课程名（Coursename）  
High-Resolution Molecular Spectroscopy  
  
课程代码（Coursenumber）  
A3  
  
课程对象（Audience）  
Undergraduate  
  
开课教师（Teacher）  
Dr J. H. Keeler and Prof. J. Klinowski  
  
学期（Semester）  
M 1–5  
  
课程描述（Description））  
This course will be concerned with the high-resolution spectra of small molecules, mostly in the gas phase. We will look at rotational, vibrational and electronic spectroscopy (including the Raman effect), and the kinds of detailed structural information that can be obtained from each kind of spectrum. The course draws extensively on material previously covered in Part IB Chemistry A, showing how the concepts introduced there can be used and extended to more complex cases.  
Topics Electromagnetic radiation and its interaction with molecules. Transition moments and Einstein coefficients. Linewidths. Lasers.  
Instrumentation. Dispersive spectrometers: diffraction gratings, sources and detectors. Fourier transform instruments: advantages. Spectroscopy with lasers.  
Rotational spectroscopy. Classification of molecules and the resulting spectra. Intensities. Centrifugal distortion. Electric field effects (Stark effect).  
Vibrational spectroscopy. Classification of normal modes and vibrational wavefunctions according to symmetry. Selection rules. Overtones and combination lines. Rotational fine structure: parallel and perpendicular bands.  
Raman spectroscopy. Origin of the Raman effect. Practicalities. Rotational and vibrational Raman spectroscopy of linear molecules and symmetric tops. Rule of mutual exclusion. Molecular identification using IR and Raman spectra.  
Electronic spectroscopy. Diatomic molecules. Electronic structure and term symbols. Selection rules and the Franck Condon principle. Vibrational structure in absorption and emission.  
  
课时信息（Totalhours）  
  
教参信息（Textbookinfo）  
Recommended books  
1 Advances in Chemical Physics, Global and Accurate Vibration Hamiltonians from High-Resolution Molecular Spectroscopy (Volume 108) by Michel Herman, Jacques Lievin, Jean Vander Auwera, and Alain Campargue (Hardcover - Mar. 30, 1999)  
ISBN-13: 978-0471328438  
2 Tenth All-Union Symposium and School on High-Resolution Molecular Spectroscopy: 2-9 June 1991 Omsk, Russia (Proceedings of S P I E) by Leonid N. Sinitsa (Paperback - Oct. 1992)  
ISBN-13: 978-0819410115  
3 14th Symposium on High-Resolution Molecular Spectroscopy (Proceedings of S P I E) by Leonid N. Sinitsa (Paperback - Jan. 2004)  
ISBN-13: 978-0819452191  
世界各地拥有馆藏的图书馆（OCLC）:47  
4 15th Symposium on High-resolution Molecular Spectroscopy (Proceedings of Spie) by Yurii N. Ponomarev, Semen N. Mikhailenko, and Leonid N. Sinitsa (Paperback - Dec. 20, 2006) – Illustrated  
ISBN-13: 978-0819467027  
世界各地拥有馆藏的图书馆（OCLC）:31  
5 High Resolution NMR, Third Edition: Theory and Chemical Applications by Edwin D. Becker (Hardcover - Oct. 18, 1999)  
ISBN-13: 978-0120846627  
6 Laser Chemistry: Spectroscopy, Dynamics and Applications by Helmut H. Telle, Angel González Ureña, and Robert J. Donovan (Paperback - June 11, 2007)  
ISBN-13: 978-0471485711  
世界各地拥有馆藏的图书馆（OCLC）:225  
7 Femtosecond Laser Spectroscopy by Peter Hannaford (Hardcover - Oct. 29, 2004)  
ISBN-13: 978-0387232935  
世界各地拥有馆藏的图书馆（OCLC）:178  
8 Weakly Interacting Molecular Pairs: Unconventional Absorbers of Radiation in the Atmosphere (NATO Science Series: IV: Earth and Environmental Sciences) by Claude Camy-Peyret and Andrei A. Vigasin (Hardcover - Oct. 31, 2003)  
ISBN-13: 978-1402015953  
世界各地拥有馆藏的图书馆（OCLC）:55  
9 Relativistic Quantum Chemistry: The Fundamental Theory of Molecular Science by Markus Reiher and Alexander Wolf (Hardcover - Mar. 16, 2009)  
ISBN-13: 978-3527312924  
世界各地拥有馆藏的图书馆（OCLC）:130  
10 Cold Atoms and Molecules: Concepts, Experiments and Applications to Fundamental Physics (Physics Textbook) by Matthias Weidem&#252;ller and Claus Zimmermann (Paperback - June 29, 2009)  
ISBN-13: 978-3527407507  
世界各地拥有馆藏的图书馆（OCLC）:91  
11 Dissociative Recombination of Molecular Ions (Cambridge Molecular Science) by Mats Larsson and Ann E. Orel (Hardcover - Apr. 14, 2008)  
ISBN-13: 978-0521828192  
世界各地拥有馆藏的图书馆（OCLC）:135