



## CHEMISTRY (2015-16)

### GENERAL INFORMATION

Code 26510

ECTS Credits 6

#### Departments and areas

Department	Area	Area	Report R.
ORGANIC CHEMISTRY	ORGANIC CHEMISTRY	YES	YES

#### Studies

DEGREE IN MARINE SCIENCES

DEGREE IN BIOLOGY

#### Context of subject

With this subject, the student would learn the basic terminology of Chemistry. This would allow expressing himself/herself with correct precision in Science, depicting ideas and concepts and the connections between them. Also would allow himself/herself to think in scientific terms and see the relationship between Chemistry, Biology and Marine Sciences bases of knowledge. The student must learn the capacity to apply and link the chemical and physical laws and principles of Biology and Marine Sciences, applying them to solve chemical problems and understanding the results and discussing if these are correct or not. The student must know the molecules structures and functions and understand the thermodynamic principles in order to expand this knowledge to the study of the biomolecules and their function and its application to bioenergetics. In this subject, the student would gain the required abilities to work in a Chemistry lab, including experimental setups, measure acquisition, and discussion of the results applying chemical and physical laws, manipulating the glassware, reactive, instrumentation and displays with safe. Finally, the student has to be able to study and plan his/her activities to acquire the knowledge of this subject, individually or working in groups, searching, selecting and synthetizing the information from different bibliographical sources.



## OBJECTIVES

### Subject objectives/competences (2015-16)

Link the physical and chemical laws and principles of Biology and Marine Sciences. (CE 2) y (CE3, CE4 )

Study the structure and function of biomolecules, and understanding of their action in biological processes. (CE13) y (CE1, CE12)

Understand the thermodynamic principles and their application in bioenergetics. (CE17) y (CE3, CE4, CE12)

Acquire the required abilities to work in the lab and discuss the experimental data and measures of Chemistry applied to Biology and Marine Sciences, being able to work safely with biological material, reagents, instruments and displays. (CE31-CE35) y (CE12, CE23)

Know how to search, analyze, understand, write and present scientific and technical texts. (CE36, CE37) y (CE22, CE33)

Connect the Chemistry bases with Biology and Marine Sciences. (CE40) y (CE6)

## CONTENTS

### Theoretical and practical contents (2015-16)

#### THEORY

#### SECTION I (CHEMICAL BONDING, BI)

##### Unit 0. Inorganic nomenclature

**Unit 1 (U1). Mass relationships in chemical reactions.** Atomic and molar mass. Mol definition. Empirical and molecular formulas. Reactions stoichiometry. Adjusting chemical reactions. Limiting reagent and chemical yield. Concentrations units.

**Unit 2 (U2). Chemical bonding and structure.** The ionic bond and lattice energy. The covalent bond: electronegativity, Lewis structures, resonance, bond enthalpy, molecular geometry and dipole moment. Valence bond theory: Hybridization. Molecular Orbital Theory: bonding, antibonding and delocalized molecular orbitals.

#### SECTION II (ORGANIC CHEMISTRY, BII)

**Unit 3 (U3). Hydrocarbons.** Structure and composition of organic molecules. Nomenclature and physical properties of alkanes, alkenes and alkynes. Aromatic hydrocarbons.

**Unit 4 (U4). Functional groups.** Definition of functional group. Structure, nomenclature and physical properties of organic compound containing functional groups.

**Unit 5 (U5). Organic stereochemistry.** Geometric isomerism. Conformations of acyclic compounds. Conformational analysis of cyclohexanes and another cyclic compounds. Chiral molecules. Optical activity. Absolute configuration: R and S rules. Configuración absoluta: las reglas. Molecules with more than one stereocenters: diastereoisomers. Resolution and separation of diastereoisomers and enantiomers.

**Unit 6 (U6). Organic reactivity.** Reactions in organic chemistry. Reaction intermediates. Addition reactions. Elimination reactions. Substitution reactions.

#### SECTION III (THERMODYNAMICS AND KINETICS, BIII)

**Unit 7 (U7). Thermochemistry.** Enthalpy. Calorimetry. Standard enthalpy of formation and reaction. Heat of solution and dilution. First law of thermodynamic. Spontaneous processes and entropy. Second law of thermodynamic. Gibbs free energy. Free energy and chemical equilibrium.

**Unit 8 (U8). Chemical equilibrium.** Chemical equilibrium concept. Law of mass action,  $K_c$ . Reaction quotient. Factors that affect the chemical equilibrium. Heterogeneous equilibria.

**Unit 9 (U9). Chemical kinetics.** Reaction rate. Reaction rate law. The relation between the reactant concentration and time. Factors that affect the reaction rates. Reaction mechanisms. Catalysis. The relation between chemical kinetics and chemical equilibrium.

#### SECTION IV (SOLUTIONS AND THEIR PROPERTIES, BIV)

**Unit 10 (U10). Chemical and physical properties of solutions.** Intramolecular forces. Liquid state: structure and properties of water. Phase changes. Phase diagrams. A molecular view of the solution process. Types of solution. The effect of the temperature on solubility. The effect of pressure on solubility of gases. Colligative properties of nonelectrolyte and electrolyte solutions.

**Unit 11 (U11). Acid-base equilibria.** Brønsted acids and bases. The acid-base properties of water and the pH scale. Strength of acids and bases. Molecular structure and acid strength. Some typical acid-base reactions. Lewis acids and bases. Weak acids. Weak bases. Polyprotic acids. Acid-base properties of salt. The common ion effect. Buffer solutions.

**Unit 12 (U12). Electrochemistry.** Redox reactions. Standard reduction potential. Thermodynamics of the redox reaction. Batteries. Corrosion.

#### PRACTICAL WORK



**Practice 1 (P1).** Stoichiometry workshop.

**Practice 2 (P2).** Chemical bonding workshop.

**Practice 3 (P3).** Molecular models: nomenclature

**Practice 4 (P4).** Molecular models: nomenclature

**Practice 5 (P5).** Molecular models: nomenclature

**Practice 6 (P6).** Organic chemistry reactivity

**Practice 7 (P7).** Thermodynamics and kinetics workshop

**Practice 8 (P8).** Acid-base titrations

## EVALUATION

### Instruments and criteria of Evaluation 2015-16

- (1) Student assistance to the practical hours is compulsory to be able to pass the subject. The practical work takes place at the time established in the timetable and can't be changed by any circumstance.
- (2) The assistance to the small-tuition hours is compulsory in order to have right to the qualifications of the different proposed activities. The no assistance to these hours would suppose lossing of the qualification of the proportional part of the activities. Only under major and justified circumstances (illness, etc..) the test of the session could be recovered.
- (3) None of the qualifications of the proposed activities would be maintained from one academic year to another.
- (4) All the obtained qualifications during the semester would be considered together with the qualification of the final exam in the same academic year, if the mark of the final exam is above 4.0 over 10.0. If the mark of the final exam is below 4.0, but the sum of all the qualification are above 5.0, the official final qualification would be 4.5 and the student would not passed the subject.

Type	Criterion	Description	Ponderation
FINAL TEST	Short questions and problems about the theoretical and practical work done along the semester	Final writing exam	50
ACTIVITIES OF EVALUATION DURING THE SEMESTER	Entrega de problemas tipo de cada bloque temático trabajados de forma individual o mediante trabajo cooperativo	Entrega de problemas	15
ACTIVITIES OF EVALUATION DURING THE SEMESTER	Moodle-tests at the end of each lesson.	Theoretical tests	15
ACTIVITIES OF EVALUATION DURING THE SEMESTER	Sheet with the answers of the proposed problems	Practice workshop and problem solving	8
ACTIVITIES OF EVALUATION DURING THE SEMESTER	Lab-reports book contents and presentation	Lab-reports book	3
ACTIVITIES OF EVALUATION DURING THE SEMESTER	Lab-attitude (application of the lab-evaluation record): base don lab-ability, safety, healthy regulations and general behaviour, experimental results, problem solving and short questions about the practical and experimental work	Lecturer observation	9

