



**Karolinska  
Institutet**

Course syllabus for

## **General and Organic Chemistry, 20 credits**

Allmän och organisk kemi, 20 hp

This course syllabus is valid from autumn 2011.

Please note that the course syllabus is available in the following versions:

[Autumn2007](#) , [Autumn2008](#) , [Autumn2010](#) , Autumn2011 , [Autumn2012](#) , [Autumn2013](#)

Course code	1BI000
Course name	General and Organic Chemistry
Credits	20 credits
Form of Education	Higher Education, study regulation 2007
Main field of study	Biomedicine
Level	G2 - First cycle 2
Grading scale	Excellent, Very good, Good, Satisfactory, Sufficient, Fail, Fail
Department	Department of Medical Biochemistry and Biophysics
Participating institutions	<ul style="list-style-type: none"><li>• Department of Physiology and Pharmacology</li><li>• Institute of Environmental Medicine</li></ul>
Decided by	Programnämnden för biomedicinprogrammet
Decision date	2007-06-11
Revised by	Programnämnd 7
Last revision	2011-05-10
Course syllabus valid from	Autumn 2011

## **Specific entry requirements**

Standardised admission requirements E.1.

## **Objectives**

After the course, the student should be able to: - account for the structure of the matter at atomic and molecular levels including stable and radioactive isotopes, and based on the structure be able to derive chemical and physical characteristics - be able to use nomenclature systems for isotope labelling, constitution, conformation and configuration - in organic molecules be able to explain processes and predict final products of simple organic-chemical reactions and be able to suggest reagents and conditions in order to, in one or several steps, convert organic compounds, independently, and with minimised risk and good results be able to perform simple and - in organic-chemical laboratory work - common operations including work with toxic and radioactive chemicals - be able to choose separation and analytical methods for simple chemical issues and be able to interpret simple chromatograms and

analysis spectra, be able to describe risks associated with the use of common chemicals and procedures - be able to write a well-structured and complete report of a completed laboratory session - be able to search and find relevant original, overview and reading list literature concerning organic-chemical issues, and based on this, retrieve information for problem-solving and orally presented overviews - be able to account for the occurrence of, and risks with hormone-disturbing and carcinogenic substances in the environment - be able to interpret classification and labelling of chemicals, and be able to use these with benchmarks and thresholds for risk assessment of laboratory sessions - be able to account for the relationships between structure and pharmacological effect in the most important pharmaceutical groups and their chemical characteristics - be able to account for and in calculations demonstrate the influence of physico-chemical properties on drugs' bioavailability - be able to account for and suggest applications of the principles of modern drug design, and be able to account for the situation of Swedish pharmaceutical industry in general (e.g. in poster format)

## Content

The course contents are oriented towards substances and methods of special biomedical interest and provides a basis for later courses in the program. The course is divided in the following parts: Part 1. Basic chemistry, 2 higher education credits. Atom and molecular structure, chemical binding. Thermodynamics and kinetics, physical properties. Polarity and extraction. Basics of chromatography. Nomenclature. Isomerism, conformations, reaction theory, alkyl halides, alcohol, ethers, substitution, elimination. Part 2. Carbonyl and unsaturated compounds, 3 higher education credits. Alkenes, alkynes, addition. Carbonyl compounds, carbohydrates, carboxylic acids, derivative, acyclic lipids and condensation reactions. IR and UV, chromatography and electrophoresis. Part 3. Organic and bioorganic chemistry, 2 higher education credits. Aromatic compounds with electrophilic substitution. Amines and amino acids, oxidation, reduction, polycyclic and heterocyclic compounds, cyclic lipids, nucleotides and radical reactions and reactive oxygen kind, spectrometric methods (NMR and MS), radioactivity and isotopes. Part 4. Environmental and medicinal chemistry, 1 higher education credit. DNA adducts and carcinogens. Structure and pharmacological effect of the most important pharmaceutical groups and their chemical properties. Bioavailability. Modern drug design. Swedish pharmaceutical industry and principles for drug development. Part 5. Organic-chemical laboratory work, 6 higher education credits. Laboratory technology with laboratory safety. Common methods in organic-chemical and bioorganic synthesis work. Classification and labelling of chemicals, standard values and limits. Laboratory reports. Part 6. Integration of Theory and Practice, 6 higher education credits.

### Basic chemistry, 2.0 hp

Grading scale: GU

### Carbonyl and unsaturated compounds, 3.0 hp

Grading scale: GU

### Organic and bioorganic chemistry, 2.0 hp

Grading scale: GU

### Environmental and medicinal chemistry, 1.0 hp

Grading scale: GU

### Organic-chemical laboratory work, 6.0 hp

Grading scale: GU

Laboratory techniques with laboratory safety. Common methods in organic-chemical and bioorganic synthesis work. Classification and labeling of chemicals, standard values and limits. Lab reports.

## **Integration of theory and practice, 6.0 hp**

Grading scale: AF

## **Teaching methods**

The teaching includes lectures, laboratory sessions, group tuition (seminars), study visits and project works. It is, to a large extent, directed towards problem-solving. The project works are advanced studies in groups, with an emphasis on own work and literature studies.

## **Examination**

Part 1 is graded Fail/Pass and is examined through an written test. Part 2 is graded Fail/Pass and is examined through a written test. Part 3 is graded Fail/Pass and is examined through an written test (voluntary participation). Part 4 is graded Fail/Pass and is examined through a poster presentation from study visits. Part 5 is graded Fail/Pass and is examined through a written test in laboratory safety and techniques, observations of the student's laboratory skills, the first written individual laboratory reports and laboratory reports, written in a group. Part 6 is graded F/Fx/E/D/C/B/A and is examined through a written examination, written individual laboratory reports not examined in part 5, and an oral project work report. For participation in a written examination, it is required that parts 1-3 are approved. For the mandatory tests connected to parts 1 and 2, a session providing a second chance for passing is organized before the written final examination. The course grade is based on the grade of part 6. Compulsory participation Laboratory sessions, project work, study visits and group tuition including practical parts or demonstrations, are compulsory, as well as presentations and lectures linked to these parts. In the course, an examination in laboratory safety and technology must be approved, before the following laboratory sessions. At the beginning of each laboratory session, an oral examination is provided that must be approved before the student starts experimenting. The course director determines if it is possible and if so how the student can compensate possible absence from compulsory parts. Before the student has participated in compulsory parts, or compensated for absence in accordance with the course director's instructions, the current part is not registered in LADOK (student registry). Students who have not passed the regular examination are entitled to participate in five more examinations. If the student is not approved after four examinations, he/she is recommended to apply for a new admission to the next regular course and may, having taken the course a second time, participate in two more examinations. If the student has failed six examinations/tests, no additional examination or new admission in the course is given. As examination sessions, those times are counted when the student participated in one and the same test. Submission of a blank exam is counted as examination attempt. An examination for which the student registered but not participated in, will not count as an examination.

## **Transitional provisions**

Regardless of changes in the contents of the course, and how it is examined, after each course, a total of at least six opportunities are given for tests and a written final examination during a period of at least two years after the end of the course.

## **Other directives**

The teaching is given in Swedish and English. Course evaluation will be carried out in accordance with the guidelines established by the Board of Education. Course council meeting is held with the course coordinator and student representatives.

## **Literature and other teaching aids**

*Berg, Jeremy Mark; Tymoczko, John L.; Stryer, Lubert*

**Biochemistry**

6. ed. : New York, N.Y. : Freeman, cop. 2007 - xxxv, 1026, [86] s.

ISBN:0-7167-8724-5 (inb.) LIBRIS-ID:10124283

[Library search](#)

*Byström, Styrbjörn; Cronholm, Tomas; Rothstein, Susanne*

**Laborationshandledning i organisk kemi för biomedicinprogrammet (kandidat) vid Karolinska Institutet.**

Stockholm : 2008

*Fessenden, Ralph J.; Fessenden, Joan S.; Logue, Marshall W.*

**Organic chemistry**

*Pienta, Norbert J.; Kessler, Robert J.; Young, Paul R.*

6. ed. : Pacific Grove, Calif. ;a London : Brooks/Cole, Grove, Calif. ;a London :b Brooks/Cole,c 1998 - 1170 s.

ISBN:0-534-35199-9 LIBRIS-ID:5037202

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