

Course Unit	Organic Chemistry	Field of study	Chemistry
Bachelor in	Pharmacy	School	School of Health
Academic Year	2022/2023	Year of study	1
Type	Semestral	Semester	2
Level	1-1	ECTS credits	5.0
Code	9549-644-1206-00-22		
Workload (hours)	135	Contact hours	T - TP 22,5 PL 30 TC - S - E - OT 7,5 O -

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s) Maria Alice Silva Pinto, Miguel José Rodrigues Vilas Boas

### Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:

1. Plan and execute experiments in a laboratory of organic chemistry.
2. Acquire the basic principles of chemical structure and bonding to understand the chemistry of the carbon compounds.
3. Recognize the families of hydrocarbons and the main functional groups; - Acquire and apply the concepts of structure and nomenclature of organic compounds.
4. Recognize the aspects that determine the reactions characteristics in organic chemistry; - Know the chemical and physical properties for the various families of organic compounds.
5. Know the typical methods used for the preparation of the different organic compounds.
6. Acquire the concepts to identify the spatial relationships between atoms and molecules.
7. Apply the concepts of chemistry in health sciences.
8. Implement and manage work independently and in groups.

### Prerequisites

Before the course unit the learner is expected to be able to:

1. Recognize de structure and atomic properties.
2. Nomenclature of inorganic compounds .
3. Fundaments of chemical equilibrium.

### Course contents

- Introduction and general principles of organic chemistry - Classification and nomenclature of organic compounds - Alkanes and cycloalkanes - Stereochemistry - Alkenes - Alkynes - Aromatic

### Course contents (extended version)

1. Introduction and general principles of organic chemistry
  - Evolution of organic chemistry and its importance in health sciences.
  - Structure and properties of carbon compounds Hybridization and geometry.
  - The connections and interconnections in organic compounds: variability in physical properties.
  - Isomery. Electronic effects: inductive and resonance effect.
2. Classification and nomenclature of organic compounds.
  - General aspects in the mechanisms of organic reactions.
3. Alkanes and cycloalkanes
  - Structure, conformations and physical properties.
  - Synthesis : oxidation, pyrolysis and halogenation reactions.
4. Stereochemistry.
  - The chirality in biological world. Enantiomers. Asymmetric carbon. Symmetry in achiral structures.
  - Notation R and S. Physical properties of enantiomers.
  - Molecules with two or more chiral centres. Resolution of enantiomers.
5. Alkenes
  - Structure, physical properties and conformations (isomers Cis/Trans and E/Z).
  - Preparation of alkenes by elimination reactions: mechanisms E1 and E2.
  - Addition reaction in alkene: hydration, halogenation, polymerization. Oxidation reactions: ozonolyse
  - Alkenes of natural origin. Structure and classification of terpenes: beta-carotene and vitamin A.
6. Alkynes
  - Structure and physical properties: acidity of alkynes.
  - Syntesis reactions: elimination and alkylation Reactivity: Addition reactions. Keto-enol equilibrium
  - Application of alkynes in the fight against cancer. Preparation of pheromones.
7. Aromatic compounds
  - Structure and physical properties: the aromaticity.
  - Electrophilic aromatic substitution reactions. Heteroaromatic hydrocarbons and polycyclic compounds.
8. Contents for practice sessions
  - Elemental analysis of organic compounds
  - Synthesis and characterization of ethene
  - Reactivity of aldehydes and ketones
  - Syntesis and purification of an organic compound
  - Meelting point evaluation
  - Reactivity of alcohols and esters

### Recommended reading

1. R. Morrison, R. Boyd; (2011). Química Orgânica (16ª Edição). Lisboa: Fundação Calouste Gulbenkian.
2. T. W. G. Solomons, C. B. Fryhle, S. A. Snyder; (2018). Química Orgânica (12ª edição). Rio de Janeiro: LTC Livros Técnicos e Científicos Editora Lda.
3. W. Brown, B. L. Iverson, E. Anslyn, C. S. Foote; (2018). Organic Chemistry, 8th Edition, Cengage Learning.
4. D. L. Pavia, R. G. Engel, G. S. Kriz, G. M. Lampman; (2009), Química Orgânica Experimental, 2ª Edição, Bookman
5. M. S. Heather, (2012). Basic Organic Chemistry for Allied Health Students. CreateSpace Independent Publishing Platform

### Teaching and learning methods

- Theory - One lesson per week of 2 hour. Interactive approach, using audiovisual materials. Study materials available via e-learning. - Practical classes - 1 lesson of 2 hours per week. Integration of knowledge with the resolution of nomenclature exercises. Performance of practical work, with educational and scientific laboratory equipment.

**Assessment methods**

1. Continuous evaluation - (Regular) (Final)
  - Laboratory Work - 12% (Student performance in the execution of practical experiments and small quizzes about the protocols.)
  - Intermediate Written Test - 9% (Written essay on the organic nomenclature)
  - Intermediate Written Test - 9% (Written essay on the results of practical experiments)
  - Final Written Exam - 70% (Written essay on the content of the theory-practical lessons.)
2. Special evaluation - (Regular) (Supplementary, Special)
  - Final Written Exam - 100% (This exam comprise questions about the practical experiments (30%) and the theoretical subject (70%))
3. Working students - (Student Worker) (Final, Supplementary, Special)
  - Final Written Exam - 100% (This exam comprise questions about the practical experiments (30%) and the theoretical subject (70%))

**Language of instruction**

Portuguese, with additional English support for foreign students.

**Electronic validation**

Maria Alice Silva Pinto, Miguel José Rodrigues Vilas Boas	Olívia Rodrigues Pereira	Ana Maria Nunes Português Galvão	Adília Maria Pires da Silva Fernandes
03-03-2023	27-03-2023	28-03-2023	28-03-2023