COURSE DATA

DATA SUBJECT

Code: 34184
Name: General Chemistry 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
1929 - Double Degree Program in Physics and Chemistry	Facultat de Física	1	Second quarter
1934 - Double Degree Program in Chemistry-Chemical Engineering	Facultat de Química	1	Second quarter

SUBJECT-MATTER

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

COORDINATION

POU AMERIGO ROSENDO

SUMMARY

The subject General Chemistry II is intended for students to deepen the knowledge of chemistry that they acquired during upper secondary education. This way, this course will serve to establish the necessary grounds for the successful further study of the different branches of the discipline. While the subject General Chemistry I focuses on the description of subject area, the guiding thread of General Chemistry II is the study of chemical reactions. Thus, topics such as the energy of reactions, kinetics or material equilibrium and its various types will be addressed. The main objectives are:

- To homogenise the prior knowledge of chemistry acquired by students in previous years.
- To establish solid bases so that they can successfully complete more advanced subjects.
- Students should acquire the basic terminology of chemistry and use it properly, expressing the ideas with the precision needed in a scientific context, knowing the conventions and using the units correctly.

- Students should develop their skill to set up and solve numerical problems in chemistry and interpret the results obtained.
- Students should be capable of looking for and selecting information in the context of chemistry and of presenting it appropriately in an oral way.
- To promote their skills for teamwork.
- To encourage among students those values and attitudes that must be inherent in the scientific activity.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

Nomenclature and chemical formulation, both inorganic and organic.
Balancing of chemical equations.
Elementary stoichiometric calculations.
Identification of the acid-base nature of common compounds.
Obtaining of oxidation states of the elements that constitute the chemical species.
Calculation of derivatives and simple integrals.
Correct use of logarithms and exponentials.

COMPETENCES / LEARNING OUTCOMES

1108 -

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

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 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.

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

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

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.

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 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

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 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 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.

Distinguish between the qualitative and quantitative aspects of chemical problems.

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.

Identify chemical processes in everyday life.

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

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

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

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.

Use chemical terminology, nomenclature, conventions and units correctly.

DESCRIPTION OF CONTENTS

1. THE ENERGY OF THE CHEMICAL REACTIONS

Basic concepts. Systems, variables and processes.- Energy, heat and work. The first law of thermodynamics.- Enthalpy.- Heat of reaction. Hess¿s law. - Standard enthalpy of formation.- Heat capacity.- Variation of the enthalpy of reaction with temperature. Kirchhoff¿s equation.

2. THE DIRECTION OF THE CHEMICAL CHANGE

Spontaneity. Need for the second law.- Reversibility and spontaneity.- The second law of thermodynamics. Entropy.- Entropy calculations.- Molecular interpretation of the entropy.- Absolute entropies. Third law of thermodynamics.- Change of the entropy of reaction with temperature.- Free energy. Change of the free energy with temperature.

3. THE EQUILIBRIUM IN CHEMICAL REACTIONS

Basic aspects of the chemical equilibrium.- General condition of the chemical equilibrium.- Chemical equilibrium in ideal gas systems.- Heterogeneous equilibria.- Variation of the equilibrium constant with temperature.- Equilibrium response to a change in conditions. Le Châtelier¿s principle.

4. CHANGES OF STATE OF SUBSTANCES

Basic concepts. Phases and phase transitions.- Phase equilibria in one-component systems. Thermodynamic study.- Pressure/temperature diagrams.

5. SOLUTIONS

Concept of ideal solution. Raoult¿s law.- Thermodynamic study of ideal solutions.- Ideal binary solutions. P-x and T-x diagrams.- Ideal diluted solutions. Henry's law.- Colligative properties.

6. ACID-BASE EQUILIBRIA

Definitions of acids and bases.- The autoionisation of water. pH scale.- Strength of acids and bases. Equilibrium constants. - Calculation of the pH and the concentrations of all the species at equilibrium.- Hydrolysis.- Buffer solutions.

7. SOLUBILITY EQUILIBRIA

Basic concepts.- Solubility product.- Factors affecting solubility.- Calculations at equilibrium.

8. OXIDATION-REDUCTION EQUILIBRIA

Oxidation-reduction reactions.- Thermodynamics of electrochemical systems. Voltaic batteries.- Electromotive force of the batteries (EMF). Electrode potentials.- Dependence of the EMF on concentrations. Nernst equation.- Types of electrodes.- Commercial batteries.- Corrosion.

9. THE RATE OF THE CHEMICAL CHANGE

Reaction rate.- Dependence of the reaction rate on concentration. Rate equation.- Simple integrated rate laws.- Mechanisms of reaction.- Influence of temperature on the reaction rate. Arrhenius equation.- Catalysis.

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	90,00
Preparation of lessons	0,00
Preparation for assessment activities	0,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

The course will be developed through the following teaching methods:

- Lectures
- Participatory sessions

• Problem solving

• Search of information

• Oral presentations

The first two methodologies will offer an overview of the topic as well as a series of recommended resources for an in-depth further study of the subject.

Problem-solving sessions will serve to explain a set of typical problems, but it will be students themselves who will have to deal with the problems, which will be corrected and analysed later on.

In tutorials the lecturer will guide the students as regards their learning process. For these sessions, students will be given a list of questions and problems that will serve to strengthen their knowledge.

Finally, the presentation of a project is compulsory. The project will involve a search of information and will be prepared in teams and presented to the whole class.

EVALUATION

The following assessment systems will be used, which will contribute to the final mark in the percentages indicated:

• Written, oral and/or practical tests: 70%

• Assessment of group tutoring sessions, seminars, preparation of projects and/or oral presentations: 25%

• Continuous assessment of each student based on classroom activities, participation and degree of involvement in the teaching-learning process: 5%

At the end of the semester, students must sit a final exam that will contribute 70% of the mark and will have two parts: one consisting of theoretical questions and another one consisting of numerical problems. The exam result will be calculated as the average of the marks obtained in each part, taking into account that both marks must be greater than or equal to 4.5. Otherwise, both the exam and the subject will be marked as failed, regardless of the other marks achieved. In that case, the final official numerical grade will be that corresponding to the part in which the minimum of 4.5 has not been reached. Official exams will be the same for all groups.

The second assessment item, which will contribute 25%, will be marked based on two components: first, the mark for the team project (10%) and second, the mark for the exercises presented in group tutorials and for the questionnaires (10%). Finally, the continuous assessment of each student will contribute an

additional 5%.

Systems and percentages will be identical in the first and second examination sitting. It is therefore not possible to be assessed only through a final exam.In the event that the student has successfully completed teamwork (10% of the final mark) in previous sessions, the note may be maintained provided that the student requests it in advance. Any student who fails at the first attempt must sit the final exam at the second examination sitting and the marks for sections 2 and 3 obtained at the first attempt will be carried forward. However, if the student failed one of these two sections and the lecturer deems it feasible and appropriate, he or she may retake it by carrying out additional activities.

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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