

PH2812

Introduction to Atomic and Molecular Physics

Professor: Nouari Kebaili

Language of instruction: English* – **Number of hours:** 36 – **ECTS:** 3

Prerequisites: PH1100 or equivalent. Basics knowledge in modern physics

Period: S8 Elective 09 February to April IN28IE2, SEP8IE2

Course Objectives

This course aims at providing the student with a knowledge that is complementary to the PH1100 physics course. It introduces to atomic and molecular physics using both traditional lectures and exercise sessions for a better involvement of the students. It gives a wide perspective onto a major domain of physics with applications to chemistry and spectroscopy methods.

On completion of the course, students should be able to

Apply basic concepts in quantum physical-chemistry

Course Contents

- ◇ Structure of the atom : hydrogen atom ; orders of magnitude ; several electrons atoms ; central field model ; electronic configuration ; spin-orbit coupling ; emission and absorption ; radiative dipolar transitions ; X-rays
- ◇ External fields effects : strong field and weak field Zeeman ; polarisation of transitions ; magnetic resonance ; optical detection ; Stark effect
- ◇ Study of diatomic molecules ; electronic structure of H_2^+ ; several electrons molecules ; vibration and rotation of molecules

Course Organization

Lectures: 16 hr, Tutorials: 17 hr, Exam: 3 hr

Teaching Material and Textbooks

- ◇ Course reader (in French)
- ◇ Atoms and Molecules (M. Weissbluth, Academic Press) or Physics of Atoms and Molecules (Bransden and Joachain, Benjamin Cummings Ed.)

Evaluation

3-h written final exam.