



**COURSE GUIDE** 2024/25

**Faculty** 215 - Faculty of Chemistry

**Cycle** .

**Degree** GQUIMI20 - Bachelor's Degree in Chemistry

**Year** Second year

**COURSE**

26122 - Experiments in Physical Chemistry

**Credits, ECTS:** 6

**COURSE DESCRIPTION**

This subject introduces students to some experimental methods to determine macroscopic properties of matter in aspects concerning Chemical Thermodynamics, Chemical Kinetics and electrochemical phenomenon. In addition, previous knowledge will also be applied concerning surface properties, macromolecules and colloids.

**COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT**

The subject is included in Physical Chemistry, within the Fundamental Module of the Degree Course and, as such, shares the transverse skills [M02CM08], [M02CM09], [M02CM10] and [M02CM011] assigned to this module. In addition, this subject develops specific skills [M02CM01]. Finally, the transverse skill of titration will also be covered [G008].

M02CM01. Understanding and handling the principles of Physical Chemistry and its influence on chemical processes.

M02CM08. Ability to select different instrumental techniques (simple or combined) to characterise chemical substances.

M02CM09. Be able to comprehensibly present phenomena and processes related to Chemistry and associated topics, both verbally and in writing.

M02CM10. Information search and selection skills in the field of Chemistry and other scientific areas, making use of the bibliography and information and communication technologies.

M02CM11. Be capable of relating Chemistry to other disciplines, and understanding its impact on today's society and the importance of the industrial chemical sector.

G008. Demonstrate teamwork and problem-solving skills in multidisciplinary contexts.

**Theoretical and Practical Contents**

Chemical Thermodynamics and Thermochemistry: Determining changes in enthalpy associated with different physical-chemical processes (reaction, dissolving, etc.) using calorimetric devices.

Binary mixtures: Determining partial molar volumes of different liquid mixtures at different temperatures.

Phase equilibria: Determining vapour pressure. Phase diagrams for different solid-liquid and liquid-vapour systems.

Liquid/liquid diagrams.

Chemical equilibria: Determining equilibrium constants.

Electrochemistry: Determining potentiometry. Electrode potentials. Thermodynamic magnitudes in electrochemical batteries.

Chemical kinetics: Determining constants and reaction orders for certain reactions. Influence of temperature.

Surface and colloid phenomena: Surface tension of liquids and solutions. Surfactants: Critical micellar concentration.

Surface adsorption phenomenon.

Macromolecules. Magnitudes in solution: viscosimetry. Determining molecular weights.

**TEACHING METHODS**

The program is divided into two semesters and we will use traditional methodology and it will be assessed, taking into account the aforementioned skills, in the following way:

The written exam counts for 40% of the mark. Skills [M02CM01] and [M02CM08].

The remaining 60% is split between a) complete individual reports and oral presentations (30%) ([M02CM08], [M02CM09], [M02CM10] and [M02CM11]) b) teamwork and continuous assessment (%10) ([M02CM01], [M02CM08], [M02CM011] and [G008]) and c) laboratory notebook (%20) (M02CM09), [M02CM03).

The mark for each semester will count for 50 % of the final mark.

**TYPES OF TEACHING**

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching		5	10	45					
Horas de Actividad No Presencial del Alumno/a		7,5	15	67,5					

**Legend:** M: Lecture-based S: Seminar GA: Applied classroom-based groups  
 GL: Applied laboratory-based groups GO: Applied computer-based groups GCL: Applied clinical-based groups  
 TA: Workshop TI: Industrial workshop GCA: Applied fieldwork groups

**Evaluation methods**

- Continuous evaluation
- End-of-course evaluation

**Evaluation tools and percentages of final mark**



- Written test, open questions 40%
- Individual assignments 20%
- Teamwork assignments (problem solving, Project design) 10%
- Oral presentation of assigned tasks, Reading 30%

#### **ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT**

TO BE ABLE TO MAKE THE MEDIA, IT WILL BE NECESSARY TO OBTAIN A MINIMUM OF 4/10 IN ALL AND EACH OF THE ACTIVITIES

For the student to be officially 'Withdrawn', they should drop out of the relevant activities one month before completing the classroom-based credits, notifying the teacher in writing, signed. In this case, the student will not take either the first sitting or the resit exams.

#### **EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT**

The student could be asked to complete the assessed activities that were not passed in the first sitting and/or a written exam. The marks for assessed activities that were passed in the first sitting will be passed over into the resits.

Given the nature of continuous assessment, the student will have a mark from the first sitting in May independently of whether they attend the final exam or not.

#### **MANDATORY MATERIALS**

Material necessary for laboratory practices: gown, safety glasses, laboratory notebook and scientific calculator.

#### **BIBLIOGRAPHY**

##### **Basic bibliography**

- A. M. Halpern, G. C. McBane. Experimental Physical Chemistry. A laboratory textbook, 3rd edition. W.H. Freeman, 2006.
- C. W. Garland, J. W. Nibler, D. P. Shoemaker. Experiments in Physical Chemistry, 7th Edition. McGraw-Hill, 2002.
- R. J. Sime. Physical Chemistry: Methods, Techniques, and Experiments. Saunders College Publishing, USA, 1990.
- J. J. Ruiz Sánchez, J.M. Rodríguez Mellado, E. Muñoz Gutiérrez, J. M. Sevilla Suárez de Urbina. Curso Experimental en Química Física. Ed. Síntesis, 2003.

##### **Detailed bibliography**

- D. R. Lide ed., Handbook of Chemistry and Physics, 89th Edition, CRC Press, 2008
- I. R. Levine. Fisicoquímica, vols. 1 y 2. 5º ed. Ed. Mac Graw Hill, 2004.
- P. Atkins, J. de Paula. Química Física. Ed. Panamericana, 2008.
- R. J. Silbey, R. A. Alberty. Kimika Fisikoa. Euskal Herriko Unibertsitatea, 2006.

##### **Journals**

Journal of Physical Chemistry  
Journal of Chemical Physics  
Journal of Chemical Education

##### **Web sites of interest**

<http://webbook.nist.gov/chemistry>  
<http://bcs.whfreeman.com/pchem8e>  
<http://www.shu.ac.uk/schools/sci/chem/tutorials/>

#### **OBSERVATIONS**

On the e-gela page, students can consult the section or guidelines used to assess their oral presentations, reports, etc.

Laboratory practicals are compulsory. Students who do not attend practicals cannot pass the subject and will not be assessed in either the first sitting or resits of exams.

Any student who wishes to exercise their right to a single assessment should follow the procedure approved by the Faculty Committee on 10-10-2012.