



Faculty of Health, Science and Technology
Chemistry

Syllabus

Physical Chemistry B

Course Code:	KEGBF3
Course Title:	Physical Chemistry B <i>Fysikalisk kemi B</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 2021-09-08, and is valid from the Spring semester 2022 at Karlstad University.

Prerequisites

Registered for 30 ECTS credits in Chemistry, including 7.5 ECTS credits completed, or for students admitted to the Master of Science programme in Engineering with a major in chemical engineering at Karlstad University, registered for 22.5 ECTS credits in Chemistry, including 7.5 ECTS credits completed, or equivalent

Learning Outcomes

The aim of the course is for students to acquire the basic knowledge and skills required to understand the chemistry of macroscopic systems, especially of chemical thermodynamics, and basic knowledge of applied quantum chemistry with a focus on spectroscopy.

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

1. perform calculations of the energy transformation in chemical systems in terms of basic chemical thermodynamics,

2. give an account of central concepts in chemical thermodynamics,
3. calculate equilibrium reactions in chemical thermodynamics,
4. give an account of the difference between ideal and non-ideal systems,
5. describe the foundations of statistical chemical thermodynamics with a link to the equilibrium concept,
6. describe selected molecular interactions and their physical and chemical consequences,
7. give an account of and use selected quantum mechanical models for energy calculations and connections to basic atom and molecular spectroscopy,
8. give an account of processes for excitation from ground state to excited state, and from relaxation to ground state,
9. give an account of chemical bonding from the perspective of quantum chemistry,
10. plan, carry out, and report laboratory work connected to the theory covered in the course, within given time limits,
11. give an oral presentation in front of a group, on a chosen topic relevant to the course, and
12. describe the links between the models presented in the course and the experimental result.

Content

Instruction is in the form of lectures, exercises, laboratory sessions and seminars. Students are expected to study certain units on their own, which means that they have to understand literature written in English. Instruction may take the form of video recordings.

The course comprises two parts which are assessed separately: a theory module and a laboratory module.

The theory module (5 ECTS cr) introduces basic chemical thermodynamics and equilibrium theory from the perspective of thermodynamics, both in relation to phase equilibrium and in relation to electrochemical processes and molecular interactions, especially van der Waals forces. Quantum mechanical models and their connection to basic atom and molecular spectroscopy are treated, as well as basic models of chemical bonding. The theory module provides the theory and calculation basis required for students to reach the learning outcomes.

The laboratory module (2.5 ECTS cr) includes laboratory components and is integrated with the theory module. Attendance is mandatory and active participation required. Access to individual laboratory units requires students to be well prepared through having studied and processed the relevant instructions and applicable parts of the course literature. Passing a safety test is required. Students are only given credit for laboratory work in a current semester if all reports and protocols have been submitted within three weeks of the conclusion of the course. Late submissions will be graded at the earliest convenience, but no later than the next course opportunity.

The laboratory module also includes two mandatory seminars. One seminar allows students to practice processing and analysing data from a laboratory experiment. The other seminar allows students to practice giving an oral presentation in front of a group on a chosen topic relevant to the course. Attendance is mandatory and active participation required for all components in the laboratory module.

Reading List

See separate document.

Examination

Assessment of the theory module is continuous and based on hand-in assignments and a final written exam. The final module grade is a total appraisal of the continuous assessment and the final exam.

Assessment of the laboratory module is continuous and based on laboratory reports as well as active participation in the two mandatory seminars.

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

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 and Master levels at Karlstad University stipulate the obligations and rights of students and staff.

The course KEGBF3 cannot be included in the same degree programme as the courses KEGBF2, KEGBF1, KEGBF0, KEGBFT, KEGBFK or KFK240.

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