Universitat Autònoma de Barcelona

2020/2021

Basic General Chemistry

Code: 100890
ECTS Credits: 6

Degree	Type	Year	Semester
2500252 Biochemistry	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: Yes
Some groups entirely in Spanish: No

Teachers

Ona Illa Soler

Prerequisites

Although there are no official prerequisites, it is advisable for the student to review the general concepts of chemistry and biochemistry acquired in the baccalaureate.

Objectives and Contextualisation

The general objective of the proposed program consists in the initiation of chemistry of molecules with an overview of the basic concepts. In this way, it is intended that the student acquires notions about atomic structure and covalent bonding and that he/she begins in the field of the molecular structure. This subject is understood as the basis to be able to develop the study of biomolecules in subsequent subjects.

Main objectives of the subject:

1. To introduce the basic concepts of atomic structure and bonding
2. To familiarize students with the nomenclature and structure of organic compounds based on functional groups
3. To introduce the basic concepts of conformational analysis and stereochemistry of organic molecules

Competences

- Collaborate with other work colleagues.
- Identify molecular structure and explain the reactivity of the different biomolecules: carbohydrates, lipids, proteins and nucleic acids.
- Manage information and the organisation and planning of work.
- Use the basics of mathematics, physics and chemistry that are required to understand, develop and evaluate the chemical procedures of living matter.
- Write an article on a scientific or technical topic aimed at the general public.

Learning Outcomes

1. Apply the principles of thermodynamics and kinetics to biochemical processes.
2. Characterise functional organic groups in the context of biomolecules.
3. Collaborate with other work colleagues.
4. Describe the laws that govern the chemical equilibrium of the various biochemical reactions.
5. Explain the effect of the three-dimensional structure of molecules on biological activity.
6. Identify the functional organic groups and describe their chemical properties.
7. Manage information and the organisation and planning of work.
8. Write an article on a scientific or technical topic aimed at the general public.

Content

The contents of this course are the following:*

1. Atomic structure. Introduction. Atomic electronic structure. Electronic configuration Periodic table of chemical elements.

2. Chemical bonding I. Introduction. Types of bonding. The octet rule. Lewis structures, formal charges, resonance. Bond order. Polarity. Lewis acidity and basicity. Acid-base equilibria. Nucleophilicity and electrophilicity. Coordination compounds.

3. Chemical bonding II. Valence bond theory. Simple and multiple carbon bonds: hybridization and geometry. Aromaticity. Intermolecular forcess.

4. Introduction to organic compounds. Structures and formulas of organic molecules. Nomenclature. Main functional groups in organic compounds. Redox equilibria. Structural and constitutional isomerism, stereoisomery.

5. Conformational analysis. Concept of conformation. Representation of conformations: Newman's projection and sawhorse projection. Acyclic systems. Conformational equilibria. Cyclic systems. Importance of conformation in biochemical systems.

6. Stereochemistry of organic compounds I. Geometric isomerism in double carbon-carbon bonds: cis-trans or Z-E isomers.Symmetryof organic molecules: Chiral molecules.Optical activity. Stereogenic centers. R / S configuration. Optical isomerism: enantiomers and diastereomers.

7. Stereochemistry of organic compounds II. Fisher and Haworth projections. Resolution: separation of enantiomers. Meso molecules. Concept of prochirality. Tetragonal prochirality: homotopic, enantiotopic and diastereotopic groups. Trigonal prochirality: re / si system. Stereochemistry in organic reactions. Chiral substances in nature.

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

Methodology

In accordance with the objectives of the subject, the student will be involved in a series of activities during the term to reach the established knowledge and skills. These sessions can be grouped into three different types:*

Master classes: In this case, students receive in person a series of knowledge articulated exclusively by the teacher. This scientific-technical knowledge is intended to serve as a platform for further maturation by students. In any case, the participation of students will be encouraged through the revitalization of classes through the resolution of cases and questions on a regular basis.

Audiovisual Material: A copy of the master classes will be provided in PDF, so that the students can review at home those knowledge taught in the classroom.

Problem classes: In these sessions, students will put into practice, in a directed manner, the knowledge acquired in the master classes and the work derived from them. Special emphasis will be made on the active participation of the students when solving the problems that arise, as well as other proposed exercises. These exercises, in some cases, will be presented so that through the solutions proposed by the students, the objectives to be achieved can be evaluated.

Resolution of individual evidences: During the course the theory teacher will propose short exercises (10-15 minutes) that must be solved in the classroom or from home (according to the teacher's criteria).

Group work: In this activity, students in groups of 5 students will carry out a detailed study of a relatively complex organic molecule. They will present the result of this study in a powerpoint document that they must present in class in joint sessions, where they must individually answer questions proposed by the profesor regarding the work done.

**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			
Magisterial classes	30	1.2	1, 2, 4, 5, 7, 6
Resolution of problems	12	0.48	1, 2, 3, 4, 5, 7, 6
Type: Autonomous			
Study, resolution of problems in group, resolution of tests or individual activities	98	3.92	1, 2, 3, 4, 8, 5, 7, 6

Assessment

The assessment of this subject is divided into three blocks:*

1. Individual assessment in partial examinations: in this part the scientific-technical knowledge of the subject acquired by the student is evaluated individually, as well as his capacity of analysis and synthesis and of critical reasoning.

The assessment of the exams represents the 80% in the final grade, and it will consists of 2 partial tests with a weight of 35% the first and 45% the second. The assessed subject will include all that subject taught up to the date of the exam. In order to access the grade per course, it is mandatory to pass both partial tests (mark $\geq$5.0). The student who has not passed one or two tests can apply for the recovery exams.

To participate in the recovery, students must have been previously examinated in a set of activities whose weight is equivalent to a minimum of two thirds of the total grade of the subject or module. Therefore, students will obtain the grade of "Non-Assessable" when the assessment activities performed have a weighting of less than 67% in the final grade.

It will also be possible to present (1st partial, 2nd partial or both partial) those students who, despite having passed more than 5.0 of both partial exams, want to raise the mark, with the understanding that the mark of the final exam will be the mark of the recovery test. Students interested in doing so must notify the teacher at least two weeks in advance of the date of the final test.

2. Assessment of the evidence: in this part the scientific-technical knowledge of the subject acquired by the student is evaluated individually, as well as his capacity of analysis and synthesis and of critical reasoning. Individual work is assessed in problem solving with a weight of 10% in the final mark. If a student does not participate, he/she will have a zero (0) in this assessment, as these are continuous assessment activities.

3. Assessment of the work in group:: in this part the capacity to elaborate an article in which presents a scientific-technical content is evaluated, as well as the capacity to collaborate with other classmates. The weight of this point is 10%.

Students who have a obtained a final mark greater than or equal to 5.0 points out of 10 will pass the course.

**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, 4, 5, 7, 6
First partial test	35	2.5	0.1	1, 4, 6
Second partial test	45	2.5	0.1	2, 5, 7
Team work	10	4	0.16	1, 2, 3, 4, 8, 5, 7, 6

Bibliography

Llibres de text:

- Ralph H. Petrucci *Química General*, 10a ed. Pearson Educación, ISBN 9788420535333
- T.W.G. Solomons. *Organic Chemistry* (9^{th} Ed.), Wiley Publishing, New York, 2008.
- K.P.C. Vollhardt; N.E. Schore *Química Orgánica. Estructura y Función* (5ª Ed.), Omega, 2008.
- W.R. Peterson. *Formulación y nomenclatura en Química Orgánica*, EUNIBAR, 1987.

Enllaços web:

- Diccionari de Terminologia Química: http://goldbook.iupac.org/
- Nomenclatura i Estructures: http://www.freechemsketch.com/
- ChemDraw: http://sitelicense.cambridgesoft.com/sitelicense.cfm?sid=1111; adreça: xxx@e-campus.uab.es
- Espai virtual de l'assignatura: https://cv.uab.cat/portada/index.html