



Universitat de Lleida

# DEGREE CURRICULUM **CHEMISTRY**

Coordination: CANELA GARAYOA, RAMON

Academic year 2022-23

## Subject's general information

<b>Subject name</b>	CHEMISTRY			
<b>Code</b>	102413			
<b>Semester</b>	1st Q(SEMESTER) CONTINUED EVALUATION			
<b>Typology</b>	<b>Degree</b>	<b>Course</b>	<b>Character</b>	<b>Modality</b>
	Bachelor's Degree in Forest Engineering	1	COMMON/CORE	Attendance-based
	Double degree: Bachelor's degree in Forest Engineering and Bachelor's degree in Nature Conservation	1	COMMON/CORE	Attendance-based
<b>Course number of credits (ECTS)</b>	9			
<b>Type of activity, credits, and groups</b>	<b>Activity type</b>	PRALAB	PRAULA	TEORIA
	<b>Number of credits</b>	1.2	3.4	4.4
	<b>Number of groups</b>	6	1	1
<b>Coordination</b>	CANELA GARAYOA, RAMON			
<b>Department</b>	CHEMISTRY			
<b>Teaching load distribution between lectures and independent student work</b>	Class hours: 90 Non-attendance hours: 135			
<b>Important information on data processing</b>	Consult <a href="#">this link</a> for more information.			
<b>Language</b>	Catalan: 100% Possibility of student consultations in English and Spanish			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
CANELA GARAYOA, RAMON	ramon.canela@udl.cat	3	
DE FARIA , CAROL CHRISTINA	carol.faria@udl.cat	1,2	
GALCERAN NOGUES, JOSE JUAN	josep.galceran@udl.cat	1,8	
GARCES GONZALEZ, JOSEP LLUIS	josepluis.garces@udl.cat	4,4	
GUILLEN MARTINEZ, PEDRO	pere.guillen@udl.cat	2	
MORALEJO VIDAL, MARIA DE LOS ANGELES	marian.moralejo@udl.cat	2,6	

## Subject's extra information

This year, and taking into account that there are still no clear guidelines from the Generalitat on how to manage the entire situation caused by Covid, the teaching of the theoretical part is planned to be taught in the inverted teaching format. This implies that the teaching staff will deposit in the Virtual Campus a whole series of material, basically videos, so that the student can study it prior to some face-to-face work sessions in the classroom with smaller groups where doubts will be resolved and exercises will be done on the subject matter.

### **Recommendations:**

Continued student work throughout the semester, reading the basic bibliography and solving exercises.

Frequently visit the Virtual Campus space associated with the subject, since it will be hanging utility material: a copy of videos containing the theoretical part of the subject, exercises collections, instructions to perform the practices and work, ...

Take advantage of the hours of consultation / tutoring with the teachers.

Students must bring the following individual protection items (EPI) in the course of lab works:

- White lab coat UdL unisex
- Safety glasses
- Chemical protection gloves
- Face cover

The EPI can be purchased at UdL's ÚDELS store

Center for Cultures and Cross-Border Cooperation - Cappont Campus

Carrer de Jaume II, 67 low

25001 Lleida

<http://www.publicacions.udl.cat/>

In any case, the Department of Chemistry will try to put at the disposal of the students glasses and gloves of protection of general use.

## **GENERAL SAFETY RULES IN LABORATORY PRACTICES**

Maintain the place of performance of clean and tidy practices. The work table must be free of backpacks, folders, coats ...

In the laboratory you can not come with shorts or short skirts.

Bring closed and covered shoes during the performance of the practices.

Bring long hair always collected

Keep the gowns cords to protect against spills and spills of chemical substances.

Do not carry wide bracelets, pendants or sleeves that can be trapped by the equipment, assemblies ...

Avoid wearing contact lenses, since the effect of chemicals is much greater if they are introduced between the contact lens and the cornea.

Do not eat or drink in the laboratory

Smoking is prohibited within laboratories

Wash your hands whenever you have contact with a chemical and before leaving the laboratory.

Follow the teacher's instructions and consult any questions about security.

Follow all the safety rules indicated related to the management of the situation created by Covid19 when carrying out the practices.

## Learning objectives

### **Aims and Objectives**

Review basic concepts of Chemistry.

To understand and apply the principles of thermodynamics to the energy balances of chemical reactions and to determine the theoretical conditions of spontaneity and equilibrium.

Extend the above concepts and apply them to proton transfer equilibrium (acid/base), precipitation and complex formation (solubility) and electronic transfer equilibrium (redox).

To know the general and reactivity properties and characteristics of the main categories of organic molecules and those of biological and biochemical interest.

To learn how to correctly pose, solve and expose the resolution of a Chemistry problem.

## Competences

### **Specific competences of the qualification**

- CB1. Students have demonstrated knowledge and understanding in an area of study that is based on a general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study.
- CB2. That students know how to apply their knowledge to their work or vocation in a professional way and possess the competencies that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.

- CB3. That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include reflection on relevant issues of a social, scientific or ethical nature.
- CEFB4. Basic knowledge of general chemistry, organic and inorganic chemistry and their applications in engineering.  
CB5. That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.
- CE1. Understand the biological, geological, chemical, physical and mathematical foundations necessary for the development of professional activity.

## Objectives

Review basic concepts of Chemistry.

To understand and apply the principles of thermodynamics to the energy balances of chemical reactions and to determine the theoretical conditions of spontaneity and equilibrium.

Extend the above concepts and apply them to proton transfer equilibrium (acid/base), precipitation and complex formation (solubility) and electronic transfer equilibrium (redox).

To know the general and reactivity properties and characteristics of the main categories of organic molecules and those of biological and biochemical interest.

## **Transversal competences of the qualification**

- CT5. Acquire essential notions of scientific thought.
- CG1. Ability to understand the biological, chemical, physical, mathematical and representation system fundamentals necessary for the development of the professional activity, as well as to identify the different biotic and physical elements of the forest environment and the renewable natural resources susceptible to protection, conservation and exploitation in the forestry field.
- CG2. Develop learning skills to improve your training autonomously.
- CG4. Understand and express themselves with the appropriate terminology.
- GC7. Ability to solve technical problems derived from the management of natural spaces.

## Objectives

Learn how to correctly pose, solve and expose the resolution of a chemistry problem.

## Subject contents

### CONTENTS (PROGRAMME)

#### GENERAL CHEMISTRY

##### Topic 1.- Introductory concepts

Role of Chemistry in today's society. States of the matter. Concept of mole. Stoichiometry and chemical reactions. Dissolutions. Concentration. Concentration units. Gases. Laws of gases.

##### Theme 2.- Thermodynamics and Chemical Equilibrium

Introduction to Thermodynamics. First principle. Thermochemistry. Standard Enthalpy of reaction. Law of Hess. Spontaneity and second principle. Gibbs energy. Conditions of spontaneity and equilibrium. Balance constants for ideal gases. Balance displacement. Chemical equilibrium in heterogeneous systems.

##### Theme 3.- Acid-base equilibria

Acid and base concepts. Balances of dissociation of acids and bases. Strength of acids and bases. Concept of pH. Hydrolysis. pH regulating solutions. Neutralization volumes. Indicators.

##### Theme 4.- Precipitation equilibrium and complex formation.

Solubility. Solubility product constant. Formation of complexes. Displacement of precipitation equilibrium.

## Theme 5.- Equilibrium in oxidation reactions - reduction

Oxidation and reduction concepts. Equalization of redox reactions. Batteries and electrolytic cells. Polarity. Electrode potentials. Nernst equation. Electrolysis.

## B) ORGANIC CHEMISTRY

### Theme 6.- Introduction to Organic Chemistry

Object of Organic Chemistry. Atomic structure. Periodic System. Chemical links in Organic Chemistry. Lewis theory of covalent bonding Lewis structures. Structural chemistry rules. Formal load. Resonant structures. Theory of the repulsions of the electron pairs of the valence layer. Molecular geometry. Intermolecular forces in Organic Chemistry.

### Theme 7.- Isomeria

Isomers. Types of isomers. Structural isomers. Stereoisomers. Optical isomers. Optical activity. Racemic mixtures. Representation of stereoisomers. Absolute configurations R, S. Relative configurations D, L. Diastereoisomers. Meso forms. Geometric stereoisomers of cycles and double link. Conformational analysis. Formers in acyclic compounds and in cyclic compounds. Newman's projections.

### Topic 8.- Basic physical-chemical properties

As the characteristics and structure of molecules are useful to explain properties of matter such as its physical state at different temperatures and its solubility. Application to the most important classes within organic chemistry: hydrocarbons, halogenated derivatives, alcohols, ethers, amines, aldehydes, ketones, carboxylic acids and derivatives thereof.

### Theme 9.-Basic concepts of chemical reactivity

How the characteristics and structure of molecules are useful to explain the reactivity of substances. Homolytic and heterolytic breaking and opening of chemical bonds. Types of reactions according to the exchanges of atoms and bonds that take place: isomerization reactions, substitution reactions, addition reactions, elimination reactions, redox reactions. Concept of radical, nucleophile and electrophilic center. Application to the most important classes within organic chemistry: hydrocarbons, halogenated derivatives, alcohols, ethers, amines, aldehydes, ketones, carboxylic acids and derivatives thereof.

## C) BIOCHEMISTRY

### Theme 10.- Carbohydrates

Characteristics Monosaccharides. Classification. Properties. Cycling of monosaccharides. Formation of derivatives.

Glycosidic bonds. Disaccharides. Characteristics and types. Polysaccharides. Characteristics and types.

### Theme 11.- Lipids

Characteristics Fatty acids. Structure and properties. Saponifiable lipids. Unsaponifiable lipids. Supramolecular structures.

### Theme 12.- Amino acids and proteins

Protein amino acids. General structure. Classification. Properties. Dissociation balances. Henderson-Hasselbach equation. Peptide bond. Structure and properties. Oligo- and polypeptides. Fibrous and globular proteins. Primary, secondary, tertiary and quaternary structure. Forces involved in the stability of protein structures. Denaturation.

### Theme 13.- Enzymes

Definition, properties and classification. Apoenzima and holoenzima. Concept of cofactor, coenzyme, co-substrate

and prosthetic group. Active centre. Definition and properties. Kinetics of Michaelis-Menten. Transformation of Lineweaver-Burk. Activation and inhibition of enzymatic activity. Dependence on pH and temperature. Denaturation of enzymes. Inhibitors.

## Theme 14.- Nucleic acids

Nucleosides and nucleotides. Structure Functions Phosphodiester bond. DNA and RNA. Structure and functions. Forces involved in its stabilization.

## Evaluation

The subject is divided into three blocks: general chemistry, organic chemistry and biochemistry

The evaluation of the subject will be carried out preferably in the form of CONTINUAL EVALUATION (3 February 2023 according to current teaching timetable), for this fact the student's attendance in the corresponding group of laboratory practices will be controlled. Students being past the practices the previous years do not need to pass the practice exam again.

Students who DO NOT OPTION for this option will be entitled to a SINGLE FINAL EXAM, with theoretical and practical contents, which will represent 100% of the FINAL MARK. The last past MARK obtained in the previous years will be the one considered for students from previous years.

For the students who opt for the CONTINUAL EVALUATION, the FINAL MARK will come out of a series of the following activities developed throughout the course:

- Laboratory practices, with a global evaluation of 10%
- General Chemistry, with a global value of 40%
- Organic Chemistry, with an overall assessment of 35%
- Biochemistry, with an overall score of 15%

The laboratory practices note will be obtained from a written test (carried out at the end of the course) and the assessment of the use and behavior of the student in the laboratory. Students being past the practices the previous years do not need to pass the practice exam again. The last past MARK obtained in the previous years will be the one considered for students being past the practices the previous years.

You can not change the practice group improvisedly. Exceptionally and in justifiable cases, you can change the group if you exchange with another partner.

The final mark of each of the three blocks of theory will be obtained from

- a. The mark of the exams with an evaluation of 80%.
  1. The first midterm will be on 2 November 2022 (according to current teaching timetable), in which the general chemistry block will be assessed.
  2. The second midterm will be on 25 January 2023 (according to current teaching timetable), in which the organic chemistry and biochemistry blocks will be assessed.
- b. The mark correspondent to a set of activities of continuous assessment (tests, problems or others), realized during the period in which the subject is ongoing; with an overall valuation of 20% always. **If the student has not attended a minimum of 80% of the face-to-face classes of the corresponding block, the mark for this section for this block will be 0.**

To pass the continual assessment, at the end of the course the final mark will be calculated based on the marks obtained in each block and their percentage weight. In no case will the assessment be passed if the mark of any of the three blocks were less than 3, the student could not pass the continual assessment.

Likewise, for those students who opt for the CONTINUOUS EVALUATION SYSTEM, and who have attended a minimum of 80% of the classes in each block, their attendance, attention, interest and participation in the classes will be valued UP TO 0.5 points. These points will be added to the final mark obtained according to the aforementioned criteria.

The 1st and / or 2nd part exams will be recoverable in a final exam only if the student has participated in all the activities described above. If it is not the case, the student must perform both parts.

June, 2022