

Basic General Chemistry

Code: 100890
ECTS Credits: 6

Degree	Type	Year	Semester
2500252 Biochemistry	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: 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

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. Molecular Orbital theory. Aromaticity: electronic structure of benzene. Intermolecular forces: hydrogen bonds.

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

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. Symmetry of 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.

Methodology

The development of the course is based on the following activities:

Magisterial classes

The student gets the scientific and technical knowledge of the matter attending magisterial classes that will be complemented with the personal study of the commented topics. Magisterial classes involve small interaction with the student and they are conceived as a unidirectional method of knowledge transmission from the teacher to the student.

Oral presentations of works by the students. Evidences

The student applies the scientific and technical knowledge acquired in magisterial classes as well as by means of bibliographic search on a specific topic prepared with other students that will be presented followed by responses to the teacher or the other students. Herein, the interaction with the student is stronger. The student will also answer some tests or short questions in individual way. All these exercises will constitute the 20% of the final mark.

Seminars (problem resolution)

The comprise sessions in which the knowledge from magisterial classes is worked in a critical and deep manner. The main goal is to promote the analysis and synthesis skills, the critical reasoning and the ability to solve problems.

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

Examinations

In the examinations, the knowledge of the contents in the course program will be evaluated with special emphasis in the resolution of problems.

There will be two qualifying examinations that will be mandatory and that will be carried out in April (40%) and June (40%) and a possible final examination at the end of June.

Evidences and works

They will be carried out over the course and will consist in exercises or short works that will be made in an individual way or in a group, in the classroom or at home. The works no presented will compute a 0 when the average will be calculated. The overall qualification of all evidences will be a 20% of the final mark.

To pass the course, it is necessary:

a) To have a mark ≥ 5.0 in both qualifying examinations.

Those students that do not achieve the requirement a), must pass the course at the final examination, which will include all the subjects of the course.

To participate in the final examination in order to pass the course, the students should have been evaluated in several activities whose relative weight will be $\geq 2/3$ of the overall qualification of the course. If the evaluation activities carried out represents a balanced weight $\leq 67\%$ of the final mark, the student will be "not able to be evaluated".

The students that pass the qualifying examinations but want to improve the mark can attend the final examination. In this case, the final mark will be that of the final examination.

It is mandatory to get a mark ≥ 5.0 over 10 in the overall evaluation to pass the course.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
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Resolution of problems in group, tests, or individual evidences	20%	5	0.2	1, 2, 4, 5, 7, 6
Two qualifying examinations	80%	5	0.2	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* (9th 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>