Faculty of Science

KEMM31, Chemistry: Advanced Organic Chemistry - Theory, 7.5 credits

Kemi: Avancerad organisk kemi - teori, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2019-01-21 to be valid from 2019-01-21, autumn semester 2019.

General Information

The course is an elective second-cycle component of a degree of Master of Science (120 credits) in Chemistry.

Language of instruction: English

Main field of studies	*Depth of study relative to the degree requirements*
Chemistry	A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

The aim of the course is to provide students with specialised theoretical knowledge in synthetic organic chemistry and knowledge in physical organic chemistry. The course has a molecular perspective and aims to develop the student's ability to describe the connection between structure and reactivity/physical properties.

Knowledge and understanding

On completion of the course, the students shall be able to

- describe in detail different models of chemical bonding in organic molecules and in organic main-group metal complexes
- account in detail for the connection between structure and reactivity/physical properties

- account for the most common name reactions in organic chemistry
- account for different methods to achieve high selectivity in organic synthesis
- account for different tools to clarify the mechanisms of chemical reactions

Competence and skills

On completion of the course, the students shall be able to

- use kinetic/thermodynamic arguments to analyse the outcome of organic chemical reactions
- use frontier orbital theory and orbital correlation analysis (pericyclic reactions) to understand, describe and analyse organic chemical reactivity
- analyse advanced organic chemical problems using a mechanistic approach
- perform basic retrosynthetic analysis
- plan and evaluate multistep synthesis of organic compounds
- propose and plan methods to examine reaction mechanism for a given chemical reaction

Judgement and approach

On completion of the course, the students shall be able to

- propose and justify synthesis routes and methods based on simple retrosynthetic analysis to solve organic chemical problems
- propose and justify the choice of a reagent for a given synthetic transformation of a given substrate, regarding for example selectivity
- use their subject knowledge in accordance with correct scientific practice to propose and analyse plausible reaction steps to achieve new organic compounds with as efficient synthesis as possible
- use their subject knowledge in accordance with correct scientific practice to examine unknown organic chemical reactions and propose plausible reaction mechanisms

Course content

The course deals with advanced synthesis and basic physical organic chemistry. The topics covered include structure and bonding, reaction mechanisms and synthesis methods. The organic synthesis part makes up two thirds of the course and focuses on methods for creating carbon-carbon bonds and selectivity (chemo-, regio- diastereoselectivity). Basic retrosynthetic analysis is used as an aid throughout the course. New reaction types based on cation, anion, radical and carbene intermediates are described in detail. Basic use of organometallic chemistry in synthesis is addressed briefly. The physical organic chemistry part mainly deals with methods to determine reaction mechanisms. The theory behind the different classes of pericyclic reactions is treated in detail.

Course design

The teaching consists of lectures, exercises and seminars.

Assessment

The assessment is based on a written exam at the end of the course.

Students who fail an assessment will be offered another opportunity for assessment soon thereafter.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass, Pass with distinction.
For a grade of Pass on the whole course, the student must have passed the exam. The grades awarded for the exam are Fail, Pass and Pass with Distinction.

The final grade is determined by the grade for the exam.

Entry requirements

To be admitted to the course, students must meet the general entry requirements for higher education and requirements for English proficiency corresponding to English 6 from Swedish upper secondary school, and have passed 90 credits in science courses including courses equivalent to:

- KEMA20 General Chemistry 15 credits, or KEMA10 General Chemistry 7.5 credits and KEMA12 Inorganic Chemistry- Basic Course 7.5 credits, KEMA01 Organic Chemistry- Basic Course 7.5 credits and KEMA03 Biochemistry- Basic Course 7.5 credits,
- KEMB09 Physical Chemistry- Basic Course 15 credits, and
- KEMB21 Organic Chemistry 15 credits

Students who have obtained the equivalent knowledge by other means may also be admitted to the course.

Further information

The course may not be included in a degree together with KEMM01 Organic Chemistry- Advanced Course 15 credits and KEMM21 Advanced Organic Chemistry 15 credits.

Subcourses in KEMM31, Chemistry: Advanced Organic Chemistry - Theory

Applies from H19

1901 Advanced Organic Chemistry - Theory, 7,5 hp
Grading scale: Fail, Pass, Pass with distinction