Universitat Autònoma de Barcelona

2020/2021

Chemistry I

Code: 103264
ECTS Credits: 6

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

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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Use of Languages

Principal working language: spanish (spa)

Some groups entirely in English: No

Some groups entirely in Catalan: No

Some groups entirely in Spanish: No

Teachers

Adelina Vallribera Massó

Rosa Suárez López

Prerequisites

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

- The concepts of stoichiometry and high school balance.

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

- Unit 2. Introduction to organic compounds. Structures and formulas of organic molecules. Nomenclature. Structural or constitutional isomerism. Nucleophiles and electrophiles. Oxidation state and degree of oxidation. 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. Alkane halogenation reactions. Alkene addition reactions. 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. Nucleophilic addition reactions. Acetals and hemiacetals. Cyclic forms of carbohydrates. Aldolic condensation.

- Unit 7. Organic compounds with oxidation degrees 3 and 4. carboxylic acids and derivatives. Examples of acids and esters. Interconversion reactions between acids and esters. Amides. Amino acids and peptides. Claisen's reaction.

* *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 on the one hand and on the other hand, attends and participates in the resolution of related problems. These classes will be developed asynchronously with engraved material.

- Seminars, which are sessions with a small number of students that should serve both to answer questions and to delve into 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.

- Team work.

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

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
Team work	5	0.2	1, 3, 6, 7, 9, 8
Type: Autonomous			
Study and solve problems	90	3.6	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 40% the second. The minimum grade required to pass the course is 5.0 in each part.

- Resolution of evidence with an incidence of 10%. Evidence is required, so students who fail to do so will automatically be graded with a zero.

- Work in group. In this activity, a group of 6-8 students will perform a detailed study of a relatively complex organic molecule. They will present the results of this study into a PowerPoint document that they will defend via *Teams* in a joint session with the whole class. In this session they will have to answer individually questions proposed by the teacher. The mark obtained in this section has an incidence of 10%.

- 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.

A student is graded as "*non-assessable*" if he / she has participated in assessment activities that represent ≤15% of the final grade, which translates into non-participation in either 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	10%	1	0.04	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	40%	2	0.08	1, 10, 3, 4, 5, 6, 7, 9, 8
Team work	10%	1	0.04	1, 3, 4, 6, 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.