COURSE DATA

DATA SUBJECT

Code: 34186
Name: Chemistry laboratory II
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

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

SUBJECT-MATTER

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

COORDINATION

SAEZ CASES JOSE ANTONIO

SUMMARY

This subject is compulsory of basic character and is taught in the second semester of the first year of the Degree in Chemistry, with a volume of 6 credits. Together with \\\"Chemistry Lab I\\\" (also compulsory of basic character, but taught in the first semester), it is intended, essentially, that the student learn the operation of a chemical laboratory, as well as the basic techniques of work that will develop in it. 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 bases developed in the previous laboratory will be consolidated: the security, analysis and interpretation of data necessary for the development of any chemical experience, as well as the management and data processing that take place in any chemical laboratory. For this purpose, experiments will be carried out in which different basic techniques must be to more elaborate experiments. Experiments will be carried out on kinetics and thermodynamics of chemical reactions, equilibria and electrochemistry.

It is required that the students already have consolidated some knowledge about safety and laboratory management, waste discrimination, preparation of memories and laboratory notebooks, correct use of material and products, data processing and realization of basic techniques developed in Laboratory of Chemistry I.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

Knowledge about laboratory safety and management, waste discrimination, preparation of reports and laboratory notebooks, correct use of materials and products, data processing and basic techniques developed in the Chemistry Laboratory I. In addition, it is assumed that the students know and use, in a basic but clear way, the concepts taught in the last year of High School Chemistry.

COMPETENCES / LEARNING OUTCOMES

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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.

Collaborate effectively in work teams, assume responsibilities and leadership roles, and contribute to collective improvement and development.

Communicate effectively both orally and in writing, adapting to the context and audience.

Contribute to the design, development and implementation of solutions that respond to social demands, using the Sustainable Development Goals as a reference.

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 both inductive and deductive reasoning skills.

Demonstrate critical and self-critical thinking, considering professional ethics, moral values and social implications of the different activities carried out throughout the degree.

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

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.

Demonstrate the ability to analyse, synthesise and reason critically.

Describe the characteristics and behaviour of the different states of matter and the theories used to explain them.

Develop capacity for analysis, synthesis and critical thinking.

Distinguish between the qualitative and quantitative aspects of chemical problems.

Evaluate, interpret and synthesise chemical data and information.

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

Evaluate the risks involved in the use of chemical substances and laboratory procedures.

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

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.

Identify chemical processes in everyday life.

Identify the main types of chemical reactions and their associated key characteristics.

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

Interpret the relationship between the variation in the characteristic properties of chemical elements and the Periodic Table.

Recognise and evaluate chemical processes in daily life.

Show inductive and deductive reasoning ability.

Solve qualitative and quantitative problems following previously developed models.

State the principles of thermodynamics and kinetics and their application in chemistry.

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 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 and analyse, from the perspective of the degree programme, social inequalities based on sex and gender; integrate gender-sensitive approaches into problem-solving and solution design.

Understand the qualitative and quantitative aspects of chemical problems.

Use chemical terminology, nomenclature, conventions and units correctly.

DESCRIPTION OF CONTENTS

1. Seminar 1

Presentation.
Safety measures.
Materials and basic operations in the laboratory.
Waste minimisation program.

2. Practice 1: Intermolecular forces

Physical properties of chemical compounds.
Acid-base reactions and solubility.

3. Practice 2. Synthesis and purification of an organic compound.

Synthesis, isolation and purification of acetanilide.
Reflux system.
Purification by crystallisation.
Characterisation by melting point and thin-layer chromatography.

4. Practice 3. Thermochemistry.

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.

5. Seminar 2

How to write a laboratory report.
Objectives, index and theoretical introduction.
Treatment and discussion of results.
Formal aspects. Presentation of tables and figures.
Bibliography.

6. Practice 4. Chemical equilibrium.

Chemical reactions in the test tube.
Factors influencing chemical equilibrium.
Reversible and irreversible reactions.

7. Practice 5. Colligative properties.

Freezing-point depression. Cryoscopic constant.
Molality.
Determination of molecular weights by cryoscopy.

8. Practice 6. Kinetics (1).

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

9. Seminar 3

Analysis and discussion of the results of practice sessions P1 to P6.

10. Practice 7. Kinetics (2).

Kinetics of the decomposition reaction of hydrogen peroxide.
Use of a catalyst (potassium iodide).
Factors affecting the rate of decomposition: reagent concentration, catalyst and temperature.
Rate law. Activation energy.

Primary standards.
Titration curves.

11. Practice 8. Potentiometric titration.

Primary standards.
Determination of water self-ionization constant(Kw).
Determination of acidity constant of acetic acid.

12. Practice 9. Buffer solutions of pH.

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

13. Practice 10. Electrochemistry.

Behaviour of some metals in HCl solution.
Influence of pH and complex formation on redox reactions.
Construction of galvanic cells.
Electrolysis.

14. Practice 11. Determining water hardness.

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

15. Seminar 4

Analysis and discussion of the results of practice sessions P7 to P11.

16. Seminar 5.

Study of practical cases and resolution of doubts raised.

17. Assessment.

Final assessment 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 continue to acquire skills in the execution of the basic techniques of laboratory work. We want to get them to apply everything developed in Chemistry Laboratory I (in the first semester) to specific experiments, as well as to introduce some techniques that were not seen in that laboratory.

A standard session consists in the initial discussion of the previous questions that each practice has (that the student must have resolved), and that will serve as a base to introduce the theoretical concepts on which the practice is based and discuss the possible doubts or special precautions 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). 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.

Five additional seminars independent of the laboratory sessions have been programmed, which will serve to reinforce the learning, either dealing with monographic topics (for example, requirements to adequately prepare the memory of a laboratory practice), either to solve or analyze doubts that have arisen in the treatment and interpretation of the results of the practices.

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 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 maintainedkept in the second one. The sections listed below, together with the percentage of the grade, cannot be recovered, if necessary, in the second call. Only in the case of the laboratory notebook, will a partial recovery of those sections corresponding to the treatment and interpretation of the results will be allowed.

1. Preparation of the experience (including the preliminary questions: 15%
2. Work in the laboratory: 20%
3. Laboratory notebook (including post-laboratory questions): 20 %

b) Evaluation of specific activities

The acquired knowledge and skills will be evaluated through exams throughout the course, and / or a test common to all the subgroups of the subject that will be carried out at the end of the laboratory work, on a date of official call. The presentation, orally and written, of a laboratory report is also part of this section.

4. Individual memory of a laboratory practice: 15 %

5. Final evaluation exercises (including the final test): 30%

To be able to pass the subject, a grade equal to or higher than 4,5 points is required in each of the five sections that make up the evaluation, and the weighted sum of all of them will reach 5 points.

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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