

10610 - 747(8) Molecular Physics (1½l, 1½p)

2020

Course summary:

Quantum mechanics of rotational and vibrational degrees of freedom of molecules. Electronic spectra of molecules. The use of symmetries in molecular physics. The interaction of light with molecules. Kinetics and dynamics of elementary molecular reactions.

Module relevance in programme:

This module builds on the undergraduate modules in quantum mechanics. The module is linked to modules in quantum mechanics 714, Quantum Optics and laser technology 745, Laser spectroscopy 744, and atomic physics 716. The module introduces basics of molecules and prepares the student for project work in the laser programme (741).

Outcomes of course:

The course skills the student in the basis of the quantum mechanical treatment of molecules with specific emphasis on interaction with light. It also lays the foundation for courses on laser spectroscopy.

Lecturer:

Prof EG Rohwer

Tel: (021) 808-3372 E-mail: egr@sun.ac.za

Office: Room 1003 in the Merensky Physics Building

Mentor:

The Department of Physics has appointed a staff member as mentor for each year of its physics programme to be available to students for consultation. Students should feel free to discuss general issues related to the physics programme or specific modules in the programme with the relevant mentor, in addition to usual consultations with their individual lecturers of modules.

The mentor for the Honours programme and its modules is Dr CM Steenkamp cmsteen@sun.ac.za

Course content:

Formal lectures

The following topics are covered during formal lectures: Quantum mechanics of electronic, vibrational and rotational states of diatomic molecules, spectra of molecules, interaction of light with molecules.

Practical (Homework):

The allocated homework is designed to consolidate and widen the subjects presented in the lectures. Oral presentations are designed to practice independent study of scientific topics (related to the lectures).

Study material:

Prescribed textbook: "**Molecular physics and elements of quantum chemistry**" (Springer) Haken and Wolf.

Learning opportunities:

Lectures

Assessment:

Methods of Assessments

Homework problems

Oral presentations

Written test

Venue and time of assessment opportunities

As determined by lecturer in consultation with students at beginning of semester and the honours time table.

Availability of marks:

Tutorial problems: marks available within 2 weeks.

Examination: marks available within 2 weeks of the examination.

Calculation of final mark for the module:

Test 50%, Oral presentation 25 %, homework 25 %