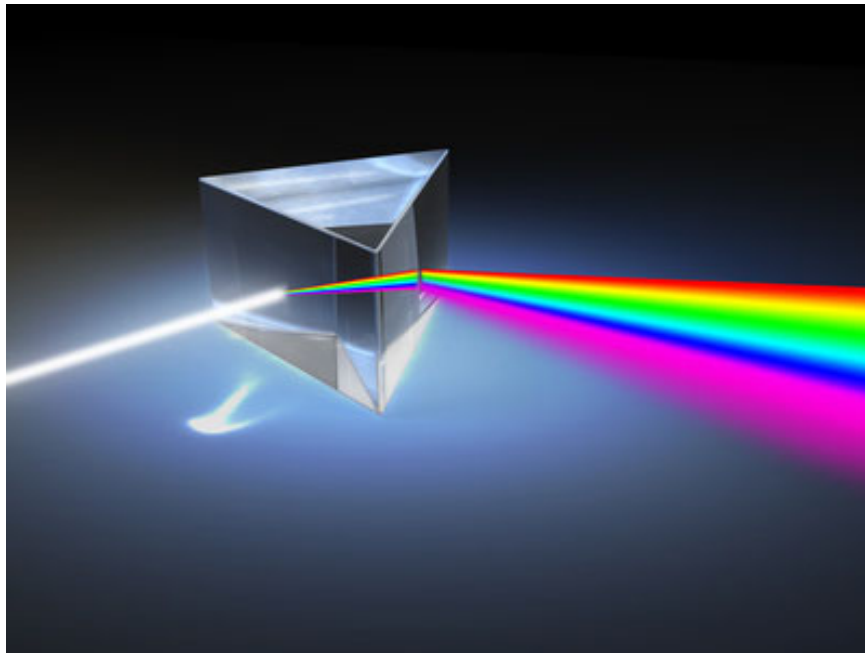


Spectroscopy

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EPFL

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Table of Contents

1	INTRODUCTION	5
1.1	GENERAL COMMENTS	5
1.2	USEFULNESS OF SPECTROSCOPY	5
2	OVERVIEW OF MOLECULAR SPECTROSCOPY	7
2.1	STARTING POINT: THE BORN-OPPENHEIMER APPROXIMATION	7
2.2	NUCLEAR SIDE OF THE BORN-OPPENHEIMER APPROXIMATION	13
2.2.1	General Treatment	13
2.2.2	Separation of Rotational Motion	15
2.2.3	The Vibrational Problem	19
2.2.4	Vibration-Rotation Interaction	23
2.3	WHAT IS A SPECTRUM?	27
2.4	SPECTROSCOPIC INTENSITIES	31
2.4.1	Kinetics of Optical Absorption	31
2.4.2	Time Dependent Perturbation Theory	35
2.4.3	Spectroscopic Selection Rules	39
2.4.4	State Populations	41
2.4.5	Nuclear Spin Statistics	44
2.5	SPECTRAL LINE BROADENING	47
2.5.1	Natural Line Broadening	47
2.5.2	Other Types of Lifetime Broadening	48
3	ROTATIONAL SPECTROSCOPY	51
3.1	CLASSIFICATIONS OF ROTORS	51
3.2	LINEAR MOLECULES	55
3.2.1	Level Spacing	55
3.2.2	Selection Rules	56
3.3	SPHERICAL TOPS	60
3.4	SYMMETRIC TOPS	61
3.4.1	Hamiltonian and Energy Levels	62
3.4.2	Selection Rules and Spectra	66
3.4.3	Effects of Centrifugal Distortion	67
3.5	ASYMMETRIC TOPS	68
4	VIBRATIONAL SPECTROSCOPY	71
4.1	DIATOMIC MOLECULES	71
4.1.1	Energy Levels and Selection Rules	71
4.1.2	Vibration-Rotation Spectra	73
4.1.3	Combination Differences	77
4.2	POLYATOMIC VIBRATION	79
4.2.1	Normal Modes of Vibration	79
4.2.2	Group Vibrations	84
4.2.3	Group Theory and Molecular Vibrations	86
4.2.4	Selection Rules	87
4.3	ROVIBRATIONAL SPECTRA OF POLYATOMIC MOLECULES	90
4.3.1	Symmetric tops	91
4.4	RAMAN SPECTROSCOPY	93
4.4.1	Introduction	93
4.4.2	Quantum Mechanical Considerations	95
4.4.3	Vibrational Selection Rules	97
4.4.4	Vibration-rotation Raman Spectra of Diatomics	98

5	ELECTRONIC SPECTROSCOPY	99
5.1	ATOMIC SPECTROSCOPY	99
5.1.1	Hydrogen atom	99
5.1.2	Helium Atom	101
5.1.3	Multi-electron Atoms	102
5.2	VIBRATIONAL STRUCTURE OF ELECTRONIC BANDS	103
5.2.1	Vibrational selection rules	106
5.2.2	Franck-Condon Principle	107
5.3	THE FC PRINCIPLE AND DIFFUSE SPECTRA	109
5.4	NON-RADIATIVE PROCESSES	110
5.5	ROTATIONAL STRUCTURE OF ELECTRONIC TRANSITIONS	111
5.6	ELECTRONIC SPECTROSCOPY OF POLYATOMICS	113

1 Introduction

1.1 General comments

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Documentation – Lecture notes, exercises, and solutions can be downloaded via Moodle.

Exercises - **Solving problems is an essential part of the course.** I encourage you not only to come to the exercise sessions, but also to work on the problems before you come.

Reference Books

Primary References:

- J. M. Hollas, *Modern Spectroscopy*
- C. H. Townes and A. L. Schawlow, *Microwave Spectroscopy*
- D. A. McQuarrie, *Quantum Chemistry*

Secondary References:

- G. Herzberg, *Molecular Spectra and Molecular Structure. I. Spectra of Diatomic Molecules*
- G. Herzberg, *Molecular Spectra and Molecular Structure. II. Infrared and Raman Spectra of Polyatomic Molecules*
- G. Herzberg, *Molecular Spectra and Molecular Structure. III. Electronic Spectra and Electronic Structure of Polyatomic Molecules*

This course will give you an introduction spectroscopy. In the time we have here we can only cover the basics, but once you understand these basics you will be able to go on and learn about more advanced topics on your own. It is therefore not important exactly how much material we cover in class. What I am most concerned about is that you understand the material that we do cover. If we don't get through everything that is no problem, as long as you understand what we discussed during class. My goal is that everyone understands the material. This puts also a certain burden on you, *i.e.* you should ask questions if a subject or point made is not clear to you. When you leave the classroom you should feel that you understand everything that I covered.

1.2 Usefulness of Spectroscopy

Spectroscopy can be broadly defined as the interaction of light with matter by which molecules make a transition from one quantum state to another. It is at work everywhere around us determining everything from the color of your clothes to the color of the sky. It is responsible for the lasers that scan the bar-codes at Migros, the ones that connect computers over the internet and the ones that determine the distance to the moon. Spectroscopy forms the basis for understanding problems like global warming and the ozone hole.

Spectroscopy provides innumerable ways to learn about chemistry in the research laboratory. One can use it to monitor how fast a reaction happens, to determine how chemistry proceeds on surfaces, to learn how energy flows within and between molecules, to assist in the synthesis of new molecules. It also provides the basis for remote diagnostics of chemical systems in the real world, such as combustion processes in automobile engines, chemistry in the atmosphere and cancer photo-therapy. It is essential in organic and inorganic chemistry for the identification for new compounds. It will also form the basis for understanding some of the TP experiments in the 6th semester.

