UAB
Universitat Autònoma de Barcelona

Basic General Chemistry

Code: 100890
ECTS Credits: 6

2024/2025

Degree	Type	Year
2500252 Biochemistry	FB	1

Contact

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Teaching groups languages

You can view this information at the end of this document.

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, bonding and equilibria.
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

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- 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.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
- 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. Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
2. Apply the principles of thermodynamics and kinetics to biochemical processes.
3. Characterise functional organic groups in the context of biomolecules.
4. Collaborate with other work colleagues.
5. Describe the laws that govern the chemical equilibrium of the various biochemical reactions.
6. Explain the effect of the three-dimensional structure of molecules on biological activity.
7. Identify the functional organic groups and describe their chemical properties.
8. Manage information and the organisation and planning of work.
9. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
10. Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
11. 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. Redox equilibria.

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.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Magisterial classes	30	1.2	2, 3, 5, 6, 8, 7
Resolution of problems	12	0.48	2, 3, 4, 5, 6, 8, 7
Type: Autonomous			
Study, resolution of problems in group, resolution of tests or individual activities	98	3.92	2, 3, 4, 5, 11, 6, 8, 7

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.

Individual/group work: Resolution of exercises to submit during the course of the lessons.

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.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evidences	10	5	0.2	1, 10, 9, 2, 3, 4, 5, 11, 6, 8, 7
First partial test	35	2.5	0.1	2, 5, 7
Second partial test	55	2.5	0.1	3, 6, 8

Option A. Continued assessment (default)

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 90% in the final grade, and it will consists of 2 partial tests with a weight of 35% the first and 55% 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. Evidences: module will have a weight of 10%.

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

Option B. Single evaluation (option to apply for academic bioscience management and responsible professor)

Thesingle evaluation will consist of a single test in which the contents of the entire subject program will be evaluated. The test will consist fundamentally of a written test where theoretical/practical exercises will have to be solved. The note obtained in this assessment will represent 100% of the final note of the subject.

The single evaluation test will be held on the same day, time and place as the last continuous evaluation test of the subject (Parkial 2 QO, in the official schedule). The subject will be approved by obtaining a rating equal to or greater than 5.0 points out of 10.

The single assessment can be recovered on the day set by the overall recovery of the subject.

Bibliography

1.- Petrucci Ralph H. *Química General* (Décima edición), Ed. Pearson Educación, 2011 (ISBN: 978-84-8322-680-3)

2.- Chang, Raymond. *Química* (Décima edición), Ed. McGraw-Hill Educación, 2010 (ISBN: 978-607-15-0307-7)

3.- ii) Bruice, P.Y. *Essential Organic Chemistry*, 3rd Ed. Ed. Pearson Education, 2016 (ISBN 9781292089034).

iii) Bruice, P. Y. *Química Orgánica*, 5ª Edición, Ed. Pearson Educación, México, 2008 (ISBN 9789702607915). Edición online de libre acceso:

4.- Timberlake, K.C. *Química: Una Introducción a la Química General, Orgánica y Biológica*, 10ª Ed. Ed. Pearson Educación, S.A. 2011 (ISBN 9788483227435).

5.- i) Holum, J.R. *Elements of General, Organic and Biological Chemistry*, 9th Ed. John Wiley & Sons Publishing, 1995 (ISBN 0471059064, ISBN 047111605X).

ii) Holum, J.R. *Fundamentos de Química General, Orgánica y Bioquímica para Ciencias de la Salud*, 1a Ed. Editorial Limusa, México, 1999 (ISBN:968-18-4637-0).

iii) Holum, J.R. Fundamentals of General, Organic and Biological Chemistry, 6th Ed. John Wiley& Sons Publishing, 1997 (ISBN-10 0471175749, ISBN-13 978-0471175742).

6.- Solomons T.W.G. *Química Orgánica*, 3ª Ed. Ed. Limusa S.A. 2014 (Vol. 1: ISBN 10 9786070506963, Vol 2: 9786070506970).

7.- Química*, (un proyecto para la A.C.S.),* Editorial Reverte, 2007 (978-84-291-7001-6).

8- IUPAC Nomenclature of Organic Chemistry:

i) https://iupac.qmul.ac.uk/BlueBook/

ii) https://publicacions.iec.cat/repository/pdf/00000195/00000013.pdf

iii) https://www.upo.es/depa/webdex/quimfis/docencia/quimbiotec/Nomenclatura_organica.pdf

9.- ACD/ChemSketch for Academic and Personal Use. A Free Comprehensive Chemical Drawing Package: http://www.freechemsketch.com

10.- Pulido F. Nomenclatura de Química Orgánica: http://es.slideshare.net/manoa21/nomenclatura-quimicaorganica-29646851?next_slideshow=1

11.- Rosso V. Química Orgánica Nomenclatura: http://es.slideshare.net/verorosso/qumica-orgnica-nomenclatura?qid=09239331-ba5c-4096-9104-dd4cb26fe6308

Software

-ACD/ChemSketch for Academic and Personal Use. A Free Comprehensive Chemical Drawing Package: http://www.freechemsketch.com

Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	311	Catalan	first semester	afternoon
(TE) Theory	31	Catalan/Spanish	first semester	afternoon