Universitat Autònoma de Barcelona

2023/2024

Chemistry

Code: 100765
ECTS Credits: 6

Degree	Type	Year	Semester
2500250 Biology	FB	1	1

Contact

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Teaching groups languages

You can check it through this link. To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

Teachers

Francesc Xavier Muñoz Berbel

Prerequisites

It is very convenient that the student is clear about the contents of the subjects of chemistry, physics and mathematics of baccalaureate. It is highly recommended to do the propaedeutic courses of chemistry if you have not studied chemistry in 2nd year of baccalaureate or access through a higher cycle.

Objectives and Contextualisation

Many of the vital processes studied in different subjects of this Degree are based on the properties, interactions and reactivity of molecules. Chemistry is, therefore, a basic tool to develop other subjects within the degree of Biology.

The objectives of the subject of "Chemistry" are to study and understand the properties and behavior of matter and its transformation, as an essential theoretical basis to understand the laws that govern many biological processes, through knowing the current scientific models that explain them.

Competences

- Be able to analyse and synthesise
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.

- Understand and interpret the physicochemical bases of the basic processes of living beings

Learning Outcomes

1. Be able to analyse and synthesise.
2. Correctly manipulate chemical equations, equalise them and make stechiometric calculations.
3. Describe conformational isomerism in alkanes and cycloalkanes and its application to biological systems.
4. Describe the fundamental principles underlying organic reactions and their application to biological systems.
5. Determine and represent the configuration of the chiral centres in chemical compounds and describe their properties and their importance in the field of biology.
6. Draw Lewis structures of chemical compounds and qualitatively predict the molecular properties based on these structures (molecular geometry and polarity).
7. Identify the functional organic groups present in biomolecules and name and formulate the corresponding organic compounds.
8. Identify the oxidation and reduction processes of a redox process and equalise the global reaction.
9. Solve basic problems in chemistry.
10. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.

Content

Item 1. Fundamentals of Chemistry: What do you need to know to get started? Experimental sciences and scientific method. Chemistry and biology. Matter, its properties and its physical states. Ideal gas laws. Chemical change: historical approach, fundamental laws. The mole. Concentrations. Dissolutions. Experimental measurement of concentrations.

Item 2. Structure of matter: What is matter like inside? Element, compound, atom, molecule, periodic table. Compounds and chemical bonding. Intermolecular forces.

Item 3. The carbon cycle: From carbon dioxide to ester. Carbon and living beings: origin and chemical transformations. Organic substances, the framework of life: properties and structure Molecular geometry. Isomerism. Metals and biology: life beyond carbon.

Item 4. Chemical reactions in biological systems. The molecular basis of chemical reactions. Heterolytic reactions. Homolytic reactions. Oxidation and reduction. Reaction mechanisms that lead to the chemistry of life.

Item 5. Energy: What causes a chemical reaction to occur? What is energy? Energy transfer. Energy exchanges during chemical reactions in chemical and biological systems: Enthalpy. Entropy: the distribution of energy as an engine of change. Spontaneous processes and non-spontaneous processes. Gibbs energy: free energy to do chemical and biochemical work (metabolism).

Item 6. Chemical equilibrium: How far do chemical reactions go? Reversible reactions: where is the balance? The reaction quotient. Disturbing a balance. Gibbs energy and chemical equilibrium.

Item 7. Kinetics: What affects the rate of a chemical reaction? The speed of reaction. Collision theory. The activation energy. Catalysis.

Item 8. Acids, bases and buffer solutions: life in the aqueous medium. Strength of acids and bases: to what extent does the dissociation reaction occur? Keeping things in balance: the ionic product of water. Measuring concentrations: the pH scale. Behavior of acids and bases in biological systems. Buffer solutions or buffer: maintaining the pH.

Methodology

The acquisition of knowledge requires autonomous work on the part of the students, beyond the face-to-face work in the classroom. Under these conditions, the use of one of the textbooks recommended by the teaching staff (or similar bibliographic material), together with the own notes, can represent a good support to overcome the expected learning of this subject.

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

Theoretical classes:

The teaching staff will work on the basic contents related to the program, which the students must complete with autonomous work, and will solve the students' questions. In the last classes of the course, 15 minutes of class will be reserved so that students can respond to the survey on the subject.

Classroom Practices (PA):

Students must prepare at home the programmed problems, which will be discussed in class with the problem teachers. In addition, group problems will be solved that will have to be delivered at the end of the PA sessions.

Laboratory practices:

There will be two practices in the laboratory to which some of the knowledge acquired in the master classes will be applied.

Tutorials:

At specific times and considering the difficulties of the students, the teaching staff will offer an hour of tutoring.

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.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Exercice classes	12	0.48	4, 5, 6, 7, 8, 2, 9, 1
Lab session	8	0.32	4, 5, 6, 7, 8, 2, 9, 1
Magistral courses	30	1.2	4, 5, 6, 7, 8, 2, 9, 1
Type: Supervised			
Tutoring	3	0.12	4, 5, 6, 7, 8, 2, 9, 1
Type: Autonomous			
Resolution of exercices	20	0.8	4, 5, 6, 7, 8, 2, 9, 1
Revision activities	12	0.48	4, 5, 6, 7, 8, 2, 9, 1
Studing	50	2	4, 5, 6, 7, 8, 2, 9, 1

Assessment

The correct achievement of the competences by the students will be evaluated through 3 types of evaluation activities, each with a specific weight in the final grade and with specific requirements.

1. Partial exams: Throughout the course there will be 2 written partial exams of the contents (theory, problems) taught until that moment of the course. The weight of each partial in the final grade is 35%. It will be necessary to obtain a 4 out of 10 of each of the two partials to make average with the rest of the notes.

2. Review activities: Throughout the semester problems will be raised to solve during the group problem class. At the end of the course it will be necessary to do a group research work on an interdisciplinary topic of chemistry and biology.... These activities will be evaluated and their average will have a weight of 15% in the overall grade. There are no minimum grade requirements.

3. Laboratory practices: After the practice session, which will be done in groups of two people, each group must answer a questionnaire of brief questions about the practice that will be delivered before leaving the laboratory and will be used to determine the practice note. A minimum grade of 4.0 out of 10 in each questionnaire will be necessary to be able to count it in the overall grade. The laboratory note has a weight of 15% with respect to the overall grade. Attendance at the practices is mandatory to be able to pass the subject.

Thus, the overall note will come out of the formula:

Overall grade = Exams*0.70 + Review*0.15 + Laboratory*0.15

The subject will be considered passed when the overall grade thus calculated is equal to or greater than 5 points out of 10. It is important to bear in mind that, if the grade of any of the two partial exams does not reach 4.0, if the grade of each practice questionnaire does not reach 4.0 or if a practice session has been unjustifiably absent, the subject will be suspended, even if the overall grade of the subject is greater than 5.

Students will be able to opt for a recovery test at the end of the course. To participate in the recovery, students must have been previously evaluated 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 qualification of "Not Evaluable" when the evaluation activities carried out have a weighting of less than 67% in the final grade. The recovery may be of any of the parts for which the minimum grade requirements have not been exceeded (first and / or second partial, practices) or of the total contents when no part has been passed. The recovery grade will replace the corresponding grade in the calculation of the overall grade by the subject. The recovery will consist of a written exam of two parts, corresponding to the two partials, and it will be necessary to take at least a 4 of each of the parts that have to be recovered.

UNIQUE ASSESSMENT

The single evaluation consists of a single synthesis test in which the contents of the entire theory program of the subject will be evaluated. The test will consist of multiple-choice questions, open-ended questions and numerical problems. The grade obtained in this synthesis test will represent 85% of the final grade of the subject.

The evaluation of laboratory practice activities, PAUL, will follow the same process of continuous evaluation. The grade obtained will represent 15% of the final grade of the subject.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes

Lab session	15%	2	0.08	10, 4, 5, 6, 7, 8, 2, 9, 1
Partial exams	35% + 35%	6	0.24	4, 3, 5, 6, 7, 2, 9, 1
Revision activities	15%	7	0.28	4, 3, 5, 6, 7, 8, 2, 9, 1

Bibliography

1. J. Crowe, T. Bradshaw. *Chemistry for the Biosciences.* Ed. Oxford University Press.

2. R. H. Petrucci Quimica General Ed. Pearson Prentice Hall. Electronic book: http://www.ingebook.com.are.uab.cat/ib/NPcd/IB_Escritorio_Visualizar?cod_primaria=1000193&libro=6751

3. P. Atkins Principios de Química Ed. Paamericana.

4. R. Chang, Química, Ed. Mc Graw Hill.

Software

There is no computer programs associated to this subject.