COURSE DATA

DATA SUBJECT

Code: 33119
Name: Chemistry
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1109 - Degree in Biochemistry and Biomedical Sciences	Facultat de Ciències Biològiques	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1109 - Degree in Biochemistry and Biomedical Sciences	Química	BASIC

COORDINATION

BORRAS ALMENAR JUAN JOSE

SUMMARY

The subject Chemistry is part of Module 1 on general scientific foundations, taught during the first semester of the first year of the Bachelor's Degree in Biochemistry and Biomedical Sciences. According to the curriculum, it consists of a total of 6 ECTS credits. The aim of this course is for students to deepen their knowledge of Chemistry acquired during their high school studies and, in certain aspects, to expand it. As this subject is part of the Biochemistry and Biomedical Sciences degree, the teaching staff understands that the study of chemical phenomena should be specifically oriented towards aspects that are most useful to the students. The subject has a mixed theoretical-experimental character, meaning that theoretical components are complemented with practical ones, including numerical problem-solving and laboratory work, where students will apply some of the studied concepts and techniques, becoming familiar with laboratory practices. The core topics covered in the course revolve around the fundamental concepts of chemistry, commonly known as General Chemistry. The objective is for students to master the most relevant aspects related to the structure of matter and chemical bonding, linking both to the properties of matter, and also to understand the principles that govern the reactivity of substances: the kinetic and thermodynamic aspects of chemical transformations as well as chemical equilibrium, with special focus on acid-base and redox equilibria.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

In order to successfully complete the course, it is essential that students possess a series of prior knowledge, in line with the level required in the Second Year of High School Chemistry curriculum. This prior knowledge, which will not be formally presented in the course but is crucial for its understanding, includes:

- Chemical nomenclature and formulation, both inorganic and organic.

- Balancing chemical reactions.

- Basic stoichiometric calculations.

COMPETENCES / LEARNING OUTCOMES

1101 -

Conocer los principios químicos de la estructura del átomo y los enlaces químicos, de la estequiometría de las reacciones químicas, de la termodinámica y del equilibrio químico, de las propiedades de los equilibrios ácido-base y rédox y de la estructura y reactividad de los compuestos orgánicos.

Manejar la nomenclatura química y las reglas de formulación y estequiometría.

Saber aplicar los conceptos físicos y químicos teóricos a casos prácticos de índole biológica.

DESCRIPTION OF CONTENTS

1. Atomic Structure and the Periodic Table.

Subatomic particles. Atomic nucleus: isotopes. Quantum theory. Atomic orbitals. Electron spin. Pauli exclusion principle. Hund's rule. Electron configurations. The Periodic Table. Periodic properties. Ionization energy and electron affinity. Metallic and non-metallic character.

2. Molecular Geometry and Chemical Bonding.

Types of bonds. Covalent bonding. Lewis electron structures. Molecular geometry: VSEPR theory. Molecular polarity. Valence bond theory: hybridization. Basic concepts of molecular orbitals: diatomic molecules. Intermolecular forces. Hydrogen bonding.

3. Chemical Thermodynamics.

Basic concepts. Enthalpy. Thermodynamic cycles. Entropy.

4. Chemical Equilibrium.
Reversible reactions and the concept of equilibrium. Equilibrium constants. Free energy and spontaneity. Heterogeneous equilibria. Factors affecting equilibrium: Le Chatelier's principle.

5. Properties of Solutions.
Factors affecting solubility. Ways of expressing concentration. Colligative properties. Colloids.

6. Acid-Base Equilibria.
Acid-base concepts. Self-ionization equilibrium of water. pH concept. pH calculations in aqueous solutions. Neutralization reactions. Buffer solutions. Acid-base titrations. Polyprotic acids. Acid-base behavior and molecular structure.

7. Redox Equilibria.
Oxidation states. Redox potentials. Balancing redox equations. Electrochemical cells. Variation of potential with concentration: Nernst equation. Determination of the equilibrium constant. Batteries and fuel cells.

8. Equilibria of Coordination Complex Formation.
Complex ions in solution. Ligands. Color and magnetism. Crystal field theory.

9. Chemical Kinetics.
Basic concepts. Rate law. Reaction order. Reaction mechanisms. Effect of temperature.

10. Introduction to Biocatalysis.
Homogeneous and heterogeneous catalysis. Examples. Enzymatic catalysis.

11. Laboratory Practicals.
Session 1. Introduction to laboratory work in chemistry. Preparation of solutions.
Session 2. Thermochemistry.
Session 3. Acid-base titrations.
Session 4. Oxidation-reduction reactions.
Session 5. Study of the kinetics of a reaction.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	35,00
Laboratory	15,00
Classroom practices	10,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	0,00
Preparation of lessons	65,00
Preparation for assessment activities	20,00
Resolution of case studies	0,00
Total hours	**85,00**

TEACHING METHODOLOGY

The course is structured around four main components: theory sessions, problem-solving sessions, tutorials, and laboratory practicals:

Theoretical classes.- These sessions will provide an overall view of each topic and emphasize key concepts necessary for understanding it. Students will also be guided towards the most recommended resources for preparing the topic during the personal study time indicated in Section III. At the end of each topic, a multiple-choice test consisting of 10 questions will be administered, to be completed in 15 minutes.

Problem-solving and question sessions.- These classes focus on applying the knowledge presented in the theoretical sessions. A list of questions and problems will be provided to students to reinforce their understanding and allow them to practice the key aspects covered in class. Students are expected to have worked on the problems in advance. Problem-solving will be carried out either by the instructor or by the students themselves, either individually or in groups.

Tutorials.- Scheduled towards the end of the semester, the tutorials will serve to guide students through the final phase of their learning process, specifically to help them prepare effectively for the final exam.

Laboratory sessions.- These will take place in small groups under the constant supervision of a professor. Attendance is mandatory. Students will work in pairs to carry out a series of simple chemical experiments. Prior to each session, students will receive the lab manual and must complete a set of preparatory questions. At the beginning of each session, the instructor will explain the characteristics of the experiment, highlighting the importance of understanding the fundamental concepts involved and of preparing a lab notebook that includes all relevant aspects to ensure the experiment is understandable and reproducible. After completing the lab work under supervision, students must record their results and answer a set of questions in their lab notebooks. At the end of the laboratory sessions, a lab exam will be held. In a coordinated manner, laboratory instructors may also require detailed reports on the experiments.

EVALUATION

The final grade of the subject has two components: the one corresponding to the theory part (**75%**) and the one corresponding to the laboratory (**25%**). In order to pass the subject, it will be an essential requirement to obtain a grade of at least 4 points (out of 10) in both the final exam and the laboratory grade.

Laboratory Evaluation

The laboratory will be evaluated by weighting the laboratory work with a maximum of 50% of the practical grade and the tests prior to carrying out the practices with a maximum of 50%. At the proposal of the professor responsible for the practical course, the laboratory notebook may be evaluated, in which case the evaluation will be included in section L-1.

The percentages assigned in the evaluation of the laboratory part will be the following:

L-1.-Individualized monitoring of practical activities (subjective evaluation of the quality of work in the laboratory): **15%**

L-2.-Qualification of exercises performed (test prior to each practice): **10%**

Theory evaluation

The evaluation of the theory part will be carried out following one of the two modalities indicated:

Modality A:

The student will be evaluated based on objective tests on the contents of the subject, with a weight on the student's evaluation of **75%**.

The qualification will be made based on a continuous evaluation carried out throughout the semester. The grade will be obtained as a weighted average of the following sections, according to the indicated percentages:

T-1.-Test-type evaluation of each of the topics. These tests will be proposed throughout the topic or at the end of it, using Virtual Classroom. They will represent a maximum of **30%**.

T-2.-Final exam of the subject, with a maximum of **45%**.

Those students who do not pass the subject in the first call must take the exam in the second call where the grade for the subject (in the percentage that corresponds to the theory) will correspond **exclusively** to the grade obtained in said exam. However, the grades obtained in subsections T-1 and T-2 may be taken into account.

Modality B: the student will be graded according to the grade obtained only in the final exam.

The student can freely choose to participate in either of the two modalities but must express his or her adherence to one or the other by signing the written Commitment that the teacher will provide and that will be available to him or her in the Virtual Classroom.

REFERENCES

BASIC

- T. L. Brown et al., Química. La Ciencia Central. 11ª Edición, Ed. Prentice Hall. México, 2009.

ADDITIONAL

- M.D. Reboiras, Química. La ciencia básica. Ed. Thompson, 2006.
- R. Chang, Química. 9ª Edición, Ed. McGrawHill, 2007.
- H. Petrucci y W.S. Harwood. Química general. Principios y aplicaciones modernas. 8ª Edición. Ed. Prentice Hall. Madrid, 2003.
- P. Atkins y L. Jones. Principios de Química. Editorial Médica Panamericana, Buenos Aires, 2006.
- M.D. Reboiras. Problemas resueltos de Química. La ciencia básica. Ed. Thompson, 2007.