Universitat Autònoma de Barcelona

2022/2023

Chemistry

Code: 100846
ECTS Credits: 6

Degree	Type	Year	Semester
2500251 Environmental Biology	FB	1	1

Contact

Name: Manel Alcala Bernardez
Email: manel.alcala@uab.cat

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

External teachers

Ajudant problemes+laboratori (per definir)

Prerequisites

There are no official prerequisites. However, it is assumed that the student has acquired the basic knowledge taught in the Chemistry and Technology and / or Experimental subjects of the baccalaureate.

Objectives and Contextualisation

In the subject Chemistry, concepts in the Inorganic Chemistry area, such as the atomic structure, the periodic table and the chemical bond, are studied in a first part, introducing the concept of Stoichiometry of compounds and reactions . We continue talking about the aggregation states of the matter, emphasizing dissolutions. Concepts of thermodynamics and chemical kinetics are introduced. In a second part, the section of dissolutions is extended by talking about the concept of chemical equilibrium, in the area of Analytical Chemistry, mentioning the main balances to be considered in aqueous solution. Finally, the last part of the subject will refer to a brief introduction to Organic Chemistry and Stereochemistry.

The general objective of the subject is to provide the basics of the basic aspects and concepts in Chemistry necessary for the follow-up of different subjects of the Degree in Environmental Biology.

Specific objectives of the subject:

Understand the fundamental concepts in chemistry: atomic structure, chemical bonding, and stoichiometry.
Understand the concepts of Thermodynamics and Kinetics of chemical reactions.
Describe the chemical equilibrium in aqueous solution and know how to get the information timely.
Introduce yourself in the world of Organic and Stereochemistry Chemistry, knowing the formulation and naming of aliphatic and aromatic hydrocarbons.
Learn how to apply the knowledge studied to solve qualitative and quantitative problems.

Competences

- Describe, analyse and assess the natural environment.

- Display basic knowledge of mathematics, physics and chemistry.
- Obtain information, design experiments and interpret results.
- Solve problems.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Work individually and in teams.

Learning Outcomes

1. Analyse phase equilibrium and chemical equilibrium: acid-base, redox and equilibrium of solubility.
2. Explain chemical bonds.
3. Know and follow the rules of a chemistry laboratory.
4. Know the different types of structural isomery.
5. Know the principal functional groups and how these confer their chemical properties on to organic compounds.
6. Measure certain chemical characteristics in various environments.
7. Obtain information, design experiments and interpret results.
8. Prepare solutions and handle reagents according to a specific protocol, and perform basic experiments in chemistry.
9. Solve problems.
10. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
11. Understand basic chemical reactions.
12. Understand the conventions and symbols of chemistry and handle its units.
13. Understand the principal organic reactions and the factors on which they are based.
14. Understand the three laws of thermodynamics.
15. Work individually and in teams.

Content

THEORY

The first topics (1 to 4) try to review the previously acquired concepts, between ESO and Baccalaureate.

Topic 5 includes chemical equilibria in dissolution, the basis for understanding many of the chemical and biochemical processes in our environment, so it will be an extensive subject, with much of the applied exercises.

Item 6 is a review of organic formulation and nomenclature, extending information relative to the main characteristics of the various types of compounds.

Topic 1. Fundamental concepts: matter, substance and mixture; physical-chemical properties; elements and compounds.

Topic 2. The periodic table. Chemical equations

Subject 3. Chemical link.

Topic 4. Thermodynamic and kinetic bases of balance.

Topic 5. Acid-base equilibria. pH and alkalinity. Oxidation-reduction balances. Solubility balances.

Topic 6. Structures and formulas of organic molecules. Aliphatic and aromatic hydrocarbons. Alcohols, ethers and thiols. The carbonyl group: aldehydes and ketones. The carboxyl group: acids and derivatives. The amino group and derivatives. Organic compounds and toxicity.

PROBLEMS

The content of this section, which will be presented in the form of a dossier at the beginning of the semester, consists of a certain amount of statements of problems related to the topics developed in Theory. The characteristics of the different parts of the Theory's agenda make the statements of these problems concentrate on certain aspects that are: calculations of concentration of dissolution (concentration concept and way of expressing it), conversion factors, and stoichiometric calculations. In the Chemical Balance section, exercises will be related to learn to perform pH calculations of acid-base solutions, determine the presence of soluble coordination compounds (complexation equilibria), determine the oxidizing or reducing capacity in Aqueous solutions (oxidation-reduction equilibrium) as well as determine the solubility of insoluble salts (solubility equilibria) including fractional precipitation concepts (separations of spices). Finally, problems of formulation and nomenclature of organic chemistry will be included in the collection.

LABORATORY PRACTICES

There are two laboratory sessions of four hours each.

Practice 1: SEPARATION AND PURIFICATION OF SOLIDS

Practice 2: DETERMINATION OF THE DURATION OF WATER. DETERMINATION OF CALCIUM AND MAGNESI IN WOMEN OF DOMESTIC CONSUMPTION

Methodology

The training activities are divided into three sections: theory classes, problem classes and laboratory practices, each one with its specific methodology. These activities will be complemented by a series of tutoring sessions that will be programmed additionally.

Theory classes

The teacher will explain the content of the syllabus with the support of audiovisual material that will be available to students in the Virtual Campus of the subject. These lectures will be the most important part of the theory section.

Under the guidance of the teacher and through communication through the Virtual Campus, the knowledge of selected parts of the syllabus will have to be searched and studied by means of autonomous learning by the students. In order to facilitate this task, information about locations will be provided in textbooks, web pages, etc. This material of autonomous study and other questions / practical problems that may be raised will be, in part, the content of the tutorial sessions.

Also to reinforce learning, cooperative activities will be proposed to be carried out in groups, both inside and outside the classroom. Within the classroom they will be led by the teacher, in some kind of theory. And activities outside the classroom will involve the need to do bibliographic research, as well as to organize properly for teamwork, discussion and sharing of the knowledge acquired by each member of the group.

Problem classes

The group will be divided into two subgroups, whose lists will be made public at the beginning of the year. Students will attend the sessions programmed by their group.

At the beginning of the semester a dossier of statements of problems of the subject will be delivered through the Virtual Campus that will be resolved throughout the sessions. In these sessions distributed throughout the semester, the teacher of problems will present the experimental and calculation principles necessary to work on the problems, explaining the guidelines for their resolution and reinforcing the same time the knowledge of different parts of the subject of the theory classes .

Laboratory practices

The group will be subdivided into two subgroups, whose lists will be announced in advance. It is necessary to appear in practices with a lab coat, the practice protocol (available on the Virtual Campus) printed, and previously read. It will also be necessary to carry a notebook to record the observations made and the data obtained.

On the days set in the calendar, students will be summoned to the chemistry laboratory to carry out basic experiences. The practices will be carried out in pairs, while being evaluated individually. At the end of each session, a test type questionnaire will be required to evaluate the understanding of the related practice, and will present the results of the experiment. Attendance is mandatory.

Tutorials

The schedule of individualized tutorials will be specified with the teacher. If the teacher finds it appropriate in some cases they will do group tutorials in the classroom, at agreed times.

Material available on the Virtual Campus of the subject

Teaching guide

Presentations used by teachers in theory and problem classes

Dossier of problem classes

Protocols of the practical classes

Calendar of teaching activities (classroom, laboratory classes, tutorials, assessments, deliveries ...)

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			
Laboratory practices	8	0.32	3, 6, 8, 15
Practical exercices classes	14	0.56	1, 13, 7, 9, 2, 6, 12, 15
Theory classes	30	1.2	1, 4, 5, 13, 14, 2, 12, 11, 15
Type: Autonomous			
Resolution of problems and cooperative activities	27	1.08	1, 7, 9, 6, 12, 11, 15
Study	60	2.4	1, 4, 5, 13, 14, 7, 9, 2, 12, 11, 15

Assessment

The evaluation of the subject will be carried out by means of a continuous evaluation that will consist of:

1) Cooperative activities that will be carried out in groups of students. A minimum grade of 4 out of 10 will be required to be considered in the final grade, otherwise the subject will be suspended. The average grade for cooperative activities will be 30% of the final grade.

2) Two partial exams that will evaluate theory and problems. The first part will evaluate the first part of the syllabus and the second will evaluate the second part of the syllabus. A minimum grade of 4 out of 10 will be required in both partials to be weighted in the final grade, otherwise the two partials will be replaced by a resit exam. The mark of each partial exam will be 30% of the final mark.

3) A resit exam that will assess theory and problems throughout the course. This recovery replaces the two partials and is only for those students who do not have a higher grade of 4 out of 10 in both partials. Carrying out the recovery will invalidate the notes of the partials. A minimum grade of 4 out of 10 will be required in the retake to be considered in the final grade, otherwise the subject will be suspended. The mark of the resit exam will be 60% of the final mark.

4) Laboratory practices. The average mark will evaluate: questionnaires and / or reports of each practice, attitude and laboratory notebook. A minimum grade of 4 out of 10 will be required to take the final grade, otherwise the subject will be suspended. The average grade for laboratory practices will be 10% of the final grade.

To participate in the recovery, students must have previously been assessed in a set of activities whose weight is equivalent to a minimum of two thirds of the total grade of the subject.

The grade of "Not assessable" will be applied to students when the assessment activities performed have a weighting of less than 67% in the final grade.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
First partial exam	30	4.5	0.18	10, 1, 4, 5, 13, 14, 9, 2, 12, 11
Questionnaires of Cooperative Activities	30	0	0	10, 1, 4, 5, 13, 14, 7, 9, 2, 12, 11, 15
Questionnaires of Practices	10	2	0.08	10, 3, 7, 9, 6, 8, 15
Secon partial exam	30	4.5	0.18	10, 1, 4, 5, 13, 14, 9, 2, 12, 11

Bibliography

Bibliography

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D.C.Harris, Chemical and quantitative analysis. Editorial Reverté. Translation of the 6th American edition. 2006
M.D. Reboiras, Química. Basic science Editorial Thomson. 2005
W.L.Masterton, C.N. Hurley, chemistry. Principles and Reactions. Editorial Thomson. 4th edition. 2003
Petrucci, Harword, Herring, General Chemistry. Chemical Link and Structure of Matter, Ed. Prentice Hall, 8th edition, 2002
B.H.Mahan, Chemistry. Editorial Addison-Wesley Iberoamericana. 2nd edition. 1986

Web links

Those that are required, will be updated on the Virtual Campus of the subject.

Software

There is no software