KD1270 Organic Chemistry, Basic Concepts and Practice 2 7.5 credits

Organisk kemi, grundläggande koncept och praktik 2

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Course syllabus for KD1270 valid from Spring 2015

Grading scale

A, B, C, D, E, FX, F

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

KD1230 Organic chemistry, basic concepts and practice, or equivalent

Knowledge equivalent to course contents of the first 7 periods of the Engineering Chemistry or Biotechnology programs at KTH

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After completion of the course, the student should be able to:

- combine the course material with previous knowledge of organic chemistry, and thereby account for basic organic chemistry in its entirety
- describe and classify the main organic reaction types
- describe the basics of synthetic radical chemistry
- describe the reactivities and basic synthesis methods for common functional groups
- describe the concepts of conjugation, aromaticity and pericyclic reactions
- describe the reactivities and synthesis methods regarding conjugated systems
- describe basic organometallic chemistry
- describe the reactivities and synthesis methods in aromatic synthetic chemistry
- account for the structures and properties of carbonyl compounds and their analogs
- describe the reactivities and synthesis methods for carbonyl compounds and their analogs
- describe the concepts of oxidation and reduction, as well as oxidative and reductive synthesis methods
- describe specific synthesis methods in natural product chemistry
- account for structural analysis using applied 1D- and 2D NMR spectroscopy
- explain the connections between organic chemistry and biochemistry, and explain basic biological processes from an organic chemistry perspective
- explain the connections between organic chemistry and polymer chemistry, and explain basic polymerization processes from an organic chemistry perspective
- explain the connections between organic chemistry and environmental chemistry, and explain basic environmental processes from an organic chemistry perspective

After completion of the project, the student should be able to:

- analyze and evaluate organic chemical reactions and processes from a sustainable development perspective based on the principles and methods of the green chemistry concept
- search for information in databases of the chemical literature from a green chemistry perspective
- extract relevant information from the chemical literature
- summarize and process the extracted information in a written report

After completion of the laboratory course, the student should be able to:

- combine the course material with previous knowledge of organic chemistry and thus master the basic laboratory and analytical techniques in their entirety

- perform advanced laboratory techniques: enhanced synthesis methodology, green chemistry, multistep synthesis, chromatography
- analyze compounds and reaction outcomes with NMR spectroscopy, IR spectroscopy and gas/liquid chromatography

Course contents

The course is designed to provide a continued introduction to organic chemistry as a complement to the course Organic Chemistry, basic concepts and practice (KD1230). The emphasis is on imparting good understanding of organic chemical principles and reactions and provide sufficient knowledge to be able to absorb higher courses in organic chemistry, biochemistry / biotechnology, polymer chemistry / polymer technology, environmental chemistry / environmental engineering, etc.

- Basic concepts - Part 2
- Models for estimation of reactivities: frontier orbital theory / hard-soft acid-base concept
- Reaction types
- Radical chemistry
- Conjugation and aromaticity
- Conjugated systems and aromatic substances, structure and reactivity
- Pericycliska reactions
- Basic organometallic chemistry
- Oxidation and reduction
- NMR spectroscopy
- Carbonyl compounds and analogous substances
- Carboxylic acids, their derivatives and analog compounds
- Reactivity and synthetic methods for common functional groups
- Basic natural product chemistry
- Organic chemistry related to biochemistry
- Organic chemistry related to polymer chemistry
- Organic chemistry related to environmental chemistry
- Green and sustainable organic chemistry
- Information retrieval in SciFinder and Reaxys
- Basic laboratory techniques: green chemistry, multistep synthesis, chromatography, spectroscopy

Course literature

- Clayden, Greeves, Warren: Organic Chemistry, Oxford University Press, Oxford, 2012, ISBN 978-0-19-927029-3

- Säkerhetskompendium, Skolan för Kemivetenskap, KTH

• Laborationskompendium, Organisk kemi, KTH

Examination

- PRO1 - Project, 1.5 credits, grading scale: P, F
- TEN1 - Written exam, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Practice, 3.0 credits, grading scale: P, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.