

27100 - General Chemistry

Syllabus Information

Academic year: 2023/24

Subject: 27100 - General Chemistry

Faculty / School: 100 - Facultad de Ciencias

Degree: 446 - Degree in Biotechnology

ECTS: 12.0

Year: 1

Semester: Annual

Subject type: Basic Education

Module:

1. General information

This subject aims to provide an overview of chemistry, creating awareness of its importance in society. In addition, it aims to provide tools to interpret the behaviour of chemical systems, both quantitatively and qualitatively.

These goals are aligned with the following Sustainable Development Goals (SDGs) of the United Nations Agenda 2030 (www.un.org/sustainabledevelopment/es/) so that the acquisition of the learning results of the subject provides competence to contribute to some extent to their achievement: Goals 2, 3, 5, 6, 7, 7, 9, 11, 12 and 13.

The subject, included in the basic module, lays the foundations to address more specific contents of other subjects of the Degree. It is recommended to have studied Mathematics, Physics and Chemistry in the Baccalaureate.

2. Learning results

- To use standard nomenclature and formulation of chemical substances.
- To use in a quantitative way the aspects of chemistry related to the weight laws, the concept of mole and Avogadro's number, the use of atomic and molecular masses, units of concentration and stoichiometry .
- To understand basic atomic theory and deduce its implications for atomic properties and the classification of elements
- To understand the different types of chemical bonds and the theories used in their interpretation.
- To understand the nature of the different forces involved in the formation of condensed phases, being able to interpret basic properties of solids, liquids and solutions.
- To understand and apply the basic concepts of thermodynamics and chemical kinetics.
- To understand the basic concepts related to the properties of acid-base and redox equilibria, solubility, and complex formation .
- To know the structure and most representative properties of elements and some inorganic and organic compounds.
- To know how to use the basic instrumentation of the chemical laboratory in an adequate way and to perform some basic operations in the laboratory, following safety rules.
- To solve problems in the field of chemistry and its application to biotechnology, as well as prepare related reports.

3. Syllabus

THEORETICAL PROGRAM:

1. INTRODUCTION TO MODERN CHEMISTRY
2. ATOMS AND ATOMIC THEORY
3. CHEMICAL COMPOUNDS
4. CHEMICAL REACTIONS AND STOICHIOMETRY
5. CHEMICAL THERMODYNAMICS
6. CHEMICAL KINETICS
7. ELECTRONS IN ATOMS
8. THE PERIODIC TABLE AND PERIODIC PROPERTIES
9. CHEMICAL BONDING I. BASIC CONCEPTS
10. CHEMICAL BONDING II. ADDITIONAL FEATURES
11. SOLIDS. INTERMOLECULAR FORCES. RELATIONSHIPS BETWEEN ATOMIC COMPOSITION, BONDING, STRUCTURE AND PROPERTIES
12. GAS
13. LIQUIDS
14. DISSOLUTIONS
15. PRINCIPLES OF CHEMICAL EQUILIBRIUM

16. ACID-BASE EQUILIBRIUM
17. SOLUBILITY EQUILIBRIA AND COMPLEX FORMATION
18. REDOX EQUILIBRIA AND ELECTROCHEMISTRY
19. PHYSICAL AND CHEMICAL PROPERTIES OF THE ELEMENTS
20. OBTAINING THE ELEMENTS
21. STRUCTURE OF ORGANIC COMPOUNDS

LABORATORY PRACTICE PROGRAM:

- Safety and basic laboratory operations
- Concentration of solutions. Strong and weak electrolytes.
- Equilibria in solution. Indicators. Acid-base reactions
- Determination of the constant of an equilibrium
- Column chromatography. Separation of a dye mixture.
- Liquid-liquid extraction. Caffeine isolation.

4. Academic activities

- Master classes: 70 hours. Theoretical-practical sessions in which the contents of the subject will be explained
- Formulation and Nomenclature Classes and Problems and Cases: 30 hours. Participative classes of problem solving and applied questions.
- Laboratory Practices: 20 hours. On-site practical sessions in a chemical laboratory. The students will be informed about the risks that may be involved in the practices of this subject, as well as if dangerous products are handled and what to do in case of an accident (see the following link) <http://uprl.unizar.es/estudiantes.html>)
- Personal study. 168 hours
- Assessment tests. 12 hours

5. Assessment system

Nomenclature

Two tests on inorganic and organic nomenclature must be passed with a minimum of 65% of correct answers. The student who does not pass the exams will have to make them up in the official calls. These tests will be graded as PASS or FAIL and will not be added to the final grade.

Laboratory Practices

Attendance to the practices is mandatory. The student will be evaluated on the use and resolution of questions.

Students who do not pass them during the term will have to make them up in the official calls. Their grade represents 15% of the final grade.

It will be essential to pass both the Nomenclature and the Practices parts to pass the subject.

Problem test

In each semester there will be a theoretical-practical problems/questions tests, which will not eliminate subject matter.

Theoretical and practical tests

The subject is divided into two midterm exams. The first and second midterm exams eliminate subject matter, so that whoever passes any of them **does not need to retake** that part during the same term; **the grade is kept until July**. As a general rule, the two midterm exams must be passed independently and those who fail any of them must retake the failed exam at a later date. As an exception, if a grade between 4.0 and 4.9 is obtained in one of the midterm exams, it may be averaged with the grade obtained in the other midterm exam. The dates of the midterm exams correspond to the January exam period (First Midterm) and the official June exam period (2nd Midterm) and are indicated in the Faculty's exam calendar. The assessment criteria are: mastery of the contents, accuracy of concepts, use of terminology and chemical nomenclature, justification of arguments.

Final grade

The final grade will be the higher of the two grades (Grade 1 or Grade 2) indicated. (P1 = grade 1st midterm; P2 = grade 2nd midterm; T = average grade of the two midterms; C = average grade of the two problem tests; L = grade for Laboratory practices):

$$\text{Grade 1} = 0.35 \cdot P1 + 0.35 \cdot P2 + 0.15 \cdot C + 0.15 \cdot L$$

$$\text{Grade 2} = 0.85 \cdot T + 0.15 \cdot L$$