Universitat de Lleida

DEGREE CURRICULUM

CHEMISTRY

Coordination: CANELA GARAYOA, RAMON

Academic year 2020-21

CHEMISTRY 2020-21

Subject's general information

Subject name	CHEMISTRY
Code	102413
Semester	1st Q(SEMESTER) CONTINUED EVALUATION
Typology	

Degree	Course	Character	Modality
Double degree: Bachelor's degree in Forest Engineering and Bachelor's degree in Nature Conservation	1	COMMON	Attendance-based
Bachelor's Degree in Forest Engineering	1	COMMON	Attendance-based

Course number of credits (ECTS)	9
Type of activity, credits, and groups	

Activity type	PRALAB	PRAULA	TEORIA
Number of credits	1.2	3.4	4.4
Number of groups	6	1	1

Coordination	CANELA GARAYOA, RAMON
Department	CHEMISTRY
Teaching load distribution between lectures and independent student work	Class hours: 90 Non-attendance hours: 135
Important information on data processing	Consult this link for more information.
Language	Catalan: 100% Possibility of student consultations in English and Spanish

CHEMISTRY 2020-21

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
CANELA GARAYOA, RAMON	ramon.canela@udl.cat	3	
GARCÉS GONZÁLEZ, JOSEP LLUÍS	josepllluis.garces@udl.cat	5	
GUILLEN MARTINEZ, PEDRO	pere.guillen@udl.cat	3,8	
LOPEZ SOLIS, CARMEN LUCIA	carmen.lopezsolis@udl.cat	1,2	
PINTO PAGES, ESTHER	ester.pinto@udl.cat	2	

Subject's extra information

This year, and taking into account 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

Ability to understand and apply the principles of basic knowledge of general chemistry, organic chemistry and biochemistry and their applications in corresponding engineering.

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

Ability to solve problems and develop and defend arguments within their area of study.

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 Entalpy 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

Topic 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. Acid concept - base in Organic Chemistry. Nucleophilic and electrophilic. Functional groups. Concept of radicals.

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.

Theme 8.- Alkanes and cycloalkanes. Concept of conformations

Characteristics, structure and nomenclature of alkanes. Linear, branched and cyclic hydrocarbons. Physical and chemical properties of alkanes. Combustion Analysis. Petroleum. Refining. Cracking. Conformational analysis. Newman's projections. Formers in acyclic compounds and in cyclic compounds.

Derivats Halogenats. Nucleophilic Substitution and Elimination Reactions

Characteristics, structure and nomenclature of halogenated derivatives. Physical properties of halogenated derivatives. Chemical properties. Nucleophilic substitution reactions. Elimination reactions.

Topic 10.- Alquens i Alquins. Addition Reactions

Characteristics, structure and nomenclature of alkenes and alkynes. Physical properties of alkenes and alkynes. Chemical properties. Addition reactions. Hydrogen addition. Addition of halogens. Ionic additions of water and alcohols. Addition reactions with oxidation with ozone and permanganate.

Topic 11.- Aromatic Hydrocarbons. Electronic Substitution Reactions

Characteristics, structure and nomenclature of aromatic compounds. Hückel rule. Physical properties. Chemical properties. Electrophilic substitution reactions. Halogenation. Nitration. Sulphonation. Friedel-Crafts reactions. Effect of ring substituents on electrophilic substitution.

Topic 12.- Alcohols, Phenols, Ethers

Alcohols. Characteristics, structures and nomenclature. Physical properties. Chemical properties. Oxidation reactions. Dehydration reactions. Phenols. Characteristics and structures. Physical properties. Chemical properties. Acid-base reactions. Ethers. Characteristics, structures and nomenclature. Physical properties. Chemical properties. Acid treatment. Peroxide formation.

Topic 13.- Carbonyl Compounds

Structural characteristics and nomenclature. Physical properties. Chemical properties. Addition reactions. Addition of water, alcohols and amines. Oxidation-reduction reactions.

Theme 14.- Carboxylic acids and derivatives

Carboxylic acids. Structural characteristics. Physical properties. Acidic character. Derived from acids. Formation of acid derivatives. Electrophilic character of acid derivatives. Esters Reactivity. Hydrolysis. Saponification. Reduction. Amide reactivity. Hydrolysis. Reduction

Item 15.- Amines

Characteristics and structures. Physical properties. Chemical properties. Acidic character - base.

C) BIOCHEMICAL

Item 16.- Carbohydrates

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

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

Topic 17.- Lipids

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

Theme 18.- 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.

Topic 19.- 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.

Topic 20.- 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, 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 past 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%.

b. The mark correspondint 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.

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 weitgh. 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.

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.