

# Syllabus

for course at first level

**Chemical Bonding**  
**Kemisk bindning**

**5.0 Higher Education**  
**Credits**  
**5.0 ECTS credits**

<b>Course code:</b>	KZ4012
<b>Valid from:</b>	Autumn 2015
<b>Date of approval:</b>	2015-05-18
<b>Department</b>	Department of Materials and Environmental Chemistry
<b>Main field:</b>	Chemistry
<b>Specialisation:</b>	G1F - First cycle, has less than 60 credits in first-cycle course/s as entry requirements

## Decision

This syllabus has been approved by the Board of the Faculty of Science at Stockholm University.

## Prerequisites and special admittance requirements

### Course structure

Examination code	Name	Higher Education Credits
MOM1	Theory	2
MOM2	Project work	1
MOM3	Laboratory Exercises	2

### Course content

a. The central domain of the course is the theory of chemical bonding. The course comprises the following elements: The principles of quantum mechanics, the theory of atomic structure, quantum mechanical theory of molecular structure with applications in inorganic and organic chemistry, molecular symmetry and its application in quantum chemistry and spectroscopy, diffraction and crystallography, spectroscopic methods, magnetic resonance, basic theory of intermolecular interactions and chemical reactivity.

The course provides practical training in quantum chemical computation methods, diffraction and NMR spectroscopy.

b. The course includes the following elements:

1. Theory 9 higher education credits.
2. Laboratory exercises 6 higher education credits.

### Learning outcomes

It is expected that the student after taking the course will be able to:

- Explain the basic principles of quantum mechanics.
- Describe chemical bonding and molecular structure in terms of quantum chemical theories.
- Give an account of the basics of intermolecular interactions and the relation between quantum chemical properties and chemical reactivity.
- Demonstrate insight into quantum chemical computation methods and programs..
- Understand and apply elementary group theory.
- Explain the basic principles of crystallography and modern NMR.

### Education

The education consists of lectures, group work, computational training and laboratory exercises. Participation in the practical laboratory work and group education associated with this is compulsory. After consultation with the relevant teacher, an examiner may rule that a student is not obliged to participate in certain compulsory education, if there are special grounds for this.

### **Forms of examination**

- a. Measurement of knowledge for element X takes place through:
  - Written or and/oral examination
- b. Grading is carried out according to a 7-point scale related to learning objectives:  
A = Excellent, B = Very Good, C = Good, D = Satisfactory,  
E = Sufficient Fx = Fail F = Fail.
- c. Grading criteria for the course will be distributed at the start of the course.
- d. A minimum grade of E is required to pass the course, together with:
  - Completion of all practical laboratory work, followed by its presentation and award of a "Sufficient" grade
- e. Students who fail to achieve a pass grade in an ordinary examination have the right to take at least further four examinations, as long as the course is given. The term "examination" here is used to denote also other compulsory elements of the course. Students who have achieved a pass grade on an examination may not retake this examination in order to attempt to achieve a higher grade. Students who have failed to reach a pass grade on two occasions have the right to request that a different teacher be appointed to set the grade of the course. A request for such appointment must be sent to the departmental board.

### **Interim**

Students may request that the examination is carried out in accordance with this syllabus even after it has ceased to apply. This right is limited, however, to a maximum of three occasions during a two-year-period after the end of giving the course. A request for such examination must be sent to the departmental board.

### **Limitations**

The course may not be included in a degree together with Molecular chemistry foundation course KE1050, 10 higher education credits, to which it is equivalent. Parts of the course are equivalent to elements of KE3750, computer chemistry, and may not be included in a degree together with these.

### **Required reading**

Course literature is decided by the departmental board and is described in an appendix to the syllabus.