

25200 - Chemical foundations of the environment

Syllabus Information

Academic year: 2023/24

Subject: 25200 - Chemical foundations of the environment

Faculty / School: 201 - Escuela Politécnica Superior

Degree: 571 - Degree in Environmental Sciences

ECTS: 6.0

Year: 1

Semester: First Four-month period

Subject type: Basic Education

Module:

1. General information

The objective of this subject is to provide general knowledge of chemistry. In particular, to know how to formulate chemical compounds (organic and inorganic), to understand the structure of matter, to plan chemical reactions and to reason physicochemical processes.

Chemistry is a core science that will help students acquire the tools necessary for the understanding of numerous physicochemical processes related to the environment and scientific-technical aspects of other subjects of the degree (Environmental Chemistry, Soil Science, etc.).

Learning within this subject can be related to some Sustainable Development Goals (SDGs), such as Goal 6: Clean water and sanitation, and Goal 7: Affordable and non-polluting energy.

In order to get the most out of the subject, students should have taken science subjects in the baccalaureate.

2. Learning results

The student, in order to pass this subject, must demonstrate the following results...

- Apply the basic concepts of nomenclature, stoichiometry and chemistry conventions
- Analyse and relate the various states of aggregation of matter.
- Recognize and use the different ways of expressing concentration.
- Recognize and differentiate the different types of chemical reactions.
- Recognize and describe the conditions of a chemical equilibrium, as well as the peculiarities of the various types.
- Apply the rules to be followed in a laboratory and carry out basic experiments involving chemical reactions in solution.
- Record accurately and in detail the observations of the experiments carried out in the laboratory, and the data obtained.
- Write the reports corresponding to each practice, answering the proposed questions.
- Interpret the results obtained in the resolution of numerical problems, related to the concepts and models learned in theory.
- Express adequately, both orally and in writing, the methods, processes, results obtained and their analysis in the cases entrusted for study, in the form of individual and/or group work .

These learning results are basic for students to be able to contribute to achieve, with their work, the Sustainable Development Goals 6 and 7, indicated in the objectives of the subject. The theoretical and practical knowledge in chemistry, which students acquire in this subject, provides a better understanding of the matter, and in particular of the environment, providing the basis for promoting sustainable development in relation to water and energy.

3. Syllabus

Theory

Block 1. Atomic structure: periodic table, atomic mass, mole, empirical formula.

Block 2: States of aggregation of matter and dissolutions: gas, liquid and solid.

Block 3. Thermodynamics and Chemical Kinetics: Enthalpy, Entropy, Gibbs Free Energy, Rate of chemical reactions.

Block 4. Chemical equilibrium: acid-base, redox and precipitation equilibrium.

Block 5. Carbon compounds: alkanes, alkenes, alkynes.

Practices

Practice 1. Preparation of different solutions.

Practice 2. Conductivity measurements.

Practice 3. Acid-base titration.

Practice 4. Redox reactions.

Practice 5. Precipitation equilibria.

Practice 6. Hydrogen production.

Practice 7. Distillation of a wine.

4. Academic activities

1. -Theory and problems sessions: lectures and problems for each of the topics; problems proposed to small groups of students for their resolution.

2. -Laboratory practice: 2-hour sessions; students will record the results and observations in a notebook, and will submit a report with questions about the practice.

3. -Group work, in conjunction with the subject Fundamentals of Geology for the Environment.

Laboratory practices and group work will cover topics related to SDGs 6 and 7, indicated in the objectives.

5. Assessment system

The evaluation activities are as follows:

Test 1. Written exam: theoretical-practical questions and problems.

Test 2. Submit the laboratory notebook, together with an individual report of each practice, detailing observations and data, and answering several questions; laboratory work (material handling, use of reagents, following safety rules, etc.) will be valued.

Those students who do not pass the laboratory practices through this procedure, or who wish to improve their grades, may take a global test consisting of a theoretical-practical exam. In order to do so, the interested students must communicate it two weeks in advance to the faculty responsible for the subject.

Test 3. Writing a paper, which involves the following steps: individual report, group report, written report.

This activity may be passed during the semester, without prejudice to the student's right to take the final overall exam for those students who present and orally defend a tutored group work at a date prior to the end of the semester set by the teacher.

Test 4. Examination of formulation of chemical compounds.

This activity may be passed during the semester, without prejudice to the student's right to take the final overall test, for those students who take an objective practical formulation and nomenclature test on a date prior to the end of the semester set by the teacher.

The relative weighting of the final grade will be as follows:

- 70% written exam, **test 1**.
- 20% laboratory practices, **test 2**.
- 10% group work, **test 3**.

the Final Grade (CF) averaged is, therefore:

$$CF = 0.70*(test\ 1) + 0.20*(test\ 2) + 0.10*(test\ 3)$$

The minimum grade for each test will be 4 points; therefore, a lower grade in one of the three tests will result in the failure of the subject, even if **CF** is equal to or higher than 5.

In addition, a minimum of 5 points in the formulation exam is required to pass the subject. That is, a **CF** greater than or equal to 5 does not result in a pass if the formulation exam is not passed.

Students who have to take the exam again will be able to choose, in subsequent calls, between sitting again for all the evaluation activities (in this case, the grade will be computed as the last one obtained) or only for those that they have failed.

The success rate for the last three academic years is 67.44% 46.94% and 60.00%.