



# KD1090 Organic Chemistry 1 7.5 credits

Organisk kemi 1

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

## Establishment

Course syllabus for KD1090 valid from Autumn 2011

## Grading scale

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

## Education cycle

First cycle

## Main field of study

Chemistry and Chemical Engineering, Technology

## Specific prerequisites

Completed upper secondary education including documented proficiency in English corresponding to English A. For students who received/will receive their final school grades after 31 December 2009, there is an additional entry requirement for mathematics as follows: documented proficiency in mathematics corresponding to Mathematics A.

And the specific requirements of mathematics, physics and chemistry corresponding to Mathematics E, Physics B and Chemistry A.

# Language of instruction

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

## Intended learning outcomes

### Course objectives for the theoretical part

The student who has achieved a pass grading in the exam is expected to master the following:

- Name organic compounds according to the IUPAC nomenclature
- Know the trivial names for common organic compounds
- Draw bond line formulas for a given organic compound
- Graphically visualize organic reactions with correct reaction mechanisms
- Show how rotation around single bonds interconverts conformations and discuss the related energetics in a qualitative manner
- Describe how organic compounds extend in three dimensions and the consequences thereof and discuss this three-dimensional behavior with concepts such as chirality, enantiomer, absolute configuration, diastereomer and meso form
- Recognize how some organic compounds as pharmaceutical active ingredients (API) in some important drugs influence health of individuals and economy for companies and the society
- Use the concepts nucleophile and electrophile in order to explain the reactivity and the role of reactants in a chemical reaction
- Use a simplified molecular orbital concept to identify HOMO and LUMO of organic molecules
- Rank different HOMOs and LUMOs for nucleophiles and electrophiles depending on their relative energies and thereby establish their relative reactivity order
- Explain the connotation of reaction mechanism arrows within an electrostatic or molecular orbital point of view
- Explain and visualize the stereochemical (and eventual regiochemical) outcome for some common and important organic reactions as  $S_N2$ ,  $E2$ ,  $S_N1$ ,  $E1$ , addition of electrophiles to alkenes and some additions of nucleophiles to a number of representative carbonyl compounds
- Explain how hydrogen bonds may influence reactivity of a given nucleophile
- Explain the very important role of proton transfer in organic chemistry

### Course objectives for the laboratory part

The student who has performed the laboratory part of the course with a pass grading is expected to have acquired knowledge and skill of the following:

- How to perform laboratory work in safe and tidy manner
- How to separate different compounds with respect to their solubility in water and organic solvents depending on pH

- How to turn a recipe to a successfully completed synthesis and understand the chemical principles behind
- How to follow a reaction with help of TLC
- How to purify an organic compound by way of distillation, recrystallization or chromatography
- How to carry through a work-up procedure for a reaction
- How to, in principle, determine structure and how to characterize organic compounds with help of NMR, IR and GC

## Course contents

- Basic principles in organic chemistry
- Structure and reactivity
- Stereochemistry
- Acidity-basicity
- Molecular orbitals
- Structural analysis
- Substitution, elimination
- Addition to double bonds
- Hydroboration
- Alcohols
- Carbonyl chemistry

The laboratory course covers: organic reactions, extraction, distillation, crystallisation, chromatography, NMR, IR.

## Course literature

- A. Burrows, A. Parsons, G.Price; Chemistry 3: Introducing Inorganic, Organic and Physical Chemistry, Oxford University Press, USA, 2009, ISBN10: 0199277893 ISBN13: 9780199277896
- Safety compendium, Organic Chemistry , KTH
- Laboratory compendium, Organic Chemistry , KTH

## Examination

- TEN1 - Examination, 4.5 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Work, 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.

## Other requirements for final grade

Examination (TEN1), 4,5 credits

Laboratory course (LAB1), 3 credits

## 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.