



**Department:** Chemistry Dept.

**College:** Education College

**University:** Salahaddin University

**Subject:** Organic Functional Group

**Course Book:** *Stage 2; First semester*

**Lecturer's name:** Assist Prof. Dr. Awaz Jamil

**Academic Year:** 2022/2023

# Course Book

<b>1. Course name</b>	Organic Chemistry
<b>2. Lecturer in charge</b>	Dr.Awaz Jamil Hussein
<b>3. Department/ College</b>	Chemistry/ Education
<b>4. Contact</b>	e-mail: <a href="mailto:awaz.hussein@su.edu.krd">awaz.hussein@su.edu.krd</a> , <a href="mailto:awazihusen@yahoo.com">awazihusen@yahoo.com</a>
<b>5. Time (in hours) per week</b>	Theory: 4 Practical: 9
<b>6. Office hours</b>	wednesday 10.5am – 12.5 pm or by appointment
<b>7. Course code</b>	
<b>8. Teacher's academic profile</b>	<p>I graduated from the College of Science, Department of Chemistry in 1993 and got a bachelor's degree BSc in chemistry. After that. I then started to study MSc/Organic Chemistry In same year at Salahaddin University.</p> <p>After finishing my MSc study in 1995, I worked in Collage of Education / Chemistry department, as an assistant lecturer. The teaching experience is practical in the Physical, Industrial &amp;Organic Chemistry. Finally I received my PhD-Organic Chemistry in the same University in 2002-2005. My academic and research program interest focus on Organic&amp; Organometallics synthesis and spectroscopic characterization of newly heterocyclic compounds; I have more than 6 published articles and going to publish some other articles.</p>
<b>9. Keywords</b>	<b>Organic Chemistry, Nomenclature, Preparation, Reaction, Reaction intermediate, Reaction Mechanism, Heterocyclic Compound &amp; Acid base in Organic Chemistry.</b>
<b>10. Course overview:</b>	<p>Organic chemistry is a study of compounds that contain carbon atom. To discuss organic compounds, you must be able to name them and visualize their structures when you read or hear their names. We study organic chemistry because just about all of the molecules that make life possible—proteins, enzymes, vitamins, lipids, carbohydrates, and nucleic acids—contain carbon, so the chemical reactions that take place in living systems, including our own bodies, are organic reactions. Most of the compounds found in nature—those we rely on for food, medicine, clothing (cotton, wool, silk), and energy (natural gas, petroleum)—are organic as well. Important organic compounds are not, however, limited to the ones we find in nature. Chemists have learned to synthesize millions of organic compounds never found in nature, including synthetic fabrics, plastics, synthetic rubber, medicines, and even things like photographic film and Super glue. Many of these synthetic compounds prevent shortages of naturally occurring products. When we study organic chemistry, we study how organic compounds react. When an organic compound reacts, some old bonds break and some new bonds form. Bonds form when two atoms share electrons, and bonds break when two atoms no longer share electrons. How readily a bond forms and how easily it breaks depend on the particular electrons that are shared, which, in turn, depend on the atoms to which the</p>

electrons belong.

**11. Course objective:**

The aim of this course is to observe the fundamental concepts of organic chemistry and illustrate how chemistry explains many aspects of everyday life. The interesting applications for all basic chemical concepts, along with theoretical representations and presenting the subjects favorable and likely by students through extensive illustrations, and step-by-step problem solving.

A key feature is the use of teaching Aids like molecular models to illustrate and explain common phenomena we encounter every day. Students are given enough detail to understand basic concepts. Different problems and more practice problems lead students to easily solve problems and allow students to apply what they have just learned.

**12. Student's obligation**

The student attendance in class two hours a week, preparation of the home works examinations and participate in the discussion in the classroom.

**13. Forms of teaching**

Different forms of teaching will be used to reach the objectives of the course: Direct questions, Quizzes, Discussion and conclusions. Power point presentations

**14. Assessment scheme**

At least one exam for each course (200pts) and ten quizzes during the year (100pts). Participation in class and answering the questions (25pts) and then an extra degree to attend the lecture (\*).

**15. Student learning outcome:**

Upon completion of these topics, the student will learn how to:

- 1: Recognize the characteristic features of organic compounds and their derivatives.
2. Recognize the polarity of bonds and molecules affect the structure on polarity. Polar and non-polar solvents.
- 3: Predict the shape, bond angles and hybridization around atoms in organic molecules
- 4: Use shorthand methods to draw organic molecules using different representations and types of bonds like ionic, covalent, hydrogen bond and other inter molecular bonds.
- 5: Recognize the common functional groups and understand their importance, nomenclature, physical and chemical properties, preparation, reactions and mechanisms.
- 6: Recognize the common reaction types and mechanisms, addition, elimination, and substitutions reactions.
- 7: After the student's knowledge of this information will be eligible to work as a successful teacher in chemistry

**16. Course Reading List and References:**

- 1- Organic chemistry Morrison and Boyd

- 2- Organic Chemistry 4<sup>th</sup> edition - Paula Bruice
- 3- General, organic, and biological chemistry. Janice Gorzynski Smith.
- 4- Organic Chemistry, David Clein, 2012 John Wiley & Sons, Inc Mechanisms in advanced Organic Chemistry R.P. Narain
- 5- Marchs Advanced Organic Chemistry, 6<sup>th</sup> edition, Jerry March.
- 6- A guidebook to Mechanism in Organic Chemistry 5<sup>th</sup> edition, Peter Sykes

**17. The Topics:**

**Lecturer's name**

- Week 1

Aromatic hydrocarbons, introduction, benzene, naming, drawing resonance structures.

Week 2:

Aromatcicity, Electrophilic substitution reaction.

Week 3

The Effect of Substituents on Reactivity (I &M)

Week 4:

The Effect of Substituents on orientation (o, m, p), The ortho-para ratio

Week 5:

Alkyl and aryl halides, introduction, nomenclature, physical properties

Week 6:

Alkyl and aryl halides, reactions and preparation.

Week 7:

Alcohols , introduction, nomenclature , physical properties . preparation and reaction.

Week 8:

Phenols, introduction, nomenclature, physical properties preparation and reaction.

Week 9:

Amines, primary , secondary and tertiary amines, general formula, structures and physical properties .

Week 10:

Structures and bonding in amines, basicity of amines,

Week11:

Aldehydes and Ketones , introduction , Structures , Nomenclature , physical properties. Reactivity, Electronic and steric factors ,

Week 12:

Preparation and Reactions of aldehydes and ketones, Acidity of alpha hydrogen

Week 13:

Dr.Awaz Jamil Hussein

**2 hours**

Carboxylic acid, General formula , Structures , Nomenclature , Physical properties ,and Preparations

Week 14:

reactions of carboxylic acids.

Acidity of carboxylic acids , factors affecting acidity , effect of substituents on acidity and their derivative-----  
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### 19. Examinations:

Q1\ A\ Answer the following

1. Write the mechanism for alcoholysis of butanoyl chloride

B\ Give the reasons for the following:

1. Additional fluorine atom increases the acidity of acetic acid.

Secondaryaryl and alkyl amines react with a nitrosonium ion to form nitrosamines rather than diazonium ions.

Q3\ A\ prepare the following compounds.

1. Dipropylamine from corresponding amide.

B\ Complete the following reaction (by using suitable reagent and catalyst):

1. Nitrobenzene +  $H_2$
2. Ethylamine + HCl
3. *p*-Methylphenol + benzenediazonium chloride

Q4\ Explain the following:

1. The basicity order of aliphatic amines (primary, secondary, tertiary) in chloro benzene.
2. The two- $pK_a$  values in Malonic acid are different.
3. The effect of electronegativity on the basic strength.

B\ Define the following: ( give an example for each one)

1. Delocalized electrons.
2. Hyperconjugation.
3. Transition states.

## **20. Extra notes:**

Here are some hints I give to my students at the beginning of the course:

1. Read the material in the subject and previous one before the lecture ). Knowing what to expect and what is in the book, you can take fewernotes and spend more time listening and understanding the lecture.
2. After the lecture, review your notes, and try to solve problems. Also, read the material for the next lecture.
3. If you are confused about something, visit your instructor during office hours immediately, before you fall behind. Bring your attempted solutions to problemswith you to show the instructor where you are having trouble.
4. To study for an exam, begin by reviewing each chapter and your notes, then concentrateon the end-of-chapter problems. Also use old exams for practice, ifavailable. Many students find that working in a study group and posing problemsfor each other is particularly helpful.

## **21. Peer review**