketones, Nucleophilic Addition Reactions of Aldehydes and Ketones, Relative Reactivity of Aldehydes and Ketones, Hydration, Cyanohydrin Formation, Imine and Enamine Formation, Nucleophilic Addition of Hydrazine: The Wolff-Kishner Reaction, Nucleophilic Addition of Alcohols: Acetal Formation.
5. **Carboxylic Acids and Nitriles:** The Importance of Carboxylic Acids (RCO<sub>2</sub>H), Naming Carboxylic Acids and Nitriles, Structure and Physical Properties of Carboxylic Acids, Dissociation of Carboxylic Acids, Substituent Effects on Acidity, Substituent Effects in Substituted Benzoic Acids, Substituent Effects in Substituted Benzoic Acids, Preparation of Carboxylic Acids, Reactions of Carboxylic Acids: An Overview, Reduction of Carboxylic Acids, Chemistry of Nitriles, Preparation of Nitriles by Dehydration, Hydrolysis: Conversion of Nitriles into Carboxylic Acids.
6. **Carboxylic Acid Derivatives and Nucleophilic Acyl Substitution Reactions:** Naming Carboxylic Acid Derivatives, Nucleophilic Acyl Substitution, Nucleophilic Acyl Substitution Reactions of Carboxylic Acids, Chemistry of Acid Halides, Chemistry of Acid Anhydrides, Chemistry of Esters, Chemistry of Amides, Thioesters and Acyl Phosphates: Biological Carboxylic Acid Derivatives, Polyamides and Polyesters: Step-Growth Polymers, Spectroscopy of Carboxylic Acid Derivatives.
7. **Amines:** Naming Amines, Structure and Bonding in Amines, Properties and Sources of Amines, Basicity of Amines, Basicity of Substituted Arylamines, Synthesis of Amines, Reactions of Arylamines, Tetra alkyl ammonium Salts as Phase-Transfer Catalysts,.
8. **Biomolecules: Amino Acids, Peptides, and Proteins:** Structure of amino acids, Chirality of amino acids, Types of amino chain, Histadiene, Synthesis of amino acids, Peptides and Proteins,



Peptide linkage, Peptide synthesis, Carbonyl protecting group, Amino group protection, Peptide coupling, Protein synthesis

9. **Biomolecules: Lipids:** Waxes, fats and oils, Triacylglycerol, Fatty acids from fats and oils, Unsaturated and polyunsaturated fatty acids, Soap and its cleansing action, Detergents, Phosphoglycerides, Sphingolipids, Aldol condensations, Steroid synthesis, Phosphorylation and decarboxylation

**b: Practical**

Laboratory Instructions and Safty: Laboratory instructions and The laboratory rules, Common Laboratory Techniques: Filtration, Decolorization, Drying and drying agents, Reflux, Reporting results, Nitration of Aromatic Compounds: Preparation of m- nitrobenzaldehyde), Sulfonation of Aromatic Compounds, Nucleophilic Substitution Reactions of Alkyl Halides, Reactivity of aldehyde with ketone in the presence of base, Aldol Condensation, Preparation of Asprine, Oxidation of Benzaldehyde-Green Chemistry, Synthesis of oximes: Reaction of carbonyl compounds with hydroxylamine, Mannich Reaction: The acid-catalyzed reaction of an enolizable aldehyde or ketone with an imminium ion, followed by a base to give a  $\beta$ -aminoaldehyde of a  $\beta$ -aminoketone, Schiff base: Reaction of N-nucleophiles with aldehyde, Saponification, Preparation of Soap, Synthesis of acetanilidine; Reaction of aniline with acetic anhydride, Synthesis of azo dye: Coupling between 2-naphthol and 4-aminobenzenesulfonic acid, Review and Discussion the results.

**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:** 6<sup>th</sup> or 7<sup>th</sup> week      & **Midterm 2:** 11<sup>th</sup> or 12<sup>th</sup> week
- **Quizzes & Homeworks: During the semester**

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

<b>Midterm 1:</b> 10 %	<b>Midterm 2:</b> 10 %	<b>Final Exam:</b> 40 %
<b>Laboratory:</b> 30 %		<b>Quizzes; Homework &amp; Attendance &amp; Participation:</b> 10 %

**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 Examsgoo.gl/ykm7t3](https://Examsgoo.gl/ykm7t3)

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