

Organic Chemistry

Calendar: 2 nd semester

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

Scientific Area: Química

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 engineering professionals in the chemical or biological in general and, in particular, 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. Spectroscopic Methods: ¹H-RMN, IV e mass spectrophotometry. Limitations and applications.
6. Alkenes and alkynes: Introduction. Hydrogenation and addition reactions. Conjugated dienes. Resonance - addition. Polymerization.
7. Aromatic compounds: Aromaticity. Properties and stability. Electrophilic substitution – Mechanism and substituents.
8. Carbonyl and carboxyl compounds: a) Aldehydes and ketones. Introduction. Reactions. b) Carboxylic acids. Reactions. Carboxylic acids derivatives and their reactions.

Demonstration of the syllabus coherence with the curricular unit's objectives

The main goal of this curricular unit is to allow the student to acquire organic chemistry basic knowledge, to acquire a solid formation and skills in an area of great importance and application at the industrial level.

In this sense, the syllabus is structured so as to focus the basic concepts of organic chemistry: in the beginning, focusing on the structure of organic compounds, main functional groups and nomenclature rules, and henceforth, with a gradual increase in complexity, focusing on each of the main groups of organic compounds, their properties and reactivity (synthesis and reactions they perform), thus describing the general organic reaction mechanisms (substitution, elimination, addition). The syllabus further focuses on spectroscopic tools to analyse and identify organic compounds, and on the geometry and stereospecificity typical of organic compounds.

Teaching methodologies

Theoretical contents will be presented to the students by means of informatic support – power point slides, that will be made available to the students. In practical classes series of exercises relating to the theory will be solved in class. Other works, namely the elaboration of summary tables will be proposed to be done by the students, as autonomous work, as a means of studying and consolidating concepts.

Demonstration of the coherence between the teaching methodologies and the learning outcomes.

The main goal of this curricular unit is to allow the student to acquire organic chemistry basic knowledge, and to acquire a solid formation and skills in an area of great importance and application at the industrial level.

For these basic theoretical contents to be correctly acquired by the students, they need to be taught in a solid and consistent manner, hence, it is necessary that basic concepts, which are innumerable in organic chemistry, be properly explained. Consequently, it is essential that the fundamental concepts be exposed in theoretical classes.

The acquired knowledge can be consolidated by solving a relevant amount of practical problems, either by the teacher or by the student, which is a very important reason for the presence of practical classes.

Another strategy to consolidate concepts is the elaboration of works outside of the classroom, that have the purpose of supporting study and apprehension of some of the theoretical concepts. These works, namely the preparation of summary tables of parts of the syllabus that need to be strongly memorized, e.g. nomenclature rules, are done by the students as autonomous work.

Finally, the consolidation of concepts can be made through laboratorial experiments, analyses of results and elaboration of reports. This fundamental part is achieved in the laboratory curricular unit occurring in the same semester (Laboratories II).