KD1230 Organic Chemistry, Basic Concepts and Practice 6.0 credits

Organisk kemi, grundläggande koncept och praktik

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

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

Establishment

Course syllabus for KD1230 valid from Spring 2020

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Language of instruction

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

Intended learning outcomes

After passing the course the student should be able to:

- describe and analyze basic organic reactions and their mechanisms
- apply the concept of “green chemistry”
- reproduce basic chemical synthetic procedures and analyzes
- apply basic spectroscopic methods for structural analysis of organic compounds

Course contents

The course objective is to provide a strong introduction to organic chemistry in terms of structure and reactivity, practical synthetic work and green chemistry. The course also provides a solid base for further specialization in organic chemistry.

Short course description:

- Nomenclature
- Conformation/configuration
- Reaction mechanisms
- Frontier molecular orbital theory
- Proton transfer/pKa
- Substitution/elimination
- Addition reactions
- Green chemistry

Detailed course description:

- applying the organic chemistry language, e.g. describe organic structures graphically, naming organic compounds according to the IUPAC nomenclature, give trivial names for some common compounds and describe the three- dimensional structure of organic compounds graphically and according to CIP nomenclature.
- identifying and ranking nucleophiles, electrophiles, acids and bases in a chemical reaction.
- how acid/base equilibrium/pK /proton transfer influence the outcome of a reaction.
- electron (arrow) pushing to describe reaction mechanisms.
- frontier molecular orbital theory to categorize which orbitals that are HOMO and LUMO in organic molecules and apply these to determine the outcome of a reaction.
- based on reaction conditions predict if a reaction proceeds through a SN1, SN2, E1 or E2 mechanism and explain the stereochemical and regiochemical outcome. Inversely, describe reaction conditions to control a reaction so that it proceeds via a SN1, SN2, E1 or E2 mechanism.
- an organic compound’s stereochemistry to determine its conformation and reactivity.
- the reaction mechanism and the stereo- and regiochemical outcome of additions of electrophiles to alkenes.

- the concept of green chemistry and its application in organic chemistry and how this can apply for sustainable development.
- basic spectroscopic methods (NMR) for structural analysis of organic compounds.
- risk analysis and safety assessment of an organic chemical reaction process and understand the safety precautions required for laboratory work.
- turning a recipe into a complete synthesis, which includes setting up the reaction, do work up and purification of the desired compound by means of extraction, distillation and crystallization.
- structure determination of organic compounds using the most common analytical methods (melting point, NMR, IR)
- basic synthesis planning, which includes extracting relevant information from organic chemistry databases, design and execute an organic reaction process and report the result.

Specific prerequisites

Basic eligibility and special eligibility are required in Mathematics course E, Physics course B, Chemistry course A. In each and every of these subjects, the lowest accepted grade is passed or 3.

Examination

- LAB1 - Laboratory Work, 3.0 credits, grading scale: P, F
- TEN1 - Written exam, 3.0 credits, grading scale: A, B, C, D, E, FX, 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.

Other requirements for final grade

Passed examination (TEN1) and passed laboratory work (LAB1)

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.