

Module Name		Modul Code		
Physical Chemistry 4: Molecular Spectroscopy		chem1003		
Module Coordinator				
Prof. Dr. Friedrich Temps				
Organizer				
Section Chemistry				
Faculty				
Faculty of Mathematics and Natural Science				
Examination Office				
Examination Office Chemistry				
ECTS Credits		5		
Evaluation		Graded		
Duration		One Semester		
Frequency		Annually Winter Term		
Workload per ECTS Credit		30 h		
Total Workload		150 h		
Contact Time		42 h		
Independent Study		108 h		
Teaching Language		English		
Module Courses				
Course Type	Course Name	Compulsory/ Optional	SWS	
Lecture	Molecular Spectroscopy	Compulsory	2	
Exercise	Molecular Spectroscopy	Compulsory	1	
Examination(s)				
Examination Name	Type of Examination	Evaluation	Compulsory/ Optional	Weighting
Mixed Examination: Molecular Spectroscopy	Other	Graded	Compulsory	100

Further Information on the Examination(s)

Exams:

- Solution of homework assignments (H),
- Short questions (T, 10 min every other week),
- Written exam at end of lecture period (K).

Module grade:

- The module marks are calculated according to the following formula:

$$P = 0,2 \times (\%H) + 0,2 \times (\%T) + 0,6 \times (\%K)$$

or

$$P \geq 0,6 \times (\%K)$$

whichever is better.

The minimum number of points to pass is 60 %.

Scheduled time for written exam: End of lecture period,

1st repetition: Before start of lecture period of the following semester,

2nd repetition: After lecture period of the following semester.

Exam language: German (for foreign students: English).

Relevance for final grade M.Sc. Chemistry, M.Sc. Business Chemistry:

- Module grade weighted with CP number enters into M.Sc. grade.

Relevance for final grade M.Ed. Chemistry 2-Subject:

- Module grade enters not M.Ed. grade.

Course Content

- Common experimental methods and devices in spectroscopy,
- Interactions of electromagnetic radiation with matter,
- Solution of the time-dependent Schrödinger equation,
- Transition dipole moment and intensities of spectroscopic transitions,
- Selection rules,
- Introduction to molecular symmetry and group theory,
- Coherent processes, Rabi frequency,
- Line widths and line broadening mechanisms,
- Rotational spectra of polyatomic molecules,
- Vibrational spectra of polyatomic molecules,
- Electronic spectra of diatomic and polyatomic molecules.

Learning Outcome

The students learn to apply their fundamental knowledge of spectroscopy from the B.Sc. study course to real (polyatomic) molecules. They learn to analyze and interpret spectra of molecules in different spectral regimes.

Reading List

- P. F. Bernath, Spectra of Atoms and Molecules, Oxford University Press,
- P. W. Atkins, R. S. Friedman, Molecular Quantum Mechanics, Oxford University Press,
- J. M. Hollas, Moderne Methoden in der Spektroskopie, Vieweg,
- Lecture Script.

Use	Compulsory/ Optional	Semester
Master, 1-Subject, Chemistry, (Version 2007)	Compulsory	1 or 2

Master, 1-Subject, Chemistry, (Version 2016)	Compulsory	1 or 2
Master, 1-Subject, Business Chemistry, (Version 2008)	Optional	1 or 2
Master, 1-Subject, Business Chemistry, (Version 2014)	Optional	1 or 2
Master, 1-Subject, Business Chemistry, (Version 2017)	Optional	1 or 2
Master, 2-Subject, Studies in Secondary Education, Chemie, (Version 2007)	Optional	1 - 4
Master, 2-Subject, Studies in Secondary Education, Chemie, (Version 2017)	Optional	1 - 4