

CHAPTER OVERVIEW

5: The Harmonic Oscillator and the Rigid Rotor

- **The harmonic oscillator is common:** It appears in many everyday examples: Pendulums, springs, electronics (such as the RLC circuit), standing waves on a string, etc. It's trivial to set up demonstrations of these phenomena, and we see them constantly.
- **The harmonic oscillator is intuitive:** We can picture the forces on systems such as pendulum or a plucked string. This makes it simple to study in the classroom. In contrast, there are many "everyday" examples that are not intuitive.
- **The harmonic oscillator is mathematically simple:** Math is part of physics. In studying simple harmonic motion, students can immediately use the formulas that describe its motion. These formulas are understandable: for example, the equation for frequency shows the intuitive result that increasing spring stiffness increases frequency.

[5.1: A Harmonic Oscillator Obeys Hooke's Law](#)

[5.2: The Equation for a Harmonic-Oscillator Model of a Diatomic Molecule Contains the Reduced Mass of the Molecule](#)

[5.3: The Harmonic Oscillator Approximates Molecular Vibrations](#)

[5.4: The Harmonic Oscillator Energy Levels](#)

[5.5: The Harmonic Oscillator and Infrared Spectra](#)

[5.6: The Harmonic Oscillator Wavefunctions involve Hermite Polynomials](#)

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[5.8: The Energy Levels of a Rigid Rotor](#)

[5.9: The Rigid Rotator is a Model for a Rotating Diatomic Molecule](#)

[5.E: The Harmonic Oscillator and the Rigid Rotor \(Exercises\)](#)

Thumbnail: The rigid rotor model for a diatomic molecule. (CC BY-SA 3.0 Unported; Mysterioso via [Wikipedia](#))

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