

Chemistry

Code: 101957
ECTS Credits: 6

Degree	Type	Year	Semester
2500890 Genetics	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: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Prerequisites

Although no official prerequisites are mandatory, it is highly recommended to have coursed the subjects of Chemistry, Physics and Biology in the High School.

As far as the lab sessions are concerned, students have the obligation to pass the tests of security and biosecurity available in Campus Virtual, as well as to read and accept the standard operating rules of the laboratories of the Faculty of Biosciences

Objectives and Contextualisation

Overall objective of the subject:

To understand and interpret a biological system from a chemical point of view

Intermediate goals:

- 1) To acquire a fundamental chemical language.
- 2) To recognize a covalent chemical bond and to derive from it structural and physico-chemical properties
- 3) To assimilate the concept of equilibrium
- 4) To know the difference of several chemical reaction types: acid-base, redox, organic
- 5) To know the main functional organic groups and their chemical reactivity.
- 6) To know how to manipulate properly materials and products in a chemical laboratory

Competences

- Apply scientific method to problem solving.
- Appreciate the importance of quality and a job well done.
- Be able to analyse and synthesise.

- Know and understand the underlying chemical basics of the molecular properties of genetic and biological processes in general.
- Reason critically.

Learning Outcomes

1. Apply scientific method to problem solving.
2. Apply the basic concepts of chemistry to the reactions of biological systems.
3. Appreciate the importance of quality and a job well done.
4. Be able to analyse and synthesise.
5. Define the basic concepts of chemistry.
6. Reason critically.

Content

Structure of the Atom

- Quantum Numbers
- Atomic Orbitals
- Electronic Configurations
- Periodic Table
- Periodic Properties

Chemical Bond

- Models of Chemical Bond
- Covalent Bond
- Lewis Structures
- Resonance
- Molecular Geometry
- Hybrid Orbitals
- Intermolecular Forces

Acid-Base Reactions

- Brønsted-Lowry Acids and Bases
- Acid-Base Equilibrium and Acidity Constant
- The pH Concept
- Calculation of Concentration in Equilibrium
- Determining the Dominant Species in Solution
- Buffer Solutions
- Acid-Base Titrations

Organic Chemistry

- The Carbon Atom
- Organic Functional Groups
- Oxidation States of C Atoms in Organic Compounds
- Balancing Organic Redox Reactions
- Isomery: Concept, Structural Isomery and Stereoisomery
- Reactivity of Organic Chemistry: Nucleophile/Electrophile Concepts, Reaction Energy Profile, Types of Organic Reactions, and Fundamental Reactivity

All these contents will be given unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents.

Methodology

The subject will be developed by means of three directed activities. Each one brings associated with a personal work carried out by the student, with the aim to: i) establish relationships between the concepts given in class and the biological system of the project, and ii) be ready for the problems and lab sessions.

Directed activities:

Master classes

Master classes will be directed activities devoted to expose the main concepts of the subject. Ideally, the procedure is not based on the full exposition from the professor to the students, but on the establishment of interactive dynamics between the professor and the students.

Problems sessions

These are the sessions devoted to apply the concepts learnt in the master classes in front of hypothetical situations. To foster the interaction between the professor and the students, these sessions will be done in reduced groups. A set of problems will be solved with the aim to get a better and deeper knowledge of the master class concepts.

Laboratory sessions

Two lab sessions will be done with reduced groups. In these sessions, students will see in a practical way some of the concepts given in the master classes and problem sessions. In the end of each session, compilation of an on-line questionnaire will be mandatory as evaluation assessment of the practice. To carry out the lab sessions, students have the obligation to pass 1) the tests of security and biosecurity available in Campus Virtual, as well as to read and accept the standard operating rules of the laboratories of the Faculty of Biosciences, and 2) an on-line test justifying that they have read the practical guides.

Personal work:

Part of this personal work is related to the project of "The Chemistry of a Biological system". This personal work will be supervised by the tutor of the subject through the forms delivered along the subject course.

The other part is related to the preparation of the problem and lab sessions. As far as the problem sessions is concerned, students have to attend the class with the problems tentatively solved, while with respect to the lab sessions with the guidelines of the practices read.

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			
Laboratory sessions	8	0.32	1, 2, 6, 4, 3
Master classes	30	1.2	1, 5, 6, 4, 3
Problem sessions	13	0.52	1, 2, 6, 4, 3
Type: Supervised			
Form supervision	3	0.12	1, 2, 5, 6, 3
Preparing lab sessions	1	0.04	6, 4, 3
Type: Autonomous			
Forms	20	0.8	2, 6, 4, 3
Preparing and solving exercises	20	0.8	1, 2, 6, 3
Studying	46	1.84	5, 6, 4, 3

Assessment

The final grade is based on the ponderation of three types of evaluation: project "The chemistry of a biological system", problem exams, and laboratory practices.

Project "The chemistry of a biological system":

The main objective of the subject is that the students know to interpret a biological system from a chemistry perspective according to the themes of the subject. In this project the students will choose a biological system and carry out a chemical interpretation. Here, the evaluation splits in two parts:

- *Delivery of forms:*

Along the subject course the students will have to deliver different forms where the chemical interpretation of the chosen biological system will be developed according to the themes of the subject. Thus, the first deliver will be related to the chemical bond, the second one to the acid-base properties, and the third one to the organic chemistry of the biological system. This part weights 20% of the final grade. This activity belongs to the continuous assessment of the subject

- *Oral exposition of the project:*

At the end of the course, student will have to give an oral exposition individually of 7 minutes length in front of the professor and behind closed door. Subsequently, the student will have to answer different questions done by the professor for 12 minutes. The overall action will last 20 minutes. This part weights 40% of the final grade. Obtaining less than 5 out of 10 will imply to attend a second-chance exam. This exam will be written and will consist in answering a set of questions related to the biological system.

Overall comments:

- The election of the biological system and the delivery of the forms can be done individually or by couples. However, the oral exposition will be individually.

- Dates of the oral exposition: 20, 21 and 22 January 2021, 9:00h - 13:00h and 15:00h- 19:00h.

Problem exams:

When a given theme will be finished, one of the master class hours will be devoted to solve a problem of the corresponding theme, which will be evaluated. A total of 3 exams will be done, one per theme. This part weights 30% of the final grade. This activity belongs to the continuous assessment of the subject. Obtaining less than 4 out of 10 will imply to attend a second-chance exam. This exam will consist in solving a set of problems related to the themes of the subject.

Evaluation of the laboratory sessions:

This part will evaluate the work carried out by the students in the laboratory sessions by assessing the acquired knowledge, the previous preparation and the work habits in the laboratory. The evaluation will be done by filling an on-line questionnaire related to the practice done. This part weights 10% of the final grade. The non-justified absence in just one of the sessions or obtaining a grade less than 4 out of 10 of this part will mean not to pass the subject course.

The student will pass the subject if the weighted average overcomes the grade of 5 (out of 10) according to the following expression:

$$\text{Final grade} = (\text{exposition grade}) \times 0.40 + (\text{form grade}) \times 0.20 + (\text{problem exams grade}) \times 0.30 + (\text{lab sessions grade}) \times 0.10$$

In the case no to reach the grade of 5, student will have the opportunity to attend the second-chance exam. The professor will assess each particular case to determine which part is recommended to recover; project, problems, or both.

Justified absence to the evaluation actions:

Students who are not able to attend in any of the evaluation actions (namely, oral exposition and lab sessions) in a justified way (namely, illness, death of relative, crash) and by providing an official document as a justification, will have the right to do the missing evaluation in another date.

Non-assessing students and retake processing:

Those students who do not attend of any of the evaluation actions in a non-justified way will be considered as non-assessing students and will not pass the subject.

To be eligible for the retake process, the student should have been previously evaluated in a set of activities equaling at least two thirds of the final score of the course or module. Thus, the student will be graded as "No Avaluable" if the weighthin of all conducted evaluation activities is less than 67% of the final score

Repeating students:

The repeating students who have a grade of > 5 in the lab sessions, this grade is kept and do not have to repeat the practices. However, they will have to attend the rest of evaluation actions

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
Forms	20%	4	0.16	1, 2, 5, 6, 4, 3
Lab Session Evaluation	10%	1	0.04	1, 2, 5, 6, 4, 3
Oral Exposition	40%	1	0.04	1, 2, 5, 6, 4
Problem Exams	30%	3	0.12	1, 2, 5, 6, 4

Bibliography

- R. H. Petrucci, W. S. Hardwood, F. G. Herring, *Química General* 8a Edició Prentice Hall, 2003.
- R. Chang *Químca* 9a Edició Mc Graw Hill 2007
- P. Atkins, L. Jones *Principios de Química Los caminos del descubrimiento* 3ª edició., Editorial médica Panamericana 2006.