Universidad Zaragoza

Year : 2020/21

27110 - Physical Chemistry

Syllabus Information

Academic Year: 2020/21
Subject: 27110 - Physical Chemistry
Faculty / School: 100 - Facultad de Ciencias
Degree: 446 - Degree in Biotechnology
ECTS: 6.0
Year: 2
Semester: First semester
Subject Type: Compulsory
Module: ---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as:

- Activity 1: Acquisition of theoretical knowledge of Physical Chemistry (3 ECTS) in participatory lectures.
- Activity 2: Classes solving exercises and seminars (1.5 ECTS) in small groups.
- Activity 3: Laboratory practice (1.5 ECTS).

4.2.Learning tasks

The course includes the following learning tasks:

- Lectures.
- Practice sessions.
- Laboratory.

The teaching and assessment activities will be carried out in person unless, due to the health situation, the provisions issued by the competent authorities and by the University of Zaragoza provide for them to be carried out electronically.

4.3.Syllabus

The course will address the following theoretical and practical topics:

THEORY

- **The kinetics of reactions.** The definition of reaction rate and empirical chemical kinetics. Measurement of reactions rate. Integrated rate laws: simple and complex reactions. The determination of the rate law. Nuclear Kinetic. Reaction mechanisms. The temperature dependence of reaction rates. Unimolecular and trimolecular reactions. Reactions in solution. Homogeneous catalysis.
- **Transport phenomena.** Transport properties. Diffusion, dialysis and ultracentrifugation. Transport across biological membranes. Sedimentation. Viscosity; rheology. The conductivities of electrolyte solutions.
- **Thermodynamic.** Fundamentals. The first law; Thermochemistry. The second law; Entropy. The Helmholtz and Gibbs energies. Variations of thermodynamic functions. The chemical potential of a pure substance. Phase equilibria for pure and mixtures fluids. Phase diagrams. Solutions. Partial molar quantities. Ideal and no-ideal solutions. Vapour-liquid equilibrium. Distillation. Liquid-liquid equilibrium. Colligative properties. Chemical equilibrium. Equilibrium constant. The response of equilibria to the conditions.
- **Equilibrium electrochemistry.** Electrochemical cells. The electromotive force. Electrodes; standard potentials. Reversible electrodes. Liquid-liquid junction potential. Selective membrane electrodes. Potentiometric measurements: Applications. Electrokinetic phenomena; electrophoresis.
- **Surfaces.** Interfaces and surface tension. Pressure inside bubble, cavities and drops. Capillarity. Adsorption of gases on solid surfaces. Physical adsorption and chemisorption. Adsorption isotherms. adhesion and cohesion.

LABORATORY PROGRAM

1. Acid-catalized inversion of sucrose. Study of the reaction by polarimetric measurements.
2. Enzyme inhibition and poisoning
3. Absorption spectrum of p-methoxyphenol. Calculation of its acid dissociation constant.
4. Measurement of the electromotive force cell.

4.4.Course planning and calendar

Schedules of lectures and problems will coincide with the officially established and will be available at: https://ciencias.unizar.es/grado-en-biotecnologia.

The places, calendar and groups for training and practical sessions will be established in coordination with the rest of maters at beginning of course. The Coordinator will produce the groups of students for these activities at beginning of course to avoid overlaps with other subjects. Exercises groups will be distributed at the beginning of the course.

For students enrolled in the subject, places, times and dates of lectures and practical sessions will be public via Bulletin Board advertisements of the grade on the platform Moodle at the University of Zaragoza, https://moodle2.unizar.es/add/, and in the moodle page for the course. These routes will be also used to communicate enrolled students their distribution by groups of practical sessions, which will be organized by the coordination of degree. Provisional dates will be available on the website of the Faculty of Sciences in the corresponding section of the Degree in Biotechnology: https://ciencias.unizar.es/grado-en-biotecnologia.

In this web there will be also available the dates of exams.

4.5.Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=27110&year=2020