



## DEPARTMENT OF CHEMISTRY AND MOLECULAR BIOLOGY

### **KEM131 Colloid and Surface Chemistry, 15 higher education credits**

Kolloid- och ytkemi, 15 högskolepoäng

*Second Cycle*

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#### **Confirmation**

This course syllabus was confirmed by Department of Chemistry and Molecular Biology on 2014-02-12 and was last revised on 2016-09-26 to be valid from 2016-10-01, spring semester of 2017.

*Field of education:* Science 100%

*Department:* Department of Chemistry and Molecular Biology

#### **Position in the educational system**

The course is given in the Master programme (120 credits) in Chemistry and as a freestanding course. This course replaces course KEM130 and the courses can not be counted at the same time in a degree.

The course is classified at the level 120-180 credits for Degree of Bachelor and be counted as course at second cycle level for Degree of Master (120 credits).

The course can be part of the following programmes: 1) Master's Programme in Chemistry (N2KEM), 2) Bachelor of Science Programme in Medicinal Chemistry (N1LMK), 3) Atmospheric Science, Master's Programme (N2ATM) and 4) Bachelor of Science Programme in Chemistry (N1KEM)

*Main field of studies*

Chemistry

*Specialization*

A1N, Second cycle, has only first-cycle course/s as entry requirements

#### **Entry requirements**

For admission to the course, completed and passed courses worth 120 credits in the field of science are required. Within the scope of the course requirements, passed courses KEM040 Physical Chemistry (15 credits) and MMGK11 Mathematics for natural scientists A1 (15 credits) or equivalent knowledge are recommended.

## Learning outcomes

On completion of the course, the student is expected to be able to:

### *Knowledge and understanding*

- **define** and **discuss** surface tension and surface-phase dynamics,
- **describe** the self-association of surfactants and its importance for emulsions, microemulsions, suspect and flotation,
- **describe** the interactions in colloidal systems and their importance for the stability of colloidal systems,
- **account for** transport phenomena: viscosity, diffusion, sedimentation and electrokinetic phenomena.

### *Skills and abilities*

- **Characterise** colloidal system's properties,
- **carry out** calculations of different properties of colloidal systems by means of simple approximate theories.

### *Judgement and approach*

- **Interpret** the properties of colloidal systems by means of basic theories,
- **critically evaluate** literature in colloid and surface chemistry.

## Course content

The course treats colloid and surface chemistry from a physico-chemical perspective.

### *Sub-courses*

#### 1. **Theory** (*Teori*), 9 higher education credits

Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)

In the module Theory, the following subjects are treated:

1. Phase-boundary phenomena: Surface tension, surface-phase thermodynamics, Gibb's adsorption isotherm, Young's equation, Young-Laplace-equation and monolayers.
2. Colloidal interaction and stability: Basic electrostatics, electric multilayer systems, van der Waals interaction, DLVO theory as well as electrostatic and steric stabilisation.
3. Surfactants in water solution: Micelles, critical concentration for micelle formation, fluent crystalline phases, microemulsions, emulsions, foam and flotation.
4. Transport phenomenon: Viscosity, Brownian movement and diffusion, Fick's

4. Transport phenomenon: Viscosity, Brownian movement and diffusion, Fick's laws, Smoluchowski and Hückel equations.
5. Methods to characterise colloidal systems: Viscosimetry, microelectrophoresis, sedimentation measurements, surface-tension measurements, static and dynamic light scattering.
6. Laboratory sessions:

**2. Laboratory Work** (*Laborationer*), 6 higher education credits

Grading scale: Pass (G) and Fail (U)

The laboratory sessions concern the following subjects:

- Surface tension,
- colloidal stability,
- micelle formation,
- diffusion,
- microelectrophoresis.

**Form of teaching**

**Module 1:** The teaching is conducted in the form of lectures and exercises.

**Module 2:** The teaching is conducted in the form of laboratory sessions including written presentations. The laboratory sessions are compulsory.

*Language of instruction:* Swedish and English

As principal rule, the course is given in Swedish but it can be given completely or partly in English if the circumstances require it.

**Assessment**

**Module 1:** Examination takes place through a written examination at the end of the course.

**Module 2:** Examination takes place continuously through laboratory reports.

For students who have not passed the regular examination, additional examination sessions are offered.

If a student who has failed twice on the same part of the examination wants to change the examiner before the next examination session, such request should be submitted in writing to the department and be approved if there are not special causes against this.

In case a course has been discontinued or undergone major changes the student should normally be guaranteed access to at least four examination sessions (including regular examination session) based on the earlier planning of the course during a period of at least two years.

### **Grades**

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

**Module 1:** grades are decided by the written examination.

**Module 2:** for grade Pass, active participation and approved laboratory reports in all laboratory sessions is required.

**Final grade:** For grade Pass, grade of Pass on both modules is required. For grade Pass with distinction, grade of Pass with distinction on module 1 and grade Pass on module 2 are required.

Regarding application of the ECTS scale for grade please see decision 28/05/2007, diary nr G 8 1976/07.

### **Course evaluation**

The course evaluation is done in relation to the expected learning outcomes and contents of the course and is carried out at the end of the course through an individual written questionnaire on the teaching platform of the University of Gothenburg. A student who participates in or has completed a course should be given possibility to anonymously express experiences of and views in the course in a course evaluation. A compilation of course evaluation and reflections of the course coordinator should be made available to the students within reasonable time after the end of the course.