



Course Specifications

Valid as from the academic year 2015-2016

Organic Chemistry 1: Structure and Reactivity (O000082)

Course size (nominal values; actual values may depend on programme)

Credits 5.0 **Study time** 150 h **Contact hrs** 60.0 h

Course offerings and teaching methods in academic year 2016-2017

A (semester 1)	lecture	30.0 h
	practicum	20.0 h
	guided self-study	10.0 h

Lecturers in academic year 2016-2017

Heynderickx, Philippe LA07 lecturer-in-charge

Offered in the following programmes in 2016-2017

	crdts	offering
Bachelor of Science in Food Technology	5	A
Joint Section Bachelor of Science in Environmental Technology, Food Technology and Molecular Biotechnology	5	A
Bachelor of Science in Environmental Technology	5	A
Bachelor of Science in Molecular Biotechnology	5	A

Teaching languages

English

Keywords

Organic chemistry

Position of the course

After a short introduction to the relevance of organic chemistry and its daily applications the necessary terminology on chemical bonding is given. The nomenclature of the most conventional organic molecules is given with attention to their physical and chemical properties. Next, the molecular structure of carbon bonds and isomerism phenomena are discussed. The central part of the course comprises the study of different mechanisms of chemical reactions, which are linked to functional groups. Electrophilic addition reactions and electrophilic aromatic substitution reactions are studied as well as the basics of nucleophilic substitution reactions, S_N1 and S_N2 , and elimination reactions E1 and E2. Hereafter, the stability of organic compounds, intermolecular reactions and interactions and the general theory of acids and bases are addressed. During the theory of 'Organic Chemistry I' a few lights are shed on specific and typical reaction mechanisms for synthesis but, however, the main emphasis on mechanistic synthesis will be situated in 'Organic Chemistry II', i.e., after all the basic but crucial and necessary knowledge is absorbed and well understood during 'Organic Chemistry I'. The course 'Organic Chemistry I' also pays attention to typical separation techniques and identification techniques, such as chromatography and spectroscopy. This supports the practical sessions in the determination of (possible) reaction products and it links practice (laboratory) with theory (chemical structures). Students are further trained through practical sessions, in which the reactivity of organic compounds is illustrated by means of appropriate (theoretical) exercises and selected laboratory activities, in which chemical reactivity can be understood and interpreted by application of the reaction mechanisms, discussed in the theory.

Contents

1. Theory:
 - Introduction
 - Terminology (orbitals, bonding, Lewis structure, resonance, ...)
 - Reactive intermediates (carbocation, carbanion, radical, ...)

- Nomenclature (alkanes, cycloalkanes, alkenes, alkynes, aromatic compounds, alcohols, ethers and epoxides, aldehydes and ketones, carboxylic acids and derivatives, amines quaternary ammonium compounds, heterocyclic compounds,
- Physical and chemical properties
- Stereoisomerism and chirality, conformations of alkanes
- Alkenes and alkynes: reactions (addition reactions, Markovnikov, hydroboration)
- Aromatic compounds (electrophilic substitution reactions in five- and six-membered rings)
- Substitution and elimination reactions (S_N1 and S_N2 ; E1 and E2)
- Stability of organic compounds
- Intermolecular reactions
- Solutions: acids and bases
- 2. Practical sessions
- Theoretical exercises
- Theoretical introduction to safety and toxicology
- Theoretical explanation of the different experiments (reactions, mechanisms, safety)
- Theoretical introduction into chemical identification methods (NMR, IR, MS, UV)
- Extraction of chlorophyll from grass (separation technique)
- Distillation of alcohol from wine (separation technique)
- Synthesis of adipic acid (dicarboxylic acid)
- Synthesis of methyl-m-nitrobenzoate

Initial competences

Secondary school chemistry.

Final competences

Knowledge

Concepts: nomenclature, molecular structure of C bonds, electrophilic addition reactions, electrophilic aromatic substitution reactions, nucleophilic substitution reactions, elimination reactions, stability of organic compounds, acid and bases.

Insights: relevant link between organic chemistry and everyday's life and agrochemical life, detailed notion in organic molecules, with their elements, bonds, steric structure, stability, mutual interaction; elaboration of reaction mechanisms; interpretation of physical and chemical properties of functional groups; good knowledge of chemical reactivity.

Skills

Methods: experience in organic chemistry laboratory, handling of organic compounds (safety), knowledge of safety principles, performing simple experiments and purification methods.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Guided self-study, lecture, practicum

Learning materials and price

Syllabus 'Organic Chemistry I and II' by Prof. Heynderickx.

References

Hart H., Hadad C. M., Craine L. E., Hart D. J. Organic Chemistry, A Short Course, 13th edition. Houghton Mifflin Company.
References in Syllabus

Course content-related study coaching

Evaluation methods

end-of-term evaluation and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Written examination with open questions, written examination with multiple choice questions

Examination methods in case of periodic evaluation during the second examination period

Examination methods in case of permanent evaluation

Job performance assessment, report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible in modified form

Calculation of the examination mark

Written examination with open questions and multiple choice questions (50 + 20%)

Lab reports: 20%

Performance assessment (practical + attitude): 10%