# COURSE DATA

## DATA SUBJECT

**Code:** 34185
**Name:** Chemistry laboratory I
**Cycle:** Undergraduate Studies
**ECTS Credits:** 6
**Academic year:** 2026-27

## STUDY (S)

| Degree | Center | Acad. year | Period |
|---|---|---|---|
| 1110 - Degree in Chemistry | Facultat de Química | 1 | First quarter |

## SUBJECT-MATTER

| Degree | Subject-matter | Character |
|---|---|---|
| 1110 - Degree in Chemistry | Chemistry | BASIC |

## COORDINATION

CULEBRAS RUBIO MARIO

# SUMMARY

This subject is compulsory and of basic character, is taught in the first semester of the first year of the Degree in Chemistry, with a volume of 6 credits. Together with the "Laboratory of Chemistry II" (also obligatory of basic character, but taught in the second semester), it is intended, essentially, that the student learn the operation and the basic work techniques that will be developed in a laboratory chemical; and the preparation, recording, analysis and presentation of results of an experimental work. In this way, the essential foundations will be established so that the experiences of the different branches that make up the discipline can subsequently be successfully addressed.

In this specific subject, the security, analysis and interpretation of data necessary for the development of any chemical experience, as well as the management and treatment of data developed in any chemical laboratory will be addressed. To this end, experiments will be carried out in which different basic techniques must be used, so that later they can be applied to more complex tests.

It is assumed that students know and use, in a basic but clear way, the concepts taught in the last year of High School Chemistry. However, all the scripts include a theoretical introduction and, whenever necessary, additional teaching material will be provided to cover those deficiencies that are detected.

Regarding the Sustainable Development Goals (SDGs), it is expected that students will be able to know in

this subject how to apply the knowledge learned to guarantee an inclusive, equitable, and quality education and promote learning opportunities for everyone (SDG 4), to acquire a special sensitivity for sustainable management of water (SDG 6), raw materials and energy sources (SDG 7), as well as for an environmentally friendly and sustainable development (SDGs 11, 12, 13, 14 and 15), in addition to being able to design, select and/or develop efficient chemical products, processes and/or analytical methodologies (SDG 7) that minimize their impact on the environment (SDGs 14 and 15), using alternative raw materials and reducing wastes (SDG 11).

## PREVIOUS KNOWLEDGE

### RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

### OTHER REQUIREMENTS

Students are expected to know and to be able to clearly apply the concepts taught on their last High School Chemistry course, albeit at a basic level. However, all scripts will include a theoretical introduction and, when required, extra teaching materials will be provided.

## COMPETENCES / LEARNING OUTCOMES

### 1108 -

Acquire a permanent sensitivity to quality, the environment, sustainable development and the prevention of occupational hazards.

Carry out standard experimental procedures involved in synthetic and analytical work, in relation to organic and inorganic systems.

Demonstrate ability to communicate information, ideas, problems and solutions to both specialist and non-specialist audiences and using information technology, as appropriate.

Demonstrate ability to work in teams both in interdisciplinary teams and in an international context.

Demonstrate a commitment to ethics, equality values and social responsibility as a citizen and as a professional.

Demonstrate knowledge and understanding of essential facts, concepts, principles and theories related to the areas of chemistry.

Demonstrate knowledge of the characteristics and behaviour of the different states of matter and the theories used to describe them.

Demonstrate knowledge of the main aspects of chemical terminology, nomenclature, conventions and units.

Demonstrate knowledge of the principles of thermodynamics and kinetics and their applications in chemistry.

Demonstrate leadership and management skills, entrepreneurship, initiative, creativity, organization, planning, control, leadership, decision making and negotiation.

Develop capacity for analysis, synthesis and critical thinking.

Evaluate, interpret and synthesise chemical data and information.

Evaluate the risks in the use of chemicals and laboratory procedures.

Express oneself correctly, both orally and in writing, in any of the official languages of the Valencian Community.

Handle chemicals safely.

Have basic skills in the use of information and communication technology and properly manage the information obtained.

Interpret data from observations and measurements in the laboratory in terms of their significance and the theories that underpin them.

Interpret the variation of the characteristic properties of chemical elements according to the periodic table.

Recognise and evaluate chemical processes in daily life.

Relate the macroscopic properties and the properties of individual atoms and molecules, including macromolecules (natural and synthetic), polymers, colloids and other materials.

Show inductive and deductive reasoning ability.

Solve qualitative and quantitative problems following previously developed models.

Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.

Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.

Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.

Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.

Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.

Understand the qualitative and quantitative aspects of chemical problems.

## 1110 - Degree in Chemistry

At the end of the course, the student will be able to assess risks in the use of chemical substances and laboratory procedures.

At the end of the course, the student will be able to describe the characteristics and behaviour of the different states of matter and the theories used to explain them.

At the end of the course, the student will be able to distinguish between qualitative and quantitative aspects of chemical problems.

At the end of the course, the student will be able to identify chemical processes in everyday life.

At the end of the course, the student will be able to identify the main types of chemical reactions and their key characteristics.

At the end of the course, the student will be able to state the principles of thermodynamics and kinetics and apply them in chemistry.

At the end of the course, the student will correctly use chemical terminology, nomenclature, conventions and units.

At the end of the course, the student will demonstrate inductive and deductive reasoning skills.

At the end of the course, the student will demonstrate the ability to analyse, synthesise and apply critical reasoning.

At the end of the course, the student will interpret the relationship between the variation of the characteristic properties of chemical elements and the periodic table.

Collaborate effectively in teams, assuming responsibilities and leadership roles and contributing to collective improvement and development.

Communicate effectively, both orally and in writing, adapting to the characteristics of the situation and the audience.

Contribute to the design, development and implementation of solutions that address social needs, taking the Sustainable Development Goals as a reference.

Demonstrate critical and self-critical reasoning within the field of study, considering aspects such as professional ethics, moral values and the social implications of the different activities undertaken.

Express oneself correctly, both orally and in writing, in any of the official languages of the Valencian Community.

Understand and recognise, from within the discipline, inequalities based on sex and gender in society; integrate different needs and preferences related to sex and gender into problem-solving and solution design.

## DESCRIPTION OF CONTENTS

### 0. Prevention Session

Prevention and fire performance in buildings for teaching-university use.

### 1. Seminar 1

Presentation.
Management and organisation of laboratory work.
Preparation of experimental work.

### 2. Practice 1. Safety and Laboratory Material.

Safety rules. Simplified sheets of compounds. Pictograms. H and P phrases. Laboratory material (glass material, electrical material, assemblies, lighter, vacuum pump, etc.). Types of filtration. Use of the balance. Direct weighing and tare. Waste. Waste minimization program.

### 3. Practice 2. Dissolution, precipitation and crystallization.

Dissolution and solubility. Precipitation and crystallization.
Solid-liquid separations: decantation and filtration.

### 4. Practice 3. Characterisation of Liquids and Solids.

Distillation. Boiling point determination.
Melting point determination.

### 5. Seminar 2

Presentation of results.
Physical magnitudes. Units system.
Measurement and experimental error.
Accuracy and precision. Significant figures.

### 6. Practice 4. Liquid-Liquid Extraction

Separation and isolation of organic unknown compounds.
Extracting solvents.
Aqueous phase and organic phase.

## 7. Practice 5. Crystallization and identification of compounds.

Session A: Purification (crystallization) and identification of an organic acid.
Session B: Purification (crystallization) and identification of a neutral compound.
Characterisation and identification by melting point.
Thin layer chromatography.

## 8. Seminar 3

Analysis and discussion of the results of practices P2 to P5.

## 9. Practice 6. Preparation of Solutions and Measurement of pH.

Acidity, alkalinity, equilibrium and pH.
Preparing solutions of different concentrations.
Solutions from commercial products (solid salts).
Use of the pH-meter and pH measurements.

## 10. Practice 7. Acid-Base Titration.

Stoichiometry and neutralisation of acid-base reactions.
Indicators in acid-base titrations.
Use of primary and secondary standards.

## 11. Practice 8. Absorbance spectrum of solutions.

Aqueous solutions of CuSO4 by dilution.
Preparation and utility of a blank solution.
Use of the visible spectrophotometer and spectrum plot.
Absorbance measurements of cupper sulphate solutions.
Data treatment.

## 12. Practice 9. Distillation of Mixtures of Miscible Liquids

Distillation acetone-acetic acid.
Simple distillation and distillation with a fractionating column. Effectiveness of both processes.
Mixture density by weighing.

Reaction between calcium carbonate and hydrochloric acid.

## 13. Practice 10. Stoichiometric Calculations.

Reaction between calcium carbonate and hydrochloric acid.Molar mass determination of CaCO3.
Percentage purity of an unknown sample.
Gravimetric and volumetric methods.

## 14. Practice of molecules in 3D

Building and using molecular models.

## 15. Seminar 4

Analysis and discussion of the results of practices P6 to P10.

## 16. Evaluation

Final evaluation session.

# WORKLOAD

### PRESENCIAL ACTIVITIES

| Activity | Hours |
|---|---|
| Tutorials | 12,00 |
| Laboratory | 48,00 |
| **Total hours** | **60,00** |

### NON PRESENCIAL ACTIVITIES

| Activity | Hours |
|---|---|
| Attendance at other activities | 0,00 |
| Individual or group project | 20,00 |
| Independent study and work | 50,00 |
| Preparation of lessons | 10,00 |
| Preparation for assessment activities | 10,00 |
| Resolution of case studies | 0,00 |
| **Total hours** | **90,00** |

# TEACHING METHODOLOGY

Among the training activities described for the subject "Chemistry" in the verification report of the Degree in Chemistry, in this subject two are used: practical laboratory classes and seminars.

In the practical laboratory sessions, an overview of the basic work of a chemistry laboratory will be offered. It is intended that students acquire skills in the execution of the basic techniques of laboratory work. They should become familiar with the mechanisms of safety and management, handling of material and equipment, treatment and presentation of data, decision making and choosing the most appropriate procedure, if applicable. A standard session will consist in the initial discussion of the previous questions that each practice has (that the student must bring resolved), and that will serve as a base to introduce the theoretical concepts on which the practice is based and to discuss the possible doubts or special precautions that they are required. The important part of the session will be the work and handling of materials and products, depending on the objectives of the practice (most of the experimental procedure must be recorded by the student in his laboratory notebook). And at the end of the session, it is convenient to share the results achieved, an interpretation of these results and a reflection on whether the proposed objectives have been achieved.

Four additional seminars have been programmed. The seminar 1 which will be carried out joined to practical session 1, and the remaining three seminars will be independent of the laboratory sessions. These seminars will serve to reinforce the learning of the subject taught in the practical sessions, either treating monographic subjects (for example, treatment of magnitudes, units and calculation of errors), either to solve or analyze doubts that have arisen in the treatment and interpretation of the results of the practices.

Due to the current situation, Seminar 1/Practice 1, which constitute a single session, will be taught in the practice laboratory, where the presentation of the subject and the most important instructions for the development of the rest of the sessions will take place. Seminars 2, 3 and 4 will be taught online.

Since it is the first laboratory that first-year students have access to, two additional activities related to waste prevention and management are planned:

- Workshop on Prevention and extinction of fires, given by the chief prevention officer of the Valencia Provincial Fire Department Consortium.

- Conference on waste treatment in the laboratories of the Faculty of Chemistry, taught by a technician of the General Chemistry Laboratory, and whose objective is to make students aware of the process of minimization and correct waste management of a laboratory of these characteristics.

## EVALUATION

Attendance at practical laboratory classes is mandatory and these sessions will be face-to-face as long as the current situation does not change, and meetings and journeys are possible. Justified absence will be allowed for a maximum of two sessions (preferably, it should be suggested to be recovered in some other subgroup).

The assessment of student learning will be formative in nature and will be carried out by addressing different aspects that are part of two blocks with well differentiated characteristics:

a) Continuous evaluation

Those aspects that require a continuous evaluation of the progress and work developed throughout the course are part of this section. For this, the following will be taken into account: active participation in the seminars, the resolution of all those questions and problems that are proposed to them to work autonomously, and of course, the management in the laboratory, the monitoring of the security rules and the laboratory notebook.

Since the work in the laboratory, the preparation work of the experience and the preparation of the notebook involves a continuous evaluation process throughout the course, the grade obtained for these three sections, in the first call, will be maintained in the second one. The sections listed below, together with the percentage of the grade, can not be recovered, if necessary, in the second call. Only in the case of the Notebook will a partial recovery of those sections corresponding to the treatment and interpretation of the results be allowed.

- Preparation of experience and work in the laboratory (20%)

- Deliverables (previous, post, results) (30%)

- Laboratory notebook (20%)

In total, this section: 70% of the final grade

b) Evaluation of specific Activities

The acquired knowledge and skills will be evaluated through an exam at the end of the course. Any questionnaire or activity carried out in the seminar sessions is also part of this section.

Evaluation of exercise/s: 30% of the final grade.

To be able to pass the subject, a grade equal to or greater than 4 points is required in each section of the two blocks that make up the evaluation, and the weighted sum of both will reach 5 points.

If the day of the exam a mandatory population confinement has been established, it is planned to carry out an online test of a similar nature to the one that would be done in person but adapted to the tools of the virtual classroom, and the percentages of each evaluable part will be maintained.

In any case, the evaluation system will be governed by the provisions of the Evaluation and Qualification Regulations of the University of Valencia for Degrees and Masters

(http://www.uv.es/graus/normatives/2017_108_Reglament_avaluacio_qualificacio.pdf)

**Final warning**

Copying or plagiarism of any assignment that is part of the evaluation will make it impossible to pass the course, and the student will be subject to the appropriate disciplinary procedures.

Please note that, according to Article 13 d) of the University Student Statute (RD 1791/2010, December 30), "*it is the duty of a student to refrain from using or cooperating in fraudulent procedures in evaluation tests, in the work performed or in official University documents*".

## REFERENCES


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