

**SCIENTIFIC AND METHOD MODULES**

<b>Module name</b>	<b>Basic Concepts in Chemistry</b>
<b>Number</b>	2013-B1
<b>Aims</b>	This module for non-chemists introduces the basic concepts in chemistry needed for actively participating in the thematic and advanced modules (T1–T6, A1, A2). The doctoral researchers will be given an introduction into the way chemists interpret atomic properties, structures and bonding.
<b>Basics</b>	
<b>Contents</b>	<p>1. Periodicity atomic models, orbitals, electron configuration, periodic table and associated properties of the elements: atom and ion size, ionization energy, electron affinity, electronegativity, oxidation number, groups and rows</p> <p>2. Chemical bonds concepts, characteristics, breaking chemical bonds, and experiments. Ionic bonds, covalent bonds, <i>d</i>- and <i>f</i>-orbitals in chemical bonding, van der Waals bonds, hydrogen bonding, hydrogen bonds in bio-systems, electronic and IR-spectroscopy to probe chemical bonding, chemistry: the change of chemical bonds</p> <p>3. Coordination chemistry <i>d</i> electrons, ligands &amp; ligand types, coordination number, complex composition and structure, bonding, valence bond theory, Lewis-acid/ -base theory, crystal field theory, crystal field splitting parameter <math>\Delta_o</math>, spectrochemical series, high-spin &amp; low-spin complexes, spin-only paramagnetism</p>
<b>Methods</b>	Seminars
<b>Type</b>	Two-day block course/ yearly recurrence with modification
<b>Date (month/year)</b>	March 21-22, 2013
<b>Time</b>	8:30 a.m.
<b>Work load</b>	15 hours presence/ 45 hours self-study
<b>Examination</b>	Written, 3 short tests
<b>Credit points</b>	2
<b>Responsible scientists</b>	Kersting, Krautscheid, Kremer
<b>Industrial partners</b>	
<b>Recommendations for literature, e-learning</b>	C. E. Housecroft, E. C. Constable: "Chemistry", Pearson; P. W. Atkins: "Physical Chemistry"; Haken, H.; Wolf, H.C. Molecular Physics and Elements of Quantum Chemistry: Introduction to Experiments and Theory (Series: Advanced Texts in Physics) (englisch) Springer, Berlin, 2004, J. Reinhold, Quantentheorie der Moleküle, Teubner

## SCHEDULE for Module 2013-B1

Time	Lecturer	Programme	Location
<b>Day 1</b>			
8:30-10:00	Kremer	Chemical Bonds I	SR101
		<i>Coffee break</i>	
10:15-11:45	Kremer	Chemical Bonds II	SR101
11:45-12:30		Discussion and Test	SR101
		<i>Lunch break</i>	
13:30-15:00	Krautscheid	Periodicity I	SR101
		<i>Coffee break</i>	
15:15-16:45	Krautscheid	Periodicity II	SR101
16:45-17:30		Discussion and Test	SR101
<b>Day 2</b>			
8:30-10:00	Kersting	Coordination Chemistry	SR101
		<i>Coffee break</i>	
10:15-11:45	Kersting	Coordinative Bonds	SR101
11:45-12:30		Discussion and Test	SR101

### Didactic elements:

Lecture, discussions

### Expected performance:

Active participation in discussions

Doctoral candidates from the chemistry field are allowed to take part in the module but will not receive any credit point or mark for attendance.

Doctoral candidates who have already received two credit points and a mark for the attendance of this module can participate, but cannot receive two graded credit points again or improve their mark.