Universitat Autònoma de Barcelona

2022/2023

Chemistry I

Code: 103264
ECTS Credits: 6

Degree	Type	Year	Semester
2501925 Food Science and Technology	FB	1	1

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: No

Prerequisites

Although there are no official pre-requisites, it is very convenient for the student to review:

- The concepts of stoichiometry learned in high school.

- The Lewis model for the representation of chemical structures.

- The basic knowledge of nomenclature of organic chemistry, as well as the representation of chemical bonds seen in the baccalaureate.

Objectives and Contextualisation

It is a first-year subject, of basic training in the foundations of organic chemistry, both from the structural point of view and chemical reactivity. The acquired knowledge should allow students who pass the subject to understand the concepts of isomerism related to organic compounds, as well as to interpret chemically most of the biochemical processes that will later be seen in other subjects of the degree.

More specifically, the objectives of the subject are:

1) Achieve knowledge and understanding of the basic concepts of the various binding theories applicable to organic compounds.

2) Be able to describe and understand the different types of isomerism of organic compounds.

3) To identify and describe the reactivity and reaction mechanisms of the main organic reactions, as well as the various factors that affect them.

Competences

- Analyse, summarise, resolve problems and make professional decisions.
- Apply knowledge of the basic sciences to food science and technology.
- Apply the scientific method to resolving problems.
- Display knowledge of the physical, chemical, biochemical and biological properties of raw materials and foods.

Learning Outcomes

1. Analyse, summarise, resolve problems and make professional decisions.
2. Apply the scientific method to resolving problems.
3. Describe the different types of isomerism in organic compounds.
4. Describe the mechanisms of the principal organic reactions and the various factors that affect them.
5. Describe the structure of the atom.
6. Describe the technofunctionality of organic compounds in accordance with the characteristics of the environment.
7. Distinguish between the different types of chemical bonds and intermolecular interactions.
8. Identify the basic reactivity associated with the various functional organic groups.
9. Identify the functional groups of the principal natural organic products and their most important reactions.
10. Name and formulate the organic and inorganic chemical compounds.

Content

The contents of this subject are as follows: *

- Unit 1. Electronic structure of the atom. Chemical bond. Lewis structures and resonant shapes. Introduction to the different types of chemical bonds. Simple and multiple carbon bonds. Aggregation states of matter.

- Unit 2. Introduction to organic compounds. Structures and formulas of organic molecules. Nomenclature. Degree of oxidation of a chemical compound. Classification of organic compounds according to their degree of oxidation and their functional groups. Kinetic and thermodynamic stability of organic molecules. Acidity and basicity of organic compounds. Concept of nucleophile and electrophile.

- Unit 3. Conformational and stereochemical analysis. Dynamic stereochemistry: Conformational isomerism in linear alkanes. Newman projections. Conformational isomerism of cycloalkanes. Static stereochemistry: Chirality. Chiral carbon atoms: stereogenic centers. Configurational isomerism: enantiomers and diastereomers. The *R / S* nomenclature to describe stereogenic centers. cis-trans or *Z-E* isomerism. Optical activity. Fisher projections.

- Unit 4. Hydrocarbons. alkanes, alkenes and aromatic compounds. Aromaticity criteria and examples.

- Subject 5. Organic compounds of with oxidation degree 1. Alkyl halides, alcohols, ethers, thiols and amines. Nucleophilic substitution reactions: S_N1 and S_N2. Elimination reactions: E1 and E2. Alcohol reactivity: dehydration and oxidation reactions.

- Unit 6. Organic compounds with oxidation degree 2. Aldehydes and ketones. General structure and reactivity. Acetals and hemiacetals. Cyclic forms of carbohydrates. Aldolic condensation.

- Unit 7. Organic compounds with oxidation degrees 3 and 4. Carboxylic acids and derivatives. Amino acids and peptides. Claisen's reaction. Reduction reactions.

* *Unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents*

Methodology

The development of the course, in terms of teaching methodology* and training activities, is based on the following activities:

- Lectures, where the student acquires the theoretical knowledge of the subject while she/he participates in the resolution of related problems.

- Seminars, which are sessions with a small number of students that should serve both to answer questions and to study more deeply certain key concepts and their application in practical cases.

- Evidences, which are evaluable exercises of individual realization on the part of the students. These can be commissioned as work outside the classroom or as a substitute for a master class at the decision of the responsible teacher.

* *The proposed teaching methodology may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities*

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Master classes	33	1.32	1, 10, 2, 3, 4, 5, 6, 7, 9, 8
Seminars	16	0.64	1, 10, 2, 3, 4, 5, 6, 7, 9, 8
Type: Autonomous			
Study and solve problems	95	3.8	10, 2, 3, 4, 5, 6, 7, 9, 8

Assessment

The evaluation of the scientific-technical knowledge of the subject achieved by the student, is done individually, continuously and through written tests consisting of: *

- 2 partial exams with an incidence in the final mark of 40% the first and of 45% the second. The minimum grade required to pass the course is 5.0 out of 10 in each part.

- Resolution of evidence with an incidence of 15. Evidence is required, so students who fail to do so will automatically be graded with a zero.

- For students who have not passed one of the partial exams there will be the recovery of one or both partial ones.

- The student who has passed the exams may decide to take the recovery to raise the grade, with the understanding that the student will give up the grade achieved so far.

- To pass the subject, a minimum of 5.0 points out of 10 calculated according to the percentages given above.

A student is graded as "*non-assessable*" if she/he has not participated in any of the two partial exams.

* *Student's assessment may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.*

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evidences	15%	2	0.08	1, 2, 3, 4, 5, 6, 7, 9, 8

First exam	40%	2	0.08	1, 10, 2, 3, 4, 5, 6, 7, 9, 8
Second exam	45%	2	0.08	1, 10, 3, 4, 5, 6, 7, 9, 8

Bibliography

- T. W. Graham Solomons, Craig B. Fryhle, Scott A. Snyder, Organic Chemistry, 11th Edition, John Wiley and Sons, New York, 2013.

- Y. Bruice. Organic Chemistry (3ª Ed) Prentice-Hall International, 2001.

- K. Peter. C. Vollhardt; Neil E. Schore, Organic Chemistry (7th Ed), Ed. Freeman, WH & Co., 2015

- H. Schmid. Química Biológica. Las bases químicas de la vida. Ed. Interamericana. 1986.

- W. R. Peterson. Formulación y nomenclatura en Química Orgánica, EUNIBAR, 1987.

- https://www.organic-chemistry.org/

In general, any book of introduction to organic chemistry.

The use of molecular models to facilitate 3D vision is highly recommended.

Software

Not applicable.