

Ministry of Higher Education and Scientific research



Department of Chemistry

College of Science

University of Salahaddin-Erbil

Subject: Organic Chemistry

Course Book – 2nd Year

Lecturer's name:

Theoretical: Dr.Muslih S. Hamasharef .

**Practical: Dr. Karzan Khaleel Hmaeed, Dr. Muslih S. Hamasharef,
Lecturer: Bushra H. Marbeen, Assist. Lecture ShelanH.Boya**

Sunday: 8:30 am- 4:30 pm Practical

Monday: 8:30 am– 4:30 pm Practical

Academic Year: 2023/2024

Course Book

1. Course name	Practical Organic Chemistry
2. Lecturer in charge	(Theoretical) Dr.Muslih S. Hamasharef . (Practical)Dr. karzan Khaleel hameed Dr Muslih S. Hamasharef, Lecturer BushraH.Marbeen, Assiss. Lecture ShelanH.Boya
3. Department/ College	Chemistry/Science
4. Contact	karzan.hameed@su.edu.krd , muslih.hamashref1@su.edu.krd , Bushramarbeen@su.edu.krd , Shelanboya@su.edu.krd Tel: (optional)
5. Time (in hours) per week	Theoretical: 3 hr/week Practical: 2 hr/week
6. Office hours	9am-11 am Tuesday,
7. Course code	
8. Teacher's academic profile	Karzan Hameed Biography (su.edu.krd)
9. Keywords	Organic compounds, structure and reactivity, physical properties, synthesis, reactions, identification
10. Course overview:	<p>Organic Chemistry is one of the core courses for chemistry students. Teaching this subject is accomplished through both theoretical and practical sessions. The theoretical part involves introduction to the basics of organic chemistry, in addition to different groups of organic compounds and the effect of the presence of various functional groups on physical and chemical properties of each group.</p> <p>The practical part is aimed at familiarizing the students with the basic skills required in organic chemistry laboratories.</p> <p>The course teaches the students experiments used in separation and identification of organic compounds in the first stage of this course. This includes learning the techniques for determination of physical properties of organic compounds such as melting and boiling points, methods used in purification of organic compounds based on their physical properties (e.g., sublimation, re-crystallization and distillation) in addition to studying the solubility behavior of organic molecules and their applications in the laboratory and basic chemical tests used in qualitative elemental analysis of organic compounds. The second stage of this practical course includes experiments targeting different functional group reaction. the main purpose of the second part is to allow the student to learn the necessary lab skills associated with the topics that are taken in the theoretical class.</p>
11. Course objective:	This course aims to familiarize the students with background knowledge and the basic skills required in all later stages of studying and working in organic chemistry-related fields. This

is achieved through:

1. Introducing the students with complete and rich foundation of organic chemistry through studying different classes of organic compounds.
2. Enhance the students awareness and familiarize them with different classes of compounds, the associated difference in reactivity and strategies used in their synthesis.
3. Providing the students with knowledge of basic lab skills and the associated background theory.
4. Allowing the students to apply these skills in solving organic chemistry problems such as purification of compounds, isolation of different reaction products and their identification.
5. Familiarize the students with basic safety practices in an organic chemistry lab through studying hazards of different materials involved in the practical and measures of their control.

12. Student's obligation

- Students have to attend weekly practical sessions.
- Students will have to adhere to lab standards including attendance, fulfilling tasks and assignments and obliging to lab safety rules.
- Students will have to sit a minimum of two exams

13. Forms of teaching

Learning resources in this course include white board, lecture notes, PowerPoint presentations and media files.

14. Assessment scheme

Theoretical:

First semester exam: 7.5 marks

Second semester exam: 7.5 marks

Quiz: 8 marks

Attendance and class activities: 2 marks

Total is equal to 25 marks

Practical:

First semester practical Exam = 4 marks

Second semester practical Exam.= 4 marks

Quiz = 2 marks

Reports = 3 marks

Student attendance and conduct in practical sessions= 2 marks

Total is equal to 15 marks

15. Student learning outcome:

The principal learning outcome of this course is

- to build the background knowledge required at all later levels of organic chemistry
- to help the student grasp the theoretical understanding of the course and to demonstrate materials taught in lecture and promote interest in organic chemistry
- to familiarize the student with skills and materials used in organic chemistry laboratories

16. Course Reading List and References:

- (1) Morrison, R. T., and R. N. Boyd. Organic Chemistry, 6th Edition.
- (2) Organic Chemistry, sixth edition, John McMurry.
- (3) Organic Chemistry, Ninth edition, Solomons and Fryhle.
- (4) Vogel's Textbook of Practical Organic Chemistry, B.S. Furniss and others, Longman Group Limited London.
- (5) The Systematic Identification of Organic Compounds, Ralph L. Shriner and others, John Wiley and Sons, USA.
- (6) Practical Organic Chemistry, Frederick G. Mann and Bernard C. Saunders, Longman Group Limited London.
- (7) Organic Experiments, Louis F. Fieser and Kenneth L. Williamson, D. C. Heath and company.
- (8) Laboratory Manual of Organic Chemistry, Raj K. Bansal, New age international (p) limited, Publishers

17. The Topics:

Lecturer's name

Theoretical:

Dr.Muslih S. Hamasharih

Week 1 (Introduction to Organic Chemistry)

Definition of organic chemistry. Chemical bonds (covalent, ionic bonds and Hydrogen bonds). Electronic configuration. Polarity of bonds
Electronic effects, electronegativity, inductive effects, resonance.
Physical Forces.

Week 2-3 (Alkanes)

Definition, physical properties, Nomenclature, preparations, reaction, Problems

Week 4-5 (Alkenes)

Structure and Preparation, Elimination, Propylene, The butylenes, Nomenclature, Physical properties, Preparation of Alkenes. Reactions of the Carbon-Carbon Double Bond, Electrophilic Addition, Reactions of alkenes, Problems

Week 6-7 (Alkynes)

Alkynes, Introduction, Structure of acetylene, Nomenclature, Physical properties of alkynes, Preparation of alkynes, Reactions of alkynes, Acidity of alkynes, Problems.

Week 8-10

Definition, physical properties, Nomenclature Preparation, Reactions, Nucleophilic substitution reaction, SN1 Mechanism, SN2 Mechanism, Elimination reaction, E1 mechanism, E2 mechanism, Problems.

<p>Week 11-13 (Alcohols and Ethers) Alcohols , Nomenclature, Physical Properties, Preparation , Reaction, Ethers and Epoxides, Nomenclature, Physical Properties Preparation, Reaction , Cyclic ethers Problems.</p> <p>Week 14-17 (Aromatic Compounds and Electrophilic Substitution Reaction) Aromatic hydrocarbons (benzene), Aromaticity , Orbital Picture, Stability of benzene ring, Aromatic character (Huckel rule) Nomenclature , Electrophilic aromatic substitution, Nitration , Sulphonation , Friedel-Craft Reactions , Halogenation, Effect of substitution group, Activity and deactivating groups, Reactivity and orientation, Arenes (Aryl halids), Nomenclature, Physical Properties, Preparation and rearrangement of carbonium ion , Reactions, Problems.</p> <p>Week 18-19 (Aldehyde and Ketones) Definition, physical properties, Nomenclature, Preparation, Reaction, Nucleophilic Addition, Oxidation, Reduction, Problems.</p> <p>Week 20-22 (Carboxylic Acids) Nomenclature, Physical Properties, Salt of carboxylic acids, Preparations Reactions, Acidity, Conversion to functional derivatives, Problems.</p> <p>Week 23-25 (Functional Derivatives of Carboxylic Acids) Structure , Nomenclature , Physical Properties, Nucleophilic acyl substitution , Role of carbonyl group, Acid chloride , Preparation, Reactions , Conversion into acids and derivatives , Formation of ketones , Reduction, Acid anhydride , Preparation , Reaction , Conversion into acids, Amides , Hydrolysis , Conversion into amid, Esters , Preparation, Trans esterification , Reactions Conversion into acid and derivatives , Reduction, problems.</p> <p>Week 26-27 (Amines) Amines, Nomenclature, Aliphatic amines, Aromatic amines, Physical properties, Preparation, Reaction, Basicity Conversion into amides, Hydrolysis.</p> <p>Week 28 (Phenols) Phenols , Structure, Nomenclature, Physical Properties, Salts of Phenol, Preparation, Reaction, Acidity, Ester Formation, Ring substitution.</p>	
<p>18. Practical Topics (If there is any)</p>	
	<p>Dr. Karzan Khaleel</p>

<ol style="list-style-type: none"> 1. Introduction to organic chemistry lab., general safety principles and instructions 2. Extraction of caffeine from tea plant 3. Separation salt in oils by extraction 4. Acid-base extraction 5. Seminar 1 6. Seminar 2 7. Solubility behaviour of organic compounds: water soluble compounds 8. Solubility behaviour of organic compounds: water insoluble compounds 9. Elemental analysis of organic compounds: fusion with sodium 10. Exam 11. Preparation of <i>p</i>-benzoic acid 12. Preparation of <i>p</i>-methylphenoxyacetic acid (Williamson ether synthesis) 13. Preparation of cyclohexanone 14. Preparation of isobutyl-3,5-dinitrobenzoate 15. Preparation of dibenzylideneacetone 16. Preparation of acetone semicarbazone 17. Preparation of benzoic acid 18. Preparation of aspirin and oil of wintergreen 19. Saponification 20. Preparation of <i>p</i>-acetaminophen (Paracetamol) 21. Preparation of acetanilide 22. Preparation of <i>p</i>-nitroacetanilide 23. Preparation of <i>p</i>-nitroaniline 24. Preparation of diazonium salt 25. Nitrosation of phenols (Liebermann reaction) 	<p>Hmaeed Dr.Muslih S. Hamasharef, BushraH.Marbeen, ShelanH.Boya</p>
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19. Examinations:

A typical exam question may include a combination of the following:

- Definitions
- Identifying the products of chemical reactions
- Giving explanations for facts and phenomena
- Outlining reaction mechanisms
- Suggesting solutions to problems encountered in practical organic chemistry (e.g., separation of a compound from a mixture)

20. Extra notes:

21. Peer review

پیداچوونھوی ھاوھل

ئھم کورسبووکه دهئیت لهالین ھاوھلئیکئ ئهکادیمیوه سهیر بکرنیت و ناوهرۆکی بابتهکانی کورسهکه پهسهند بکات و جهند ووشهیهک بنوسئیت لهسهر شیاوی ناوهرۆکی کورسهکه و واژووی لهسهر بکات. ھاوھل ئهو کهسهیه که زانیاری ههئیت لهسهر کورسهکه و دهئیت پلهی زانستی له ماموستا کهمتر نهئیت.