



Faculty of Health, Science and Technology
Chemistry

Syllabus

Matter

Course Code:	CBGAM1
Course Title:	Matter <i>Materia</i>
Credits:	7.5
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has less than 60 credits in first-cycle course/s as entry requirements (G1F)

Major Field of Study:
KEA (Chemistry)

Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2018-02-09, and is valid from the Autumn semester 2018 at Karlstad University.

Prerequisites

45 ECTS credits for the Msc programme in engineering including 15 ECTS credits completed.

Learning Outcomes

The aim of the course is that students develop knowledge of how basic physical principles explain the forms and properties of matter.

Upon completion of the course, students should be able to:

1. describe and discuss the background to the emergence of quantum mechanics and how it is used to describe matter,
2. use different models to describe the atom structure,
3. explain the principles of the periodic system,
4. use different models to describe chemical bonding,
5. determine molecular geometry and the intermolecular forces at work between them and how they affect molecular properties,
6. calculate stoichiometry and mass balance in simple chemical reactions,
7. name ionic compounds with simple and complex ions,
8. behave and act in a safe way in a laboratory environment,
9. Prepare, conduct, and report a chemical lab experiment according to instructions within a given time frame.

Content

Instruction is in the form of lectures, calculation exercises, and mandatory seminars and laboratory

sessions. A further mandatory activity is carried out in conjunction with industry or public agency, for example, a study visit, an authentic seminar project or a guest lecture.

Course content:

- the background to quantum mechanics: photons, matter waves and wave-particle-duality,
- basic quantum mechanics: wave function, Heisenberg's uncertainty principle, the Schrödinger equation and its solution for different potentials,
- application of the Schrödinger equation to the hydrogen atom and particle in box (one dimension) and characterisation of solutions and quantum equations,
- quantum mechanical tunneling through potential barriers,
- structure of atomic nucleus,
- different atom models: for example, Bohr's atom model, Dalton's atom model, Rutherford's atom model,
- the connection between materials electronic structure and properties (e.g. chemical reactivity and interaction with electromagnetic radiation),
- the structure of the periodic system, classification of elements and their properties and occurrence of the most important element groups,
- chemical bonding: ionic bonding and covalent bonding, connection between electronic structure and molecular geometry as described with the Lewis-, VSEPR- and valence-bonding models, molecular orbital theory: the LCAO method,
- the dipole moment in molecules,
- intermolecular forces: hydrogen bond, van der Waal's forces and properties in the solid state, gases and fluids,
- mass balance and stoichiometry in simple chemical reactions,
- laboratory safety,
- apply theories treated to practical lab experiments.

Reading List

See separate document.

Examination

Assessment is based on the following components:

- written exam
- hand-in assignments
- oral presentation and seminar discussions
- attendance at mandatory activities (guest lecture, seminar or study visit)
- safety test
- planning, conducting and reporting lab results within given time frames.

Grades

One of the grades Distinction (VG), Pass (G) or Fail (U) is awarded in the examination of the course. Engineering students are awarded one of the grades 5 (Pass with Distinction), 4 (Pass with Some Distinction), 3 (Pass), or U (Fail).

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 course CBGA02 and CBGAM0 cannot be included in the same degree programme as CBGAM1. The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.