COURSE DATA

DATA SUBJECT

Code: 36821
Name: Chemistry laboratory
Cycle: Undergraduate Studies
ECTS Credits: 7.5
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1934 - Double Degree Program in Chemistry-Chemical Engineering	Facultat de Química	1	Annual

SUBJECT-MATTER

Degree	Subject-matter	Character
1934 - Double Degree Program in Chemistry-Chemical Engineering	Primer curso	COMPULSORY

COORDINATION

CARDONA SERRA SALVADOR JOSE

SUMMARY

This subject is compulsory and of basic character, is taught in both semesters of the first year of the Double Degree in Chemistry and Chemical Engineering, with a volume of 7,5 credits. It is intended, essentially, that the student learn the operation and the basic work techniques that will be developed in a chemical laboratory; 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 chem

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.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

No enrollment restrictions have been specified with other subjects of the curriculum.

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.

COMPETENCES / LEARNING OUTCOMES

1934 - Double Degree Program in Chemistry-Chemical Engineering

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 main types of chemical reaction and their main characteristics.

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.

DESCRIPTION OF CONTENTS

1. Prevention session

Prevention and action against fires in buildings for university teaching use

2. Seminar 1

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

3. 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.

4. Prqactice 2. Dissolution, precipitation and crystallization

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

5. Practice 3. Characterization of liquids and solids

Distillation. Determination of the boiling point. Determination of the melting point.

6. Seminar 2

Results presentation. Physical magnitudes Unit system. Measurement and experimental error. Accuracy and precision. Significant numbers.

7. Seminar 3

Waste conference.

8. Practice 4. Preparation of solutions and pH measurement

Acidity, basicity, balance and pH. Preparation of solutions of different concentrations. Solutions from solid salts. Use of the pH meter and pH measurements.

9. Practice 5. Absorbance spectrum of solutions

Aqueous solutions of CuSO4 by dilution. Preparation and utility of a white solution. Use of the visible spectrophotometer and spectrum recording. Absorbance measurements of copper sulphate solutions. Data treatment.

10. Practice 6. Distillation of mixtures of miscible liquids

Acetone-acetic acid distillation. Simple distillation and fractionation column. Efficiency of both processes. Density of a mixture by weighing.

11. Practice 7. Stoichiometric calculations

Reaction between calcium carbonate and hydrochloric acid. Determination of the molar mass of CaCO3. Weight richness of a problem sample. Gravimetric method and volumetric method.

12. Seminar 4

Analysis and discussion of the results of the practices P2 a P7.

13. Practice 8. Thermochemical

Determination of the calorific capacity of a calorimeter. Determination of the enthalpy variation of a neutralization reaction. Estimation of the dissolution heat of an ionic solid. Effect of temperature on the solubility of an ionic solid.

14. Seminar 5

Computer Applications: use of Excel® for representation of graphs and interpretation of laboratory results.

15. Practice 9. Chemical equilibrium

Chemical reactions in test tube. Factors that influence a chemical equilibrium. Reversible and irreversible reactions.

16. Practice 10. Colligative properties

Cryoscopic depression. Cryoscopic constant. Molality. Determination of molar masses by cryoscopy.

17. Practice 11. "Crystal violet" discoloration kinetics

Discoloration kinetics of the "cristal violet". Instantaneous rate constant. Experimental determination of the rate constant and the order of reaction. Photocolorimetric technique. Apparent rate constants and absolute rate constant.

18. Seminar 6

Analysis and discussion of results from P8 to P10.
Preparation of a laboratory memory. Objectives, index and theoretical introduction. Treatment and discussion of results. Formal aspects. Presentation of Tables and Figures. Bibliography.

19. Practice 12. End-point titration. Potentiometric titration

Stoichiometry and neutralization of acid-base reactions. Indicators in acid-base titrations. Use of primary and secondary standards. Titration curves. Determination of Kw. Determination of the acidity constant of acetic acid.

20. Practice 13. pH regulating solutions

Study of the buffering capacity of buffer solutions. Preparation of pH buffer solutions. Effect of the addition of bases or acids to buffer solutions. Buffering capacity.

21. Practice 14. Electrochemistry

Behavior of some metals against a solution of HCl. Influence of pH and formation of complexes on redox reactions. Construction of galvanic batteries. Electrolysis.

22. Practice 15. Determination of water hardness

Determination of the hardness of a water sample by means of a complexomètric titration with EDTA. Ionic exchange. Softening and deionization. Measurements of ionic conductivity and pH. Chlorides test.

23. Seminar 7

Analysis and discussion of results of practices P11 to P15. Defense and presentation of laboratory memory.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	15,00
Laboratory	60,00
Total hours	**75,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	25,00
Independent study and work	60,00
Preparation of lessons	15,00
Preparation for assessment activities	12,50
Resolution of case studies	0,00
Total hours	**112,50**

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 independent seminars of the laboratory sessions have been programmed, which will serve to reinforce the learning of the same ones, 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.

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. 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 this section, 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.

In the Seminar 6 of the second semester, the procedure for preparing a Laboratory Report will be analysed. Each student (or pair of students, as considered by the teacher) must prepare and defend (in the last seminar session) the report of one of the practicals carried out.

• Preparation of experience and work in the laboratory (15%)

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

• Laboratory notebook (15%)

• Laboratory Report (dossier and defense) (10%)

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

b) **Final evaluation test**

The knowledge and skills acquired will be evaluated by means of two partial exams throughout the course:

First midterm: content of practices P1 to P7. It will take place during the last week of class in December (see exam calendar).

Second midterm: content of practices P8 to P15. To be taken during the last week of class in May (see exam calendar).

The grade of both exams must be higher than 4 points, and the average value of both grades will be averaged with the grade of the continuous evaluation block.

Evaluation exercises: **30%** of the final grade

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

Second call.

Students who do not pass on the first call must sit the exam on the second call, keeping the mark of the other sections (continuous assessment and laboratory), which are considered "non-recoverable". The same percentages and requirements are maintained as in the first call.

The activities of continuous evaluation, which in this subject are laboratory sessions (and all of the associated tasks), are of MANDATORY ATTENDANCE, and therefore, NOT RECOVERABLE, in accordance with the provisions of Article 6.5 of the Regulation of Evaluation and Grading of the UV for Bachelor and Master degrees.

Final warning (regarding the possibility of using AI or any other form of plagiarism or copying of homework).

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*".

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)

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