



DEPARTMENT OF CHEMISTRY AND MOLECULAR BIOLOGY

KEM021 Basic Chemistry 2, 15 credits

Grundläggande kemi 2, 15 högskolepoäng

First Cycle

Confirmation

This course syllabus was confirmed by Department of Chemistry and Molecular Biology on 2014-03-24 and was last revised on 2019-06-17 to be valid from 2019-07-01, autumn semester of 2019.

Field of education: Science 100%

Department: Department of Chemistry and Molecular Biology

Position in the educational system

The course is classified at the level 0-30 credits for Degree of Bachelor. Alternatively, it can be read as a free-standing course.

The course can be part of the following programmes: 1) Molecular Biology, Master's Programme (N2MBI), 2) Marine Science, Bachelor's Programme (N1MAV), 3) Bachelor's Programme in Earth Sciences (N1GVS), 4) Programme in Pharmacy (F2APP), 5) Marine Science, Master's Programme (N2MAV), 6) Bachelor's Programme in Biology (N1BIO), 7) Environmental Sciences (N2MVN), 8) Bachelor of Science in Environmental Science (N1MVN), 9) Bachelor's Programme in Molecular Biology (N1MBI), 10) Bachelor of Science Programme in Medicinal Chemistry (N1LMK) and 11) Bachelor of Science Programme in Chemistry (N1KEM)

Main field of studies

Chemistry

Specialization

G1F, First cycle, has less than 60 credits in first-cycle course/s as entry requirements

Entry requirements

For admission to the course, completed course KEM011 is required, Basic chemistry 1 (15 credits) or the equivalent knowledge.

Learning outcomes

The aim of course is to give basic theoretical knowledge in organic chemistry and biochemistry as well as much basic experimental proficiencies in these subjects. Knowledge that is necessary for continued studies in chemistry or to the chemistry adjacent fields. Course should furthermore give an increased understanding of chemical reactions and processes that happens in our environment.

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

Knowledge and understanding

- identify and name selected functional groups according to IUPACs nomenclature as well as name selected compounds with trivial names
- identify and categorise basic stereochemical concepts
- define different types of biological macromolecules
- explain relationship between structure and function of proteins
- describe the molecular relationships between catalytic function and structure of enzymes
- account technologies for separation and purifying of proteins
- describe how structures for DNA and RNA lie the molecular information transfer in cell
- explain the structure of biological membrane and their role in biochemical processes.

Competence and skills

- reproduce molecules by means of different structural representations,
- explain and utilise/apply relationship between structure and reactivity
- explain and apply selected reaction mechanisms
- use given basic experimental methods for synthesis, purifying, separation and identification of synthetic products,
- compile laboratory result written in a scientific way.

Judgement and approach

- utilise the chemical literature for risk analyses
- explain and assess meaning of popular articles and scientific reports in the above fields.

Course content

The course consists of 4 modules.

Both in organic chemistry and in biochemistry was attached weight on relationship between compounds' name and structure according to IUPAC:s nomenclature system. In the laboratory sessions (modules 2 and 4) is placed strong emphasis at environment and health risks. The laboratory components illustrate chosen parts of the theoretical contents of course.

Sub-courses

1. **Organic chemistry, theory** (*Organisk kemi, teori*), 4.5 credits

Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)

Module treat chosen functional groups' structure, properties and reactivity. Chosen reactions as well as their use in organic synthesis are concerned. Furthermore, the course up takes some selected reaction mechanisms, such as addition, elimination and substitution. Special focus is placed on stereochemistry and structural representation of organic compounds, such as by means of computer-based drawing programs.

Following compounds categories (functional groups) are treated:

- Alifatic hydrocarbons
- Aromatic compounds
- Alkyl halides
- Esters, epoxides and sulphides
- Alcohol, thiols and phenols
- Amines
- Carbonyl compounds, aldehydes, ketones
- Carboxylic acids and their derivative: esters, amides, acid anhydrides, acid halides and nitriles
- Carbohydrates
- Chosen heterocycles

2. **Organic chemistry, laboratory exercises** (*Organisk kemi, laborationer*), 3 credits

Grading scale: Pass (G) and Fail (U)

The laboratory course in organic chemistry includes basic skills in laboratory technology such as production and purifying of organic compounds.

Practical components that are brought up during the laboratory course are:

- Heating, stirring
- Vacuum, evaporation
- Separation, extraction
- Drying of solutions
- Crystallisation, distillation
- Thin layer chromatography (TLC)
- Melting point, Boiling point

3. Biochemistry, theory (*Biokemi, teori*), 4.5 credits

Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)

The theoretical module in biochemistry give bases to structural biochemistry with a main specialisation in nucleic acids proteins and biological membranes as well as polysaccharides of biological interest. In these contexts are discussed experimental methodology for isolation and characterisation of biological macromolecules. The following subjects are brought up:

- The molecular bases of the stability of macromolecules
- Nucleic acids' structure and general properties, genetic information
- Proteins' structure and function
- Introduction to evolution and bioinformation
- Enzymes' structure, function, kinetics and regulation
- Biological membranes' structure and function
- Glycolipids and lipoproteins
- The structure of polysaccharides

4. Biochemistry, laboratory exercises (*Biokemi, laborationer*), 3 credits

Grading scale: Pass (G) and Fail (U)

This module include gel electrophoretic separation of proteins, protein purification and enzyme kinetics as well as a computer-based structural biochemistry laboratory session.

Form of teaching

Module 1 and module 3: The teaching is given in the form of lectures and assisted problem solving.

Part 2: The teaching includes security test, a number of stated experiments as well as a computer exercise. Attendance at security test as well as at the carrying out the stated experiments is compulsory. In addition should laboratory reports deliver in connection with each laboratory session according to criteria that are presented during course.

Module 4: The teaching includes a number of stated experiments as well as a computer exercise. Attendance at security test as well as at the carrying out the stated experiments is compulsory. In addition should laboratory reports deliver in connection with each laboratory session according to criteria that are presented during course.

Language of instruction: Swedish and English

As principal rule, the course is given in Swedish but can be given completely or partly in English if the circumstances require it.

English-speaking reading list can occur.

Assessment

Part 1: Examination takes place through written subtests that are given during the course and a written examination at the end of module.

Part 2: Examination takes place through compulsory attendance at security test as well as at the carrying out the experiments and through approved laboratory accounts for the stated experiments. Laboratory reports are assessed according to criteria that are presented during the course. Criteria describe content of reports as well as time frames for submission and maximum number audits.

Part 3: Examination takes place through a written examination at the end of module.

Module 4: Examination takes place at the implementation of the experiments and through approved laboratory accounts for the stated experiments. Laboratory reports are assessed according to criteria that are presented during the course. Criteria describe content of reports as well as time frames for submission and maximum number audits.

For students who have not become passed in module 1 or 3 at regular examination session is offered additional examination sessions. For students who have not become passed in module 2 or 4 at regular laboratory session is offered additional occasions on the following course in case of a vacancy.

If student who has failed twice on the same assessing component, examiner renewal want before the next examination session, should the such request submit in writing to department and be approved if there are not special causes on the other hand. (HF 6 chapters section 22)

In cases where a course has been discontinued or has undergone major changes, the student shall normally be guaranteed at least three examination occasions (including the ordinary examination) during a period of at least one year from the last time the course was given.

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

Module 1 and 3: For the grade G, at least 60% of the maximum score is required in the written exam. For the grade VG, at least 75% of the maximum score is required in the written exam..

Module 2 and 4: To pass are required attendance at all compulsory components and at least 50% of the maximum score is required on all laboratory reports.

Final grade: For final grade G on the course, G is required for all modules. For final grade VG on the course, VG on modules 1 and 3 and G on modules 2 and 4 are required

Regarding application of ECTS grading scale, see Vice-chancellor decision 28/05/2007, diary nr G 8 1976/07.

Course evaluation

A course evaluation is done in relation to the intended learning outcomes and content of the course. It is performed at the end of the course through an individual written questionnaire on the virtual learning environment at University of Gothenburg.

A student who participates in or has completed a course should be given possibility to anonymously express experiences of and views in the course in a course evaluation. A compilation of course evaluation and reflections of the responsible teacher should be made available to the students within reasonable time after the end of the course. Next time the course is given the compilation and, if applicable, actions taken should be presented for the students.