Universidad Zaragoza

Year : 2019/20

27111 - Organic Chemistry

Syllabus Information

Academic Year: 2019/20
Subject: 27111 - Organic Chemistry
Faculty / School: 100 -

Degree: 446 - Degree in Biotechnology

ECTS: 6.0
Year: 2
Semester: Second semester
Subject Type: Compulsory
Module: ---

1.General information

1.1.Aims of the course

1.1 The course respond to the following approaches and objectives:
1. To provide the student with the set of fundamental tools in Organic Chemistry (structural knowledge of the different organic families and their basic reactivity, stereochemical implications of the products and reagents) in order to understand the biochemical processes from the molecular point of view.
2. To contribute to the creation in the student of a clear conscience about the importance of Organic Chemistry in the transformation processes carried out by living beings in isolated systems or in their cellular or tissue environments, which may allow them, not only interpret the processes, but also design the appropriate modifications to develop applications.

1.2.Context and importance of this course in the degree

The subject of Organic Chemistry aims to provide students with an overview of organic compounds, the chemical processes in which they participate and their application to the understanding of biological processes. Organic Chemistry is fundamental to understand the matters related to the interaction between chemistry and biochemical processes.

1.3.Recommendations to take this course

It is fundamental to review the knowledge acquired in the aforementioned subject, in terms of the basic nomenclature of Organic Chemistry, distinction of functional groups or practical aspects of basic manipulations in the laboratory and in terms of a safe way of working in the laboratory. The usual attendance to the classes as well as the continued study of the subject is fundamental to facilitate the understanding of it.

2.Learning goals

2.1.Competences

The student will demonstrate knowledge of the association between the structure, bonding, reactivity and stability of organic molecules.

The student will demonstrate knowledge of the classification, composition and behavior of families of carbon compounds

The student will demonstrate knowledge of using the International Union of Pure and Applied Chemistry (IUPAC) rules for nomenclature

The student will demonstrate knowledge of the spatial arrangement, properties and reactivity of stereoisomers

The student will demonstrate an extension of their knowledge of thermodynamic chemical principles

The student will demonstrate knowledge of kinetic chemical principles

The student will demonstrate knowledge of the types of reactions that classes of organic compounds undergo

The student will demonstrate knowledge of using curved arrows to establish the process, stereochemistry and regiochemistry by which organic reactions occur

The student will demonstrate knowledge of organic synthesis

2.2.Learning goals

- Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories in Organic Chemistry.
- Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.
- Students will be able to clearly communicate the results of scientific work in oral, written and electronic formats
- Students will appreciate the central role of Organic Chemistry in the Biotechnology area
- Students will be able to explain why Organic Chemistry is an integral activity for addressing biotechnological problems.
- Students will be able to function as a member of an interdisciplinary problem solving team.

2.3.Importance of learning goals

The purpose of the Organic Chemistry Course is to provide the key knowledge base and laboratory resources to prepare students for the correct use of Organic Chemistry concepts ini the framework of their Biootechnology-oriented careers as professionals.

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

EVALUATION ACTIVITIES (1st call)

Problems resolution: 5%

Laboratory: 5%

Wirtten quiz on nomenclature and basic concepts: 10%

Writen final exam: 80%

2nd CALL

GLOBAL EXAM: 100%

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as: lectures and practice sessions. The students are expected to participate actively in the class throughout the semester. Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, as well as other learning resources such as news related with Biotechnology. Further information regarding the course will be provided on the first day of class.

4.2.Learning tasks

The course includes the following learning tasks: ? Lectures: (3.5 ECTS). It is based in the acquisition of basic knowledge on Organic Chemistry. This activity is developed in 35 hours. ? Practice sessions: (1.9 ECTS). The lectures devoted to solve problems in practical cases which could be developed individually or in groups depending on the proposed case. It is compulsory the participation of the students. It is also fundamental the correct interpretation of the experimental results. (0.6 ECTS). ? Tutorials: The particular questions could be solved in tutorial activities in both individual or small

groups. The material used in the lectures as well as some complementary resources will be available to the student in the Digital Teaching Ring. Some activities devoted to solving problems and practical questions could be developed in small groups. This activity will involve 19 hours.

4.3.Syllabus

BASIC CONCEPTS OF ORGANIC CHEMISTRY.

INTRODUCTION

CLASIFICATION AND NOMENCLATURE OF ORGANIC COMPOUNDS. FUNCTIONAL GROUPS

CHEMICAL BONDING IN ORGANIC COMPOUNDS

STEREOCHEMISTRY. Concepts of conformation and configuration in organic molecules. Geometrical isomerism. Optical isomerism. Conformational analysis

CHARACTERIZATION OF ORGANIC COMPOUNDS. SPECTROSCOPIC METHODS

STRUCTURE, REACTIVITY AND ORGANIC TRANSFORMATIONS. Classification of organic reactions. Reaction mechanisms. Intermediates. Carbocations. Carbanions. Radicals. Carbenes. Thermodynamics and kinetics of organic reactions. Acidity and Basicity. Nucleophilicity and Electrophilicity

REACTIVITY OF ORGANIC COMPOUNDS.

CARBONYL GROUP I. Nucleophilic additions to the carbonyl group. Aldehydes and Ketones.

CARBONYL GROUP II. Nucleophilic substitution on the carbonyl group. Carboxylic acids and derivatives.

NUCLEOPHILIC SUBSTITUTIONS ON SATURARED CARBON. Alkyl halides. Alcohols.

ELIMINATION REACTIONS. Alkenes and Alkynes.

ELECTROPHILIC ADDITIONS TO UNSATURATED SYSTEMS

ADDITIONS TO CONJUGATED SYSTEMS

SUBSTITUTIONS ON UNSATURATED CARBON. Aromatic systems.

OXIDATION AND REDUCTION REACTIONS

PERICYCLIC REACTIONS. Rearrangements.

BIOORGANIC CHEMISTRY.

Contents associated to this section will be treated in the corresponding above-mentioned chapters by using particular examples closely related with biotechnology.

4.4.Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the Facultad de Ciencias website https://ciencias.unizar.es/grado-en-biotecnologia

4.5.Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=27111&year=2019