COURSE DATA

DATA SUBJECT

Code: 36450
Name: Analytical Chemistry 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	2	First quarter
1929 - Double Degree Program in Physics and Chemistry	Facultat de Física	2	First quarter
1934 - Double Degree Program in Chemistry-Chemical Engineering	Facultat de Química	2	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1110 - Degree in Chemistry	Analytical Chemistry	COMPULSORY
1929 - Double Degree Program in Physics and Chemistry	Segundo Curso (Obligatorio)	COMPULSORY
1934 - Double Degree Program in Chemistry-Chemical Engineering	Segundo curso	COMPULSORY

COORDINATION

BAEZA BAEZA JUAN JOSE

SUMMARY

"Analytical Chemistry I" is the first course in the Analytical Chemistry subject, serving as the starting point for its teaching. Therefore, it is of great importance for tackling subsequent subjects related to this field. This course introduces fundamental concepts related to the analytical process, basic operations, analytical parameters, and the expression of results, so that students become aware of what analytical chemistry represents and contributes to the society.

In addition to an introduction to sample treatment and preparation, as well as the evaluation and presentation of analytical results, the main content of this course focuses on the study of classical analysis techniques, primarily in the applications of reactions in solution, i.e., volumetric and gravimetric analysis. Therefore, the content covered in the "General Chemistry II" course related to chemical equilibrium is very important. The training in classical analysis is completed with the course "Analytical Chemistry Laboratory I," which is taken in the second semester of the same academic year.

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

Basic knowledge of: Nomenclature and formulation. Stoichiometric calculations. Fundamentals of equilibria in solution: identification of the acid-base and redox character of species. Accuracy and precision. Basic mathematical and statistical calculations. Types of error. Propagation of uncertainty. Significant figures. Prerequisites or previous recommendations.

COMPETENCES / LEARNING OUTCOMES

1110 - Degree in Chemistry

Act autonomously in learning, making informed decisions in different contexts, forming judgements based on experimentation and analysis, and transferring knowledge to new situations.

At the end of the course, the student will be able to address new problems and develop strategies to solve 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 distinguish the principles, procedures and techniques used for the determination, separation, identification and characterisation of chemical compounds.

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 implement sustainable and environmentally friendly methodologies.

At the end of the course, the student will be able to relate theory and experimentation.

At the end of the course, the student will be able to solve problems effectively.

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.

At the end of the course, the student will relate chemistry to other disciplines.

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.

Propose creative and innovative solutions to complex situations or problems within the field of study, in order to respond to diverse professional and social needs.

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

1. Introduction to Analytical Chemistry

Introduction to analytical chemistry. Definition of Analytical Chemistry. Basic terminology. Analytical properties. Classification of analytical methods. Classical Qualitative Analysis Steps of the analytical process.Sustainable Analytical Chemistry. Evaluation and presentation of results.

2. Analytical Sampling and Sample Treatment

Analytical sampling and sample treatment. Definition. The importance of representativeness in the sampling. Basic operations of sampling (in solid, liquid and gaseous states). Basic operations of sample treatment in Analytical Chemistry: dissolution, leaching, wet and dry mineralization, liquid-liquid extraction, solid-phase extraction, distillation, evaporation, filtration, centrifugation, precipitation, masking and derivatisation.

3. Influence of the reaction medium on the equilibrium in solution

Influence of the reaction medium on the equilibrium in solution.- Side reactions. Side reaction coefficient. Complex formation equilibrium: calculus of conditional constants. Conditional solubility product. Conditional redox potential: effect of the reaction medium on the stability of the oxidation states.

4. Fundamentals of Gravimetric Analysis: precipitation gravimetry

Fundamentals of gravimetric analysis:precipitation gravimetry.-Principles. Gravimetric factor. Characteristics of the precipitates. Basic steps of gravimetric analysis based on precipitation. Applications.

5. Volumetric Analysis

Volumetric analysis.- Fundamentals of volumetric analysis. Requirements of the reactions used in titrations. Titration curves. The equivalence point and the end point. Volumetric titration error. Primary and secondary standards (preparation, standardization and/or conservation). Types of titration: direct, indirect and back titration.

6. Acid-base Titrimetric Analysis

Acid-base titrimetric analysis. Introduction. Titration curves. End point detection: acid-base indicators. Selecting the indicator. Error assessment. Applications.

7. Titrimetric Analysis Based on Complex Formation

Titrimetric analysis based on complex formation. Introduction. Titration curves. End point detection: metallochromic indicators. Selecting the indicator. Error assessment. Applications.

8. Titrimetric Analysis Based on Precipitation

Titrimetric analysis based on precipitation. Introduction. Error assessment. Applications.

9. Redox Titrimetric Analysis

Redox titrimetric analysis. Introduction. Selection of the indicator. Error assessment. Applications.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	9,00
Theory	51,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	40,00
Preparation of lessons	28,00
Preparation for assessment activities	22,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

The course will be conducted using the following teaching methodologies:

• Lectures

• Participatory classes

• Exercise solving

• Seminars

• Information searching

• Problem-based learning

• Case analysis/study

In the theory and seminar classes, a global view of the topic and practical cases will be provided. During tutorials, the fundamentals for solving typical problems related to the theoretical content will be established. The teaching staff will provide material through the virtual classroom to help students consolidate the knowledge acquired.

In group tutorials, practical cases will be discussed, and the student's ability to solve them will be assessed. These classes will also serve to address and resolve any questions the student may have encountered while solving problems and issues provided by the teacher.

Additionally, throughout the course, students will have the opportunity to solve and submit selected questions and/or problems chosen by the teacher, which will contribute to the evaluation process.

EVALUATION

FIRST CALL

The assessment of student learning will consider all the aspects outlined in the methodology section of this teaching guide. The evaluation consists of two components:

1) Tests (70%): These tests include written, oral, and/or practical exams.

2) Continuous Evaluation (30%): Each student's performance is assessed based on the proposed activities (questions, exercises, evaluation tests, etc) participation, and engagement in the teaching-learning process. Note that continuous evaluation activities are non-recoverable.

The final mark will be the sum of the exam mark and the marks obtained in all assigned activities, according to the previously indicated percentages. To pass the course, the student must obtain a minimum mark of 4.5 on the final exam, and the weighted average must be equal to or higher than 5. There is no minimum mark required in continuous evaluation to average with the exam, but the mark obtained in this part will necessarily be included in the calculation of the final course mark.

Copying or plagiarism of any assignment that is part of the evaluation will result in the impossibility of passing the course, and the student will be subject to the appropriate disciplinary procedures.

It should be noted 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 documents of the University".Evaluation system of the subject.

SECOND CALL

In the second call, the mark will be obtained by applying the same criteria as in the first call.

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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