

Things You Should Know

Chapters 3: The Harmonic Oscillator

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

Hook's Law

Harmonic oscillator

Tunneling

Zero-point energy

Hermite polynomials

Concepts and Exercises:

1. Know what approximations one must make in using the harmonic oscillator model to describe vibrational motion in molecules. Know how the energy level spacings and qualitative features of the wave functions.
2. Know how to apply the technique of the separation of variables to solve simple differential equations.
3. Be familiar with the general procedure of solving differential equations by the power series method. You do not need to reproduce the solution, but be able to describe the steps.
4. Be able to use raising and lowering operators for the harmonic oscillator Hamiltonian to evaluate integrals involving the harmonic oscillator wave functions.
5. Be able to do all the exercises