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Physical Sciences Educational Reviews

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Basic Atomic and Molecular Spectroscopy - Chemistry Tutorial Text

Subject area
Physical Chemistry.

Description
This book is an undergraduate text in the area of spectroscopy.

Authors
J.M. Hollas.

Publishers/Suppliers
Royal Society of Chemistry (http://www.rsc.org/tct/).

Date/Edition
2002/1st Edition.

ISBN
0-85404-667-4.

Level
Undergraduate.

Price
£12.95.

Summary Review

range: * very poor to ***** excellent	
Academic content	*****
Usefulness to student	*****
Usefulness to teacher	*****
Meets objectives	*****
Accuracy	*****

The study of quantum mechanics and spectroscopy are intimately linked and any good text should have a balance of quantum mechanics and applications of that theory to actual spectra. This text by Hollas does achieve the balance.

The book is volume 11 in the RSC's ***Tutorial Chemistry Texts*** series; it is intended for 1st or 2nd year undergraduates, 'particularly those with minimal mathematics qualifications'. No calculus is required to comprehend the book. There is only one derivative, which appears in the Schrödinger equation, but the reader is quickly referred to the reading list for further details. There are two integrals, the normalisation of a wavefunction and the transition moment, both of which appear in "boxes" rather than the main text. My only criticism of the mathematical content is a minor inconsistency in the symbol for frequency, which changes from ν to ω in a few places.

After a brief introduction -*What is Spectroscopy?* and *The Electromagnetic Spectrum* - the first half of the book is devoted to quantum mechanics - *Quantization and the Hydrogen Atom*, *Quantization in Polyelectronic Atoms*, *Electronic States of Diatomic and Polyatomic Molecules*, *Molecular Vibrations*, and *Molecular Rotation*, as well as a chapter on *How Spectra are Obtained*. As implied by the title, this is a book on basic spectroscopy. Rotational, vibrational and electronic absorption spectra and vibrational Raman spectra are discussed in the second half of the book. I particularly liked the well-chosen spectra, which illustrate these latter chapters. Atomic spectra are covered in the chapter on quantization, but without any actual spectra. More advanced types of spectroscopy, such as photoelectron, X-ray, NMR, and laser spectroscopy, are beyond the intention and coverage of this book.

The book is well presented and consistent with guidelines for good student-centred learning practices. Every chapter has a clear set of aims, worked problems, summary of key points and problems. An appendix gives worked answers to all the end-of-chapter problems. Many chapters also have "boxes" which introduce concepts requiring more advanced mathematics than the main text, for example: Box 5.2 Vector representation of orbital and electronic spin angular momenta in a diatomic molecule.

I found the style and presentation to be easy-to-read. For example, the nomenclature of term symbols has been difficult for me: Hollas gives a clear and concise description of this topic and the rest of the book is equally insightful.

This is an excellent book, and is great value-for-money. I will be prescribing Hollas's text for my students. This ends a search for a suitable spectroscopy text, which has lasted several years. I highly recommend the book to you as a class text. It would also be a worthwhile addition to the departmental library or your personal reference library.

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May 2003

Atomic and molecular spectroscopy has provided basic information leading to the development of quantum mechanics and to the understanding of the building blocks of matter. It continues to provide further insight into the statics and dynamics of the microcosmos, and provides the Â·means for test ing new concepts and computational methods.Â This textbook on Atomic and Molecular Spectroscopy has been pre pared to provide an overview of modern spectroscopic methods.Â The text has evolved from courses on atomic and molecular spectroscopy given by the author since 1975 at Chalmers University of Technology and at the Lund Institute of Technol ogy.