

Physics for scientists and engineers serway jewett 10th edition

by serway and jewett · Language: EN

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Overview

Physics for Scientists and Engineers with Modern Physics by Serway and Jewett, 10th Edition, is a comprehensive, calculus-based textbook designed for introductory physics courses at universities and colleges. It systematically covers fundamental principles of physics, starting with classical mechanics and progressing through oscillations, waves, thermodynamics, electricity and magnetism, light and optics, and concluding with an introduction to modern physics concepts. The book is renowned for its clear and logical presentation, making complex topics accessible to students with a strong mathematical background.

The primary goal of the textbook is to foster a deep understanding of physical concepts and to develop robust problem-solving skills essential for students pursuing careers in science and engineering. It achieves this through a pedagogical approach that includes numerous worked examples, conceptual questions, and a vast array of end-of-chapter problems ranging in difficulty. The 10th edition incorporates updated content, enhanced problem sets, and improved illustrations to reflect current teaching methodologies and scientific understanding, ensuring its continued relevance as a foundational text in physics education.

Key Takeaways

- Mastering fundamental physics principles requires a strong grasp of calculus and vector analysis.
- Effective problem-solving in physics involves a systematic approach, including identifying knowns, unknowns, relevant principles, and logical steps.
- Conceptual understanding is as crucial as mathematical proficiency for truly comprehending physical phenomena.
- The interconnectedness of different physics topics means that knowledge from one area often applies to others.
- Regular practice with a variety of problems, from conceptual to quantitative, is essential for solidifying learning.
- Physics is not just about memorizing formulas, but about applying a few core principles to diverse situations.

- Developing an intuition for physical processes through careful observation and critical thinking enhances learning.

Chapter Summaries

Part 1: Mechanics

This section introduces the foundational concepts of classical mechanics, including kinematics, Newton's laws of motion, work and energy, potential energy, momentum, rotation, and static equilibrium. It covers the motion of particles and rigid bodies, emphasizing the application of calculus to describe physical quantities like velocity, acceleration, and force. Students learn to analyze motion in one, two, and three dimensions, understand conservative and non-conservative forces, and apply conservation laws to solve complex problems.

Part 2: Oscillations and Waves

This part delves into oscillatory motion and wave phenomena. It begins with simple harmonic motion, exploring its characteristics and applications. The discussion then extends to various types of waves, including mechanical waves, sound waves, and standing waves. Key concepts such as wave speed, superposition, interference, and diffraction are introduced, providing a basis for understanding how energy and information are transmitted through different media via wave propagation.

Part 3: Thermodynamics

Thermodynamics explores the relationship between heat, work, temperature, and energy. This section covers the zeroth, first, and second laws of thermodynamics, introducing concepts like internal energy, heat capacity, entropy, and thermodynamic processes. It examines heat engines, refrigerators, and the efficiency limits of energy conversion, providing a macroscopic understanding of energy transformations and the direction of natural processes.

Part 4: Electricity and Magnetism

This extensive section covers the fundamental principles of electromagnetism. It starts with electrostatics, electric fields, Gauss's law, and electric potential. It then progresses to electric current, resistance, DC circuits, and magnetic fields generated by currents. Further topics include Faraday's law of induction, inductance, AC circuits, and Maxwell's equations, culminating in a unified description of electric and magnetic phenomena.

Part 5: Light and Optics

This part focuses on the nature and behavior of light. It introduces geometric optics, covering reflection, refraction, mirrors, and lenses, and their applications in optical instruments. It then transitions to wave optics, discussing interference, diffraction, and polarization of light. The dual wave-particle nature of light is explored, laying the groundwork for understanding more

advanced topics in modern physics.

Part 6: Modern Physics

The final section provides an introduction to modern physics, covering topics that emerged in the 20th century. This includes special relativity, quantum physics, atomic physics, nuclear physics, and an overview of particle physics. Concepts such as wave-particle duality, the uncertainty principle, quantum numbers, radioactivity, and fundamental forces are introduced, offering insights into the microscopic world and the structure of matter.

Themes

- Problem-Solving Strategies
- Conceptual Understanding
- Application of Calculus
- Foundational Principles
- Scientific Inquiry

Frequently Asked Questions

What is Physics for scientists and engineers serway jewett 10th edition about?

This textbook provides a comprehensive, calculus-based introduction to physics for university students. It covers classical mechanics, thermodynamics, electricity and magnetism, optics, and modern physics, emphasizing conceptual understanding and problem-solving skills essential for science and engineering disciplines.

Is Physics for scientists and engineers serway jewett 10th edition worth reading?

Yes, it is widely regarded as a highly effective and comprehensive textbook for introductory university physics. Its clear explanations, extensive problem sets, and logical structure make it an excellent resource for students seeking a rigorous foundation in physics for STEM fields.

How does Physics for scientists and engineers serway jewett 10th edition end?

Spoiler: The book concludes with an introduction to modern physics, covering topics such as special relativity, quantum physics, atomic physics, nuclear physics, and an overview of particle physics, providing a glimpse into the frontiers of physical understanding.

Who should read Physics for scientists and engineers serway jewett 10th edition?

This book is primarily intended for university students majoring in science, engineering, and other technical fields who are taking a calculus-based introductory physics course. It is also a valuable reference for anyone seeking a deep and rigorous understanding of fundamental physics principles.

How long does it take to read Physics for scientists and engineers serway jewett 10th edition?

Given its extensive coverage and depth, a thorough 'read' (which for a textbook implies studying and working through problems) could take upwards of 50-70 hours for a full pass, and significantly more for complete mastery over a two-semester course.