

# Physical Chemistry, Spectroscopy

Programme course

6 credits

Fysikalisk kemi, spektroskopi

NKEB09

Valid from: 2017 Spring semester

**Determined by**

Board of Studies for Chemistry, Biology  
and Biotechnology

**Date determined**

2017-01-25

## Main field of study

Chemistry

## Course level

First cycle

## Advancement level

G1X

## Course offered for

- Chemical Biology
- Chemistry

## Entry requirements

Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

## Prerequisites

General Chemistry, Organic Chemistry, Biochemistry, Physical Chemistry, Thermodynamics, Mathematics

## Intended learning outcomes

The course aims to confer knowledge in physical chemistry within the areas kinetics, quantum mechanics and molecular spectroscopy and skills in problem solving and laboratory tasks within the areas listed in the course contents below. After successfully completed course the course participant will be able to:

- understand the basic principles underlying the physical processes covered in the course
- describe and discuss the physical phenomena as well as the kinetic and spectroscopic instruments and measurement techniques
- account for, explain and exemplify the theory
- perform calculations for and solve problems within the course content area.
- analyse and apply the acquired facts and skills on complex physical processes
- conclude whether obtained results are reasonable and reflect over fundamental physical-chemistry problems in science, nature and society
- work with physical-chemistry problems solitarily and in groups
- analyse, compile and account for the laboratory exercise results in laboratory reports.

## Course content

Lectures, lessons and laboratory exercises cover the following areas: Kinetics: rate equations and their integration, reaction order, half life, mechanisms, catalysis, photochemistry, techniques for measuring fast reactions, flow, flash and relaxation methods, activation energies and molecular reaction dynamics. Quantum mechanics: basic quantum-mechanical concepts, particle-in-a-box, harmonic and anharmonic oscillator, rotation on a ring and on a sphere, the hydrogen atom, plus elementary introduction to many-electron atomic and molecular electron structure. Spectroscopy: interaction between electromagnetic radiation and matter by absorption and emission, fluorescence and phosphorescence, lasers, rotational, vibrational and electron spectroscopic methods such as microwave, infrared, visible/UV, X-ray photoelectron and magnetic resonance spectroscopy.

## Teaching and working methods

The theory is presented during the lectures. Problem solving is practised during the lessons. In the laboratory exercises fundamental laboratory techniques and moments connected to the theory and problem solving are practised. The laboratory exercises, whose laboratory exercise instructions and safety rules must be studied prior to the exercise, are mandatory. Written reports are handed in within five workdays from the laboratory exercise occasion. For the laboratory exercises special premises are required.

## Examination

LAB1	Laboratory work	1.5 credits	U, G
TEN1	Written examination	4.5 credits	U, 3, 4, 5

The problems at the written examination probes to what extent the participant fulfils the aims of the course. For approved laboratory work carried-through laboratory exercises and approved reports are required. For grade 3, 4 and 5, respectively, on the course, grade 3, 4 and 5, respectively, on the written exam together with grade G on the laboratory work are required.

## Grades

Four-grade scale, LiU, U, 3, 4, 5

## Other information

Supplementary courses: Materials Chemistry, Chemical Bonding, Computational Chemistry, Nanochemistry A and B, Coordination Chemistry, Physical-Organic Chemistry, Biological Measurements.

## Department

Institutionen för fysik, kemi och biologi

## Director of Studies or equivalent

Magdalena Svensson

## Examiner

Lars Ojamäe

## Course website and other links

<http://www.ifm.liu.se/physchem/courses/>

## Education components

Preliminary scheduled hours: 56 h

Recommended self-study hours: 104 h

## Course literature

P. Atkins & J. de Paula: Atkins' Physical Chemistry Laborationskompndier, problemsamling och PM för laborationsredogörelser.

## Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at [http://stydokument.liu.se/Regelsamling/Innehall/Utbildning\\_pa\\_grund-\\_och\\_avancerad\\_niva](http://stydokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva).