Department of Biology

College of Science

University of Salahaddin

Subject: Chemistry

Course Book – (Year 4)

Lecturer's name

theory 1: Sawar Ibraheem Maulood

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Practice 2:Alla Jallal Ahmad.MSC

Academic Year 2022/2023

Course Book

1. Course name	**Chemistry**
2. Lecturer in charge	**Sawar Ibraheem Maulood/ Alla Jallal**
3. Department/ College	**Biology/ Science**
4. Contact	**e-mail: sawar.maulood@su.edu.krd** **alle084@su.edu.krd** **Tel: (optional)**
5. Time (in hours) per week	**Theory: 4** **Practical: 12**
6. Office hours	
7. Course code	**107**
8. Teacher's academic profile	I graduate from Salahaddin university in 1990 in chemistry department (Ranked first). I finished my master degree in natural chemistry in 1996, and start as assistant lecturer teaching theory and practical general chemistry in Biology department till now. In (1998-2001), I teaches practical Biochemistry for post graduated students (MSc ,PhD). In(2001-2002) I teaches pratical Biochemistry for second class in the college of agriculture. In(2002-2003) I teaches teaching pratical micro Biology for the forth class students in the Biology department
9. Keywords	**Isomer, hybridization, Lipid, hydrogenation, steroids.**

10. Course overview:

Science of Organic Chemistry is central to the discovery, understanding and development of many important breakthroughs in biology, medicine, and materials science. This course will provide an introduction of the concepts and fundamental reactions of Organic Chemistry, show how these discoveries are supported experimentally, and how this knowledge can be used in a problem-solving and predictive capacity.

Second course is designed to introduce and develop the fundamental data and concepts of analytical chemistry; to show some of the key experimental evidence which supports these concepts; to apply these data and concepts to chemical problem solving; and to demonstrate that the subject is still evolving and that it has a key role to play in modern technological developments in diverse fields, ranging from biology to materials science

11. Course objective: For students to gain an understanding of chemistry that supports their broad interests in science. The course also prepares students for Organic Chemistry and other advanced chemistry courses.

1. To learn to communicate using the nomenclature used by chemists.
2. To understand the basic structure of the atom and its subatomic particles.
3. To learn the basic principles of mass balance.
4. To understand the nature of the chemical bond.

5. To understand how chemical reactivity regulates the world in which we live.

2. For students to sharpen their quantitative skills in a scientific context.

1. For students to improve skills in solving problems that involve the integration and synthesis of new knowledge and to master the interface between narrative and mathematical problem solving.
2. To be able to work confidently using a range of scales to describe, mass, distance, time, and energy.

3. For students to think critically through their analyses of experimental data.

Perseverance will be an important key to success. Stay involved and up-to-date on the homework.

12. Student's obligation

All students should take 2 exams during the year, all cell phones are to be turned off and no talking during the lecture.

13. Forms of teaching

Power point presentation for the head titles, definitions, practical preparations of the compounds, and the procedure of identification, purification and standardization of the compounds with determination the concentration of the unknown will be used to reach the objective.

Furthermore students will be asked for prepare a report and seminar about all experiments.

14. Assessment scheme

Theory/the students will be required to do two closed book exams; the mean of the two exams has 50 marks beside other assignments including dairy exam (10 marks). So that the final grade of theory exam has 60 marks.

Practical/ The students will be required to do two closed book exams; the mean of the two exams has 30 marks beside other assignments including dairy exam (5 marks),reports (5marks) and seminars.. So that the final grade of practical exam has 40 marks.

15. Student learning outcome:

In the end of the course you should know:

1- Methods of expressing solution concentration.
2- Preparation of solutions (liquid and solid) to some high degree of precision.
3- Identification and quantification of the components of material system.
4- Methods of purification of liquid and solid compounds.

16. Course Reading List and References:

Organic chemistry with a biological emphasis. volume 1 By: Timsoderberg.

"Organic Chemistry", Second Edition, Maitland Jones, Norton, 2019

"Foundations of Organic Chemistry", Hornby and Peach, OUP, 1994

"Organic Chemistry", Clayden, Greeves, Warren and Wothers, OUP, 2017

"Principles of Organic Synthesis", Third Edition, Norman and Coxon, Blackie, 1995

"Foundations of Chemical Biology", Dobson, Gerrard, Pratt, OUP, 2018

"Biochemistry," Voet and Voet, Wiley, 2002

Fundamental of analytical chemistry ,9th edition ,By: Skoog.

17. The Topics:	**Lecturer's name**
Course Content: The course will provide a comprehensive introduction to the fundamentals of organic chemistry, and no previous knowledge of Organic Chemistry will be assumed. The Introductory Course of MT will deal mainly with general concepts, which will be built upon in later lectures. Topics to be covered are: **Lecture 1:** What do we mean by Organic Chemistry? a broad overview of the First Year course. Books, models, and study methods. Carbon element, its electronic properties, valance, and hybridization. **Lecture 2** Bonding. The Structure of methane, and higher alkanes to C_6. Branching and rings. Alternative representations of organic structures introduced with alkanes. Rotation about simple single bonds, concept of conformation, their general physical properties and un reactivity under many circumstances. Electro negativity and bond polarization – carbon halogen bonds. **Lecture 3:** -Bonding. Structure of alkenes, nomenclature and brief general remarks about scope for reactivity - concept of localized functionality. Stereo isomerism of alkenes –conjugation – concept of resonance and its pitfalls; curly arrows to relate canonical structures - introduced by consideration of butadiene and benzene. **Lecture 5:** Structure and reactions of esters. Mechanisms of hydrolysis; tetrahedral intermediates in the formation and hydrolysis of carboxylic acid esters; reduction of esters with $LiAlH_4$and reaction of esters with Grignard reagents; amides: hydrolysis under acidic and basic conditions; reduction of amides with $LiAlH_{4-}$ synthesis of amines. **Lecture 6:** Carbonyl compounds. Halogenations; differences under	

acidic and basic conditions **Lecture 7:** Reactions of carbonyl groups. Enolisation followed by attack at a carbonyl group. Aldol condensation and its reversal, simple and crossed aldol reactions; ester condensations both acyclic and cyclic, crossed condensations. **Lecture 8**: Alkenes from carbonyl compounds. The Wittings reaction of phosphorous ylids with aldehyde and ketone carbonyl groups to make alkenes. **Lecture 9:** Alkenes. Preparations: (i) HOBr (anti attack);(ii) per cyclic additions (hydroboration (then H_2O_2, NaOH), O_3 (and then Me_2S); (iii) free radical additions (anti Markownikov); (iv) catalytic hydrogenation. **Lecture 10:** Alkynes. Preparations: (i) alkylation of terminal alkynes (acidity); (ii) elimination of dihalides. Reactions (i) alkylation; (ii) isomerisation; (iii) reduction (to cis/trans alkenes). **Lecture 11:** Alcohols. Preparations: from organohalides, alkenes, reduction of C=O compounds, Grignard reactions Reactions: organohalide formation, ester formation, oxidation, Williamson ether synthesis (choice of alcohol and halide), Ethers. **Lecture 12:** Amines. Preparations: alkylation direct/indirect (Gabriel), reduction of amides, nitriles, reductive amination Reactions: amide formation. **Lecture13:**Lipids, types of lipids, Fatty acids, cis and trans isomers of fatty acids**,** Steroids, cholesterol, bile salts, and steroid hormones. **Lecture 14:** Steroids, cholesterol, bile salts, and steroid hormones, Carbohydrates'. **Recommended texts:** **Lecture 15:** First semester examination would be out of 40 %. **Second semester** **Lecture 1:** Analytical chemistry**,** application of analytical chemistry, standard solution, preparation of standard solution.	

Lecture 2: primary standard solution, the requirements of titration, end point, standardization. **Lecture 3:** Acid and bases, and neutralization reactions. **Lecture 4:** Concentrations of reactants in solution (molarity, normality, percent composition). **Lecture 5:** Acid- base reactions, diluting concentrated solutions. .**Lecture 6:** oxidation reduction reactions, red-ox titration, identify red-ox titrations, some application of red-ox reactions. **Lecture 7:** precipitation reaction and solubility rules, Acid- base reactions. **Lecture 8:** Complex reaction, application of complex reactions. **Lecture 9:** ligand ,types of ligand, types of coordination compounds. **Lecture 10:** second semester examination would be out of 40 %.	
18. Practical Topics (If there is any)	
Week 1: General provisions about apparatuses, working in laboratory, and chemical compounds. **Week 2:** Calculation formulas: Molarities, Normality and part per million, Preparation of solid and liquid solutions **Week 3:** Introduction to titrimetric analysis, terminology, and standardization. **Week 4:** Application of titrimetric Analysis, Acid-Base titration and titration curves, titration of Sodium carbonate. **Week 5:** Precipitation reaction. Reaction of silver nitrate with Sodium Chloride. **Week 6:** Applications of Oxidation-Reduction reaction, reaction of Potassium permanganate with Sodium oxalate. **Week 7:** Complex ion formation reaction: The Introduction, the complex ion terminology, the reaction of EDTA with metal ions. **Week 8:** EDTA with water hardness, and water hardness calculation.	

Week 9: Seminar

First semester examination would be out of 10 %.
In the second semester eight experiments will be done in the same day by all the students, each student will do one experiment and these are the name of the experiments:

1- Re-crystallization.
2- Simple distillation.
3- Fractional distillation.
4- Freezing point.
5- Extraction of caffeine from tea.
6- Boiling point.
7- Sublimation.
8- Melting point.
9- Seminar

Second semester examination would be out of 10%.

19. Examinations:

1) Write a short report about precipitation reaction.

2) Write the types of hardness, the methods of releasing them.

1- Describe the followings:

Purification melting point

2- A/ Write two methods for purification of solid materials.

B/ why does diet soda freeze at a higher temperature that regular soda?

3- In order to find the molar mass of an unknown compound, a research scientist prepared a solution of 0.930 g of unknown in 125 g of a solvent. The pure solvent had a freezing point of 74.2 °C, and the solution had a freezing point of 73.4 °C. Given the solvent's freezing-point depression constant, K_f = 5.50 °C/*m*, find the molar mass of the unknown.

20. Extra notes:

21. Peer review