



## Course syllabus

Faculty of Health and Life Sciences

Department of Chemistry and Biomedical Sciences

1KE009 Allmän kemi, 7,5 högskolepoäng

1KE009 General Chemistry, 7.5 credits

### **Main field of study**

Chemistry, Biomedical Laboratory Science

### **Subject Group**

Chemistry

### **Level of classification**

First Level

### **Progression**

G1N

### **Date of Ratification**

Approved by Faculty of Health and Life Sciences 2018-06-14

The course syllabus is valid from autumn semester 2018

### **Prerequisites**

General entry requirements and Biology 2, Chemistry 2, Mathematics 3b / 3c, Physics 1a/1b1 + 1b2 or Biology B, Chemistry B, Mathematics C, Physics A (Field-specific entry requirements 12/A12).

## Objectives

Module 1. General Chemistry: Theory, 5 credits

The purpose of this module is for students to acquire knowledge and insights in general chemistry.

After completing the module, the student should be able to:

- name and interpret names of simple inorganic substances
- balance chemical reaction formulas and perform stoichiometric calculations
- present the structure and geometry of atoms and molecules at a basic level and describe how these properties affect molecular polarity and substance characteristics using electron configuration, valence shell electron pair repulsion (VSEPR) theory, and valence bond theory
- present the fundamental structure of the periodic table
- draw conclusions about how the position of an element in the periodic table affects its properties
- describe the most important compounds and oxidation states of some common

elements

- explain chemical bonding within and between molecules and ions from a foundational perspective
- describe the properties of gases and their solubility in water
- apply the ideal gas law and Dalton's law of partial pressures
- describe simple chemical equilibria and buffer systems
- perform basic calculations on equilibrium systems in aqueous solutions and in gas phase, including acid-base equilibria, buffer systems, and solubility equilibria
- explain the concept of pH and the fundamental properties of acids and bases
- use the thermodynamic concepts of enthalpy, entropy, and Gibbs free energy, and explain energy transformations in chemical reactions and their connection to equilibrium
- perform simple thermodynamic calculations.

#### Module 2. Laboratory Work and Statistics, 2.5 credits

The purpose of this module is for students to develop fundamental laboratory skills.

After completing the module, the student should be able to:

- perform a simple risk analysis
- statistically analyse measurement results by calculating measures of central tendency and dispersion and perform regression analysis using Excel or equivalent software
- conduct hypothesis testing using t-tests and Grubbs tests
- plan, execute, and document chemical experiments
- process, critically interpret, and present in writing the results of simple chemical experiments.

### Content

#### Module 1. General Chemistry: Theory, 5 credits

This module includes the following components:

- inorganic nomenclature
- reactions in aqueous solutions, redox reactions, stoichiometry
- atomic structure, atomic orbital theory, quantum chemistry
- the periodic table and the most important oxidation states and compounds of elements
- molecules, hybridisation, chemical bonding (intra- and intermolecular bonding and ionic bonding)
- gases: properties, solubility in water, the ideal gas law, Dalton's law of partial pressures
- chemical equilibrium: Le Chatelier's principle, acids and bases (including the concept of pH), buffer systems, solubility equilibria
- thermodynamics: energy changes in chemical reactions; the relationship between the equilibrium constant and Gibbs free energy.

#### Module 2. Laboratory Work and Statistics 2.5 credits

This module includes the following components:

- basic quantitative analysis methods: titration, pH determination, and spectroscopic techniques (UV/VIS spectroscopy and/or atomic absorption spectrometry)
- statistical analysis of measurement results: measures of central tendency and

- dispersion, and regression analysis using Excel
- hypothesis testing: t-tests, Grubbs' tests.

## Type of Instruction

Teaching is delivered in the form of lectures, exercises, and/or group exercises, as well as laboratory work and preparation for laboratory sessions. Participation in group exercises, laboratory work, and preparation for laboratory sessions is mandatory.

## Examination

The course is assessed with the grades Fail (U), Pass (G) or Pass with Distinction (VG).

Module 1 is examined through diagnostic tests and a written examination, and is assessed using the grades Fail, Pass, and Pass with Distinction. Module 2 is examined through participation in, and written reports on, laboratory work, and is assessed using the grades Fail and Pass.

The grading criteria for the grade of Pass are based on the course objectives (see above).

The first resit examination is offered within six academic weeks.

## Course Evaluation

During or shortly after the course, a course evaluation should be conducted. The result and analysis of the course evaluation should be promptly communicated to the students who have taken the course. Students who are taking the course when it is offered the next time should be informed of the result at the course introduction. The course evaluation is anonymous.

## Required Reading and Additional Study Material

Aylward, G. and Findlay, T. *SI Chemical Data*. John Wiley & Sons, the latest edition, approx. 200 pp.

Rosengren Holmberg, Jenny. 2004. *Grundläggande terminologi och statistik*. Revised by Lindegård, Boel 2014. Available as an electronic resource in the form of a PDF file.

Chang, R and Goldsby, K. *Chemistry*. McGraw-Hill, the latest international edition, approx. 1000 pp.

*Laborationshäfte i Allmän kemi*. Kalmar, Linnaeus University. Available as an electronic resource in the form of a PDF file.