

Things You Should Know

Chapter 2: Overview of Molecular Spectroscopy

Be able to define the following terms (using words, equation, or figures):

Born-Oppenheimer Approximation	Potential Energy Surface
Spherical Harmonics	Absorption
Stimulated Emission	Spontaneous Emission
Einstein A and B coefficients	Homogeneous Broadening
Natural Line Broadening	Pressure Broadening
Inhomogeneous Broadening	Doppler Effect

Concepts and Exercises:

1. Know the basic principle of the Born-Oppenheimer approximation.
2. Be able to interpret simple figures in which we draw an electronic potential curve for a diatomic molecule with the vibrational and rotational levels superimposed on it. Understand how this picture results from the approximate separation of the electronic, vibrational and rotational motion in the Hamiltonian.
3. Know the general approach used to go beyond the Harmonic oscillator and Rigid Rotor approximations for diatomic molecules.
4. Be able to describe the physical significance of each term in the expression for the energy levels of a diatomic molecule.
5. Know in which wavelength regions different types of spectra occur.
6. Be able to discuss all the factors that determine the intensity of a spectroscopic transition.
7. Know where the various types of selection rules come from.
8. Know the various sources of spectral broadening and be able to calculate the contributions of each type under a particular set of conditions.
9. Be able to do all the assigned exercises.