

Organic Chemistry

Calendar: 2nd semester

Contact Hours: T:30,0; TP:30,0; O:7,5

Intended learning outcomes of the curricular unit:

The objectives for students are: to become familiar with formulas, structures, nomenclature and concepts in the field of organic chemistry; to recognize the importance of a given molecule, the role and distribution of electrons that can intervene in organic reactions; to classify the reactions of organic compounds; to understand the chemical reactions and justify mechanistically these reactions. Apply the knowledge of the reactivity of different functional groups in order to obtain new compounds; to acquire the concept of geometry of molecules in space associated with the study of stereochemistry. It is intended that students acquire skills to access profession as chemical or biological engineering professionals in the chemical or biological in general and particularly in the pharmaceutical, agrochemical, food and biochemistry, or related fields, and in public services.

Syllabus:

1. Introduction: Functional groups and IUPAC rules. Basic concepts. 2. Alkanes and cycloalkanes: Introduction. Conformational analysis. Reactions. 3. Stereochemistry: Chirality e symmetry. Configuration specification. Optical activity e Racemic mixture. 4. Alkyl halides: Introduction. Nucleophilic substitution reactions. Elimination. 5. Alkenes and alkynes: Introduction. Hydrogenation and addition reactions. Conjugated dienes. Resonance - addition. Polymerization. 6. Aromatic compounds: Aromaticity. Properties and stability. Electrophilic substitution - Mechanism and substituents. 7. Carbonyl and carboxyl compounds: a) Aldehydes and ketones. Introduction. Reactions. b) Carboxylic acids. Reactions. Carboxylic acids derivatives and their reactions. 8. Compounds of biological relevance

Demonstration of the syllabus coherence with the curricular unit's intended learning outcomes.

The main goal of this curricular unit is to allow the student to acquire organic chemistry basic knowledge that is essential for a biotechnological course, since the contents is expected to be focus in biological activities, in which an important part is related with organic chemistry. The curricular unit is structured in such a way that complexity of the theoretical contents is progressively increased throughout the semester. 2nd chapter starts with the simpler organic compounds, such as saturated hydrocarbon, alkane and cycloalkane.

In 3rd chapter stereochemistry and quiralilty are presented, being these fundamentals subjects for the analysis of biological processes, such as the industrial processes involving enzymes which are frequently stereoselectives.

Chapters 4th and 6th refers to more complex hydrocarbon, such as the unsaturated and halogenated ones, which are essential in several organic industries, since they are frequently precursors for organic synthesis and for some pharmaceutical industry.

Throughout the lecture of this curricular unit the compounds and organic functions studied are increasingly more complex, either with the presentations of aromatic compounds in chapter 7th or in the carbonyl and carboxyl compounds lecture in chapter 8th. These last ones are essentials to understand the many biological processes, such as fermentation, esterification, and others.

In chapter 9th integration of the previous knowledge will be made by introducing some compounds with important biological relevance, being these one of the most important goals in this curricular unit, which is a basic knowledge for others curricular units in the biochemistry area. It must be stated that chapter 5th consists of an introduction to several methods for organic compounds identification, such as RMN, IV and UV-Visible. These techniques are commonly used in organic chemistry, pharmaceutical, biological and food industries. Sometimes these techniques are used as control method of industrial processes.

Teaching methodologies (including evaluation):

In theoretical classes fundamental concepts are exposed. Illustrative applications of these concepts are solved. In theoretical/practical classes, students solve application exercises individually.

Evaluation: (a) Final examination with a minimum of 9.5 values (0 to 20 values) and 100% weight in the final evaluation (b) Two written tests with a minimum of 8.5 values for each (0 to 20 values), occurring at the middle and at the end of the semester, respectively. The average grade must have a minimum of 9.5 values (0 to 20 values) and 100% weight in the final evaluation. In the same semester there is a laboratory associated curricular unit in which the students will perform several experimental works that will exemplify the thermodynamics principles applications.

Demonstration of the teaching methodologies coherence with the curricular unit's intended learning outcomes.

The main goal of this curricular unit is to allow the student to acquire organic chemistry basic knowledge that is essential for a biotechnological course, since the contents is expected to be focus in biological activities, in which an important part is related with organic chemistry.

For these basic contents to be correctly acquired by the students, it must be teaches in a solid and consistent approach. For that purpose it is necessary that basic concepts, which are innumerous in organic chemistry, be properly explained. Consequently, it is essential that in theoretical classes' the fundamental concepts are exposed.

The acquired knowledge can be consolidate by solving relevant amount of practical problems, either by the teacher or by the student, which is a very important reason for the presence of significant number of practical classes. Finally, the concepts consolidation can be made through laboratorial experiments, results analyses and reports. This fundamental part is achieved in the laboratory curricular unit occurring in the same semester.