

Molecular Physics

Module No.: MN-P-SP-Mol, MN-PN-Mol, MN-P-WaMa

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Course: Molecular Physics II

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Category	Type	Language	Teaching Hours	CP	Semester
Core Course	Lecture	English	3 + 1	6	SuSe
Core Course	Lecture	English	3	4.5	SuSe

Requirements for participation:

Atomic Physics, Molecular Physics and Quantum Mechanics at the level of the bachelor courses in physics, Molecular Physics I

Type of module examinations:

One oral examination at the end of the module

Duration of the course:

1 semester

Aims of the course:

In the second part of the core courses more complex issues of molecular spectra are introduced. The students will be enabled to analyze spectra of polyatomic molecules in particular the complex vibrational motion of molecules are described in the framework of normal modes.

If time permits also more involved subjects, e.g. couplings between electronic, vibrational and rotational motions are presented.

This module prepares for topics of current research in molecular physics and provides the basis for the preparation of the master thesis.

Contents of the course:

- Vibrational modes of polyatomic molecules
- Fundamentals of point group symmetry and permutation inversion symmetry
- Vibrational dipole moment and selection rules
- Characteristic ro-vibrational spectra of selected molecules
- Raman and Infrared Spectra of polyatomic molecules
- Tunneling motion
- Breakdown of Born-Oppenheimer Approximation
- Coupling of rotation and vibration
- Coupling of angular momenta in molecular physics

Recommended literature:

Bernath, "Spectra of Atoms and Molecules", Oxford University Press)

Townes Schawlow, "Microwave Spectroscopy" (Dover Publications)

Gordy & Cook, "Microwave Spectra" (Wiley)

Engelke, „Aufbau der Moleküle“ (Teubner)

P. R. Bunker and Per Jensen: "Molecular Symmetry and Spectroscopy, 2nd Edition," (NRC Research Press, Ottawa).