

SCIENTIFIC AND METHOD MODULES

Module name	Basic Concepts in Chemistry
Number	2015-B1
Aims	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.
Basics	
Contents	<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 & ligand types, coordination number, complex composition and structure, bonding, valence bond theory, Lewis-acid/ -base theory, crystal field theory, crystal field splitting parameter Δ_o, spectrochemical series, high-spin & low-spin complexes, spin-only paramagnetism</p>
Methods	Seminars
Type	Two-day block course/ yearly recurrence with modification
Date (month/year)	March 30-31, 2015
Time	See page 2
Work load	15 hours presence/ 45 hours self-study
Examination	Written, 3 short tests
Credit points	2
Responsible scientists	Kersting, Krautscheid, Kremer
Industrial partners	
Recommendations for literature, e-learning	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 2015-B1

Time	Lecturer	Programme	Location
30 March 2015			
8:30-10:00	Krautscheid	Periodicity I	SR101
		<i>Coffee break</i>	
10:15-11:45	Krautscheid	Periodicity II	SR101
11:45-12:30		Discussion and Test	SR101
		<i>Lunch break</i>	
13:30-15:00	Kersting	Coordination Chemistry	SR101
		<i>Coffee break</i>	
15:15-16:45	Kersting	Coordinative Bonds	SR101
16:45-17:30		Discussion and Test	SR101
31 March 2015			
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

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.