



Faculty of Health, Science and Technology
Chemistry

Syllabus

Introductory Chemistry

Course Code:	KEGA22
Course Title:	Introductory Chemistry <i>Inledande kemi</i>
Credits:	7.5
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has only upper-secondary level entry requirements (G1N)

Major Field of Study:
KEA (Chemistry)

Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2026-02-10, and is valid from the Autumn semester 2026 at Karlstad University.

Prerequisites

General entry requirements plus upper secondary level Chemistry 2 and Mathematics 4, or Chemistry level 2 and Mathematics Further level 2.

Students admitted to the Master of Science Programme in Chemical Engineering at Karlstad University must have completed 15 credits in the programme. An equivalence assessment can be made.

Learning Outcomes

The aim of the course is for students to acquire the basic knowledge and skills required for chemistry-oriented activities and for further science and technology studies.

Upon completion of the course students shall be able to

1. explain the basics of quantum mechanics and apply the Schrödinger equation to simple systems,
2. explain the principles behind the periodic table,
3. use different models to describe chemical bonding,
4. explain key concepts in introductory chemistry,
5. calculate on cubic unit cells,
6. determine the geometry of molecules and decide what intermolecular forces are at work between them and how these affect the properties of the molecule,
7. name ionic compounds containing simple ions and polyatomic ions,
8. act and work safely in a laboratory environment, and
9. plan, carry out, and report chemical laboratory tasks according to instruction and within given time frames.

Content

The course comprises a theoretical module and a laboratory module. Learning outcomes 8 and 9 are only part of the laboratory module while the other components can be addressed in either module.

Learning outcome 1: Basics of quantum mechanics; the Schrödinger equation and its time-independent solution in one dimension, application to the hydrogen atom and the particle in a box, and the interpretation of solutions using quantum numbers.

Learning outcome 2: The periodic table and its background, periods, groups, electron configuration, Pauli principle, Hund's rule, Aufbau principle, trends in the periodic table regarding atom radius, ion radius, ionization energies,

electron affinity, electronegativity, description of the properties of the most common elements.

Learning outcome 3: Chemical bonding; Lewis structures (including resonance structures and formal charge), ionic bonding, covalent bonding, hybridisation, electron sharing, LCAO-MO.

Learning outcome 4: Key concepts; empirical formula, formula unit, dipole moment, band theory, ligand theory, crystal structure, cubic cell unit.

Learning outcome 5: Simple cubic unit cell (sc), body-centred cubic unit cell (bcc), face-centred cubic unit cell (fcc).

Learning outcome 6: Lewis structures, geometry based on electron groups, bonding electron groups and free electron pairs, intramolecular and intermolecular forces.

Learning outcome 7: Nomenclature for ionic compounds and polyatomic ions.

Learning outcome 8: Practical laboratory work and knowledge of the most common equipment in a chemical laboratory.

Learning outcome 9: Laboratory instructions and risk assessments, documentation in lab journals and lab reports.

Reading List

See separate document.

Examination

Assessment of the theoretical module is based on an individual on-campus written exam. The laboratory module is assessed on the basis of a safety test, mandatory attendance, and active participation in laboratory sessions, as well as a lab report according to instructions and within a given time frame.

If students have a decision from Karlstad University entitling them to Targeted Study Support due to a documented disability, the examiner has the right to give such students an adapted examination or to examine them in a different manner.

Grades

One of the grades Pass with Distinction (VG), Pass (G), or Fail (U) is awarded in the examination of the course.

Engineering students are awarded one of the grades Pass with Distinction (5), Pass with Some Distinction (4), Pass (3), or Fail (U).

Quality Assurance

Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate

A course certificate will be provided upon request.

Additional information

The local regulations for studies at the Bachelor's and Master's levels at Karlstad University stipulate the obligations and rights of students and staff.

The course KEGA22 cannot be included in the same degree programme as the courses CBGAM0, CBGAM1, or KEGA21.

The course may include as many as 5 days of mandatory attendance at Karlstad University.