

27207 - Physical Chemistry I

Syllabus Information

Academic year: 2023/24

Subject: 27207 - Physical Chemistry I

Faculty / School: 100 - Facultad de Ciencias

Degree: 452 - Degree in Chemistry

ECTS: 10.0

Year: 2

Semester: Annual

Subject type: Compulsory

Module:

1. General information

The subject and its expected results respond to the following approaches and objectives:

1. To know the essential concepts and principles of Physical Chemistry (equilibrium and change) and apply them to the study of systems of interest in Chemistry.
2. To apply the knowledge to the resolution of questions and problems, properly using the systems of units and physically analysing and interpreting the results obtained.
3. To provide a solid foundation for further studies in specialized areas or in the practice of the profession.
4. To obtain a solid foundation for further learning in subsequent subjects and in other aspects of the Physical Chemistry.

These approaches are aligned with the following Sustainable Development Goals (SDGs):

- Goal 7: Affordable and non-polluting energy
- Goal 9: Industry, Innovation and Infrastructure

2. Learning results

The student, in order to pass the subject, must demonstrate the following:

- Performs analysis and synthesis and is capable of critical reasoning.
- Has acquired the capacity for autonomous learning, group work and problem solving.
- Distinguishes between macroscopic and microscopic approach.
- Knows the meaning, handles with ease and relates the chemico-physical quantities included in the program of the subject.
- Knows how to use these chemico-physical properties in different types of calculations and reasoning.

3. Syllabus

Thermodynamics of chemical systems

- Introduction and fundamental concepts.
- Principles of thermodynamics.
- Gibbs and Helmholtz functions.
- Multi-component systems.
- Ideal and real solutions. Phase equilibria in multicomponent systems.
- Chemical equilibrium.

Electrolytes and thermodynamics of electrochemical systems

- Electrolytes: Debye Hückel's limiting law and conduction of electric current in ionic solutions.
- Thermodynamics of electrochemical systems. Nernst equation. Concentration piles with and without transport.

Kinetics of chemical reactions

- Reaction kinetics.
- Reaction mechanisms.
- Influence of temperature on reaction rate.
- Unimolecular and trimolecular reactions.
- Chain reactions. Reactions in liquid solution.
- Homogeneous catalysis.

4. Academic activities

The learning process designed for this subject is based on the following:

1. Training activity 1. Acquisition of theoretical knowledge of Physical Chemistry (6 ECTS) through participatory lectures.
2. Training activity 2. Problem solving classes and seminars (4 ECTS), in which students will actively participate.

The schedule of activities is as follows:

- **Thermodynamics of chemical systems:** 42 h (22 h of theory and 20 h of problems/seminars)
- **Electrolytes and thermodynamics of electrochemical systems:** 26 h (17 h of theory and 9 h of problems/seminars)
- **Kinetics of chemical reactions:** 32 h (21 h of theory and 11 h of problems/seminars)

5. Assessment system

Blocks of the subject and requirements to pass it

For evaluation purposes, three blocks have been established in the subject

- **TQ** (Thermodynamics of chemical systems)
- **EQ** (Electrolytes and Thermodynamics of Electrochemical Systems)
- **CR** (Reaction Kinetics)

The evaluation will consist of three exams, one per block, which will consist of theoretical-practical written tests that may include numerical calculations (**ETQ**, **EEQ** and **ECR** grades).

In order to pass the subject, it will be required to pass independently, with a grade equal to or higher than 5.0 out of 10, the exams of the three blocks (ETQ, EEQ and ECR). The compensation of a single block will be admitted, with a minimum grade of 4.0 in the exam, provided that the final grade [equation (1)] is at least 5.0 out of 10.

Schedule of evaluation activities

1. In the evaluation period of the first semester an exam of the TQ block (**ETQ**) will be held. If the TQ block is passed (or it can be compensated) the grade will be saved for all the calls of the term.
2. The EQ block exam (**EEQ**) will be held in the middle of the second semester. If the EQ block is passed (or the EQ block can be compensated) the grade will be saved for all the calls of the term.
3. First call (official exam calendar). The student will take the exam of the CR block (**ECR**) and may take the rest of the blocks of the subject.
4. Second call (official exam calendar). Students who have not passed the subject in the first call, must sit for the exams of all the blocks that they have not passed or that can be compensated.

Final grade:

The final grade will be calculated by applying equation 1:

$$\text{Final grade} = 0.42 \cdot \text{ETQ} + 0.26 \cdot \text{EEQ} + 0.32 \cdot \text{ECR} \quad (\text{equation 1})$$

Students who have not taken any block in the 1st or 2nd call will be listed in the minutes as *Not Shown*.

When, having taken the 1st or 2nd call, the requirements to pass the subject are not met, because any of the block has been passed or compensated, the grade will be *Failed*, even if the weighted average when applying equation 1 is equal to or higher than 5 points. In this case, a numerical grade of 4.5 points will appear in the records.