Faculty of Science

KEMM77, Chemistry: Advanced Surface and Colloid Chemistry, 15 credits

Kemi: Avancerad yt- och kolloidkemi, 15 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2018-11-23 to be valid from 2018-11-23, autumn semester 2019.

General Information

The course is an elective second-cycle component of a Master of Science (120 credits) degree in Chemistry and a compulsory component of a Master of Science (120 credits) degree in Organizing Molecular Matter.

Language of instruction: English

Main field of studies	*Depth of study relative to the degree requirements*
Chemistry	A1N, Second cycle, has only first-cycle course/s as entry requirements
Organizing Molecular Matter	A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

The aim of the course is to enable students to acquire in-depth physicochemical knowledge in the field of surface and colloid chemistry from a molecular perspective and a quantitative understanding of selected fundamental colloid and interface phenomena.

Knowledge and understanding

On completion of the course, the students shall be able to

- explain the self-association of amphiphilic molecules and the underlying thermodynamics

- explain surface energy and interface phenomena
- explain electrostatic exchange in colloidal systems
- describe the structure and properties of micelles of amphiphilic molecules
- explain different forces between colloidal aggregates and colloidal stability
- describe amphiphilic bilayer systems
- explain the effects of polymers in colloidal systems
- describe colloidal sols
- describe micro and macro emulsions
- explain phase equilibria and describe phase diagrams
- describe a number of applications (primarily biological and technical ones) in which the systems and phenomena mentioned above are central

Competence and skills

On completion of the course, the students shall be able to

- compile and analyse experimental data and summarise them in a written report
- present and discuss research articles in the subject area
- apply conceptual understanding within surface and colloid chemistry in order to understand and explain everyday phenomena to which the above-mentioned systems and phenomena are central

Judgement and approach

On completion of the course, the students shall be able to

- propose qualitative molecular interpretations of properties and phenomena of complex systems in applications
- identify and independently acquire the knowledge required to implement a project in surface and colloid chemistry

Course content

The *theoretical component* (7.5 credits) deals with surface and colloid chemistry from a molecular physicochemical perspective The key topics comprise the self-association of amphiphilic molecules, polymers in colloidal systems, phase equilibria in solutions, interface phenomena, electrostatic exchange in colloidal systems and forces between macro and mesoscopic surfaces separated by a liquid phase.

The *practical component* (7.5 credits) consists of laboratory sessions, computer simulations and a literature exercise. The laboratory sessions deal with key experimental techniques such as QCM (quartz crystal microbalance), calorimetry, AFM (atomic force microscopy) and experimental studies of colloidal stability in milk. The computer simulations concern polymers and electrostatic phenomena in colloidal systems. The literature exercise includes literature searches in a database, oral presentation of a research article and participation in discussions at the oral presentations

Course design

The teaching consists of teacher-directed sessions, which presuppose that the student has prepared the material in the textbook in advance and make use of computer-based learning activities, computer exercises and laboratory sessions. Compulsory participation is required in the literature exercise, computer exercises, laboratory sessions and associated elements.

Assessment

The assessment is based on a written exam at the end of the course and on the compulsory components throughout the course.

Students who fail an assessment will be offered another opportunity for assessment soon thereafter.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass, Pass with distinction.
For a grade of Pass on the whole course, the student must have passed the exam and the compulsory components.

The grades awarded for the exam are Fail, Pass and Pass with Distinction. The grades awarded for the compulsory components are Fail and Pass.

The final grade is determined by the grade for the exam.

Entry requirements

To be admitted to the course, students must meet the general entry requirements for higher education and requirements for English proficiency corresponding to English 6 from Swedish upper secondary school, and have passed 90 credits in science courses including courses equivalent to:

- KEMA20 General Chemistry 15 credits, or KEMA10 General Chemistry 7.5 credits and KEMA12 Inorganic Chemistry- Basic Course 7.5 credits, KEMA01 Organic Chemistry- Basic Course 7.5 credits and KEMA03 Biochemistry- Basic Course 7.5 credits,
- KEMB09 Physical Chemistry- Basic Course 15 credits, and
- MATA02 Mathematics for Scientists 15 credits, or the equivalent

Students who have obtained the equivalent knowledge by other means may also be admitted to the course.

Further information

The course may not be included in a degree together with KEMM07 Surface and Colloid Chemistry- Advanced Course 15 credits.

Subcourses in KEMM77, Chemistry: Advanced Surface and Colloid Chemistry

Applies from H19

1901 Advanced Surface and Colloid Chemistry, 7,5 hp
Grading scale: Fail, Pass, Pass with distinction
1902 Advanced Surface and Colloid Chemistry, Compulsory Elements, 7,5 hp
Grading scale: Fail, Pass