

SECTION 17 3 HOLT PHYSICS REVIEW ANSWERS Workbook

section 17 3 holt physics review answers is a crucial resource for students studying physics, especially when preparing for exams or seeking to deepen their understanding of complex concepts. Holt Physics, developed by Holt, Rinehart and Winston, offers comprehensive review materials that cover a broad spectrum of physics topics. Section 17.3 typically focuses on specific areas such as electromagnetic waves, optics, or related phenomena, depending on the edition. Having access to accurate and detailed review answers can significantly enhance learning efficiency, clarify difficult concepts, and improve test performance. This article provides an in-depth overview of key points related to **section 17 3 holt physics review answers**, along with tips for mastering the material.

Understanding the Focus of Section 17.3 in Holt Physics

Section 17.3 usually covers specific physics principles that students need to grasp thoroughly. While the exact content can vary, it often centers around topics such as electromagnetic radiation, wave properties, or light behavior. To maximize your understanding, it's essential to identify the core concepts typically addressed in this section.

Common Topics Covered in Section 17.3

- Properties of Electromagnetic Waves
- The Electromagnetic Spectrum
- Speed of Light and Its Implications
- Wave Behavior: Reflection, Refraction, and Diffraction
- Optical Phenomena and Applications

Having a clear understanding of these areas can help you approach review questions confidently and utilize the answers effectively.

Key Concepts in Section 17.3 Holt Physics Review Answers

To excel in this section, students should focus on mastering several fundamental concepts. The review answers serve as a guide to reinforce these ideas and prepare for assessments.

Electromagnetic Waves and Their Properties

Electromagnetic waves are oscillations of electric and magnetic fields that propagate through space. They are characterized by:

- Wavelength
- Frequency
- Speed (which is approximately 3.00×10^8 m/s in a vacuum)
- Amplitude

The review answers often clarify how these properties relate, such as the inverse relationship between wavelength and frequency.

The Electromagnetic Spectrum

This spectrum encompasses all types of electromagnetic radiation, from radio waves to gamma rays. Key points include:

- Different types of waves are distinguished by their wavelengths and frequencies
- Visible light is just a small part of the spectrum
- Applications vary across the spectrum, including communication, medical imaging, and more

Understanding the spectrum helps in answering questions related to wave behaviors and their practical uses.

Speed of Light and Its Significance

The speed of light (c) is a fundamental constant in physics. Review answers often emphasize:

- The value of $c = 3.00 \times 10^8$ m/s
- How this speed affects the behavior of electromagnetic waves
- The relationship between wavelength, frequency, and speed: $c = \lambda f$

Grasping this relationship is essential for solving problems involving wave properties.

Wave Reflection, Refraction, and Diffraction

These phenomena describe how waves interact with different media:

- Reflection: waves bounce off surfaces
- Refraction: waves bend when entering a different medium
- Diffraction: waves spread out after passing through openings or around obstacles

Review answers often include diagrams and equations to illustrate these concepts.

Optical Phenomena and Applications

This includes topics like:

- Mirrors and lenses
- Dispersion of light into a spectrum
- Optical instruments such as microscopes and telescopes
- Prisms and the formation of rainbows

Mastering these areas helps in understanding real-world applications and answering related questions.

Strategies for Using Holt Physics Review Answers Effectively

Having the review answers is valuable, but knowing how to use them efficiently can make a significant difference.

Step-by-Step Approach to Review

- Read the question carefully, identifying what concept it tests
- Attempt to solve the problem on your own first
- Compare your answer with the Holt Physics review answer
- Analyze any discrepancies and review relevant concepts
- Use additional resources if needed, such as diagrams or videos

Tips for Maximizing Learning from Review Answers

- Don't just memorize answers?understand the reasoning behind them
- Practice similar problems to reinforce concepts
- Use review answers as a study guide to identify weak areas
- Discuss challenging questions with teachers or classmates for clarity
- Regularly revisit difficult topics to build confidence and mastery

Additional Resources to Complement Holt Physics Review Answers

To deepen your understanding, consider supplementing review answers with other materials:

- Online tutorials and videos on electromagnetic waves and optics
- Physics textbooks that explain concepts in detail
- Practice problems with solutions to test your knowledge
- Study groups for collaborative learning

Combining these resources with Holt's review answers will create a well-rounded study plan.

Conclusion: Mastering Section 17.3 in Holt Physics

Access to accurate **section 17.3 holt physics review answers** is an invaluable tool for students aiming to excel in physics. By understanding key concepts such as electromagnetic waves, the spectrum, wave behaviors, and optical phenomena, students can confidently tackle related questions. Remember to approach review answers as learning tools, not just solutions—use them to clarify, understand, and reinforce your knowledge. With consistent practice, strategic studying, and the right resources, mastering the material in section 17.3 becomes an achievable goal. Stay focused, practice regularly, and leverage all available resources to succeed in your physics journey.

Section 17.3 Holt Physics Review Answers serve as an essential resource for students tackling the complexities of modern physics, particularly in understanding the principles of wave behavior, sound, and electromagnetic radiation. Whether you're preparing for a test, completing homework, or seeking a deeper grasp of physics concepts, reviewing Holt Physics section 17.3 answers can significantly enhance your comprehension. This guide aims to provide a comprehensive, detailed analysis of the key concepts, typical questions, and strategies to master this section effectively.

Understanding Section 17.3 in Holt Physics: An Overview

Section 17.3 of Holt Physics usually focuses on wave phenomena, particularly sound waves and electromagnetic waves. It explores how waves propagate, interact, and are characterized by properties like frequency, wavelength, and amplitude. The section also discusses the behavior of waves in different media, the Doppler effect, and the principles underlying the behavior of light and sound.

In the context of Holt Physics review answers, this section often includes problems that test your understanding of wave speed calculations, the relationship between wave properties, and real-world applications like Doppler shifts observed in astronomy or radar.

Key Concepts Covered in Section 17.3

- Wave Properties and Characteristics
 - Wavelength (λ): The distance between successive crests or troughs.
 - Frequency (f): How many waves pass a point per second.
 - Wave Speed (v): The speed at which the wave propagates through a medium.
 - Amplitude: The maximum displacement from equilibrium, related to wave energy.
- The Wave Equation

The fundamental relation connecting wave properties:

- $v = f \times \lambda$
- This equation allows you to find any one property if the others are known.

- Types of Waves

- Mechanical Waves: Require a medium (sound waves).
- Electromagnetic Waves: Do not require a medium (light, radio waves).

- The Doppler Effect

A change in observed frequency or wavelength when the source or observer moves relative to each other, critical in applications like radar and astronomy.

- Sound and Light Wave Interactions

- Reflection, refraction, diffraction.
- Applications like sonar, radar, and optical devices.

Typical Questions and Holt Physics Review Answers for Section 17.3

Question 1: Calculating Wave Speed

Given a wave with a frequency of 50 Hz and a wavelength of 0.5 meters, what is its speed?

Answer:

Using $v = f \times \lambda$,

$$v = 50 \text{ Hz} \times 0.5 \text{ m} = 25 \text{ m/s}$$

This straightforward calculation emphasizes understanding the wave equation and the importance of units.

Question 2: Understanding the Doppler Effect

If a train approaches at a speed of 30 m/s emitting a horn sound of frequency 1000 Hz, what is the observed frequency? Assume the speed of sound in air is 340 m/s.

Answer:

The Doppler effect formula when the source moves towards the observer:

$$f' = f \times (v + v_o) / (v - v_s)$$

Here, v_o (observer speed) = 0 (stationary observer),

v_s = 30 m/s (source moving towards the observer),

v = 340 m/s (speed of sound).

$$f' = 1000 \text{ Hz} \times (340 + 0) / (340 - 30) = 1000 \text{ Hz} \times 340 / 310 \approx 1000 \text{ Hz} \times 1.0968 \approx 1096.8 \text{ Hz}$$

This illustrates how motion impacts perceived frequency? a key concept in wave physics.

Question 3: Wavelength and Frequency Relationship

If a wave travels at 300 m/s and has a frequency of 15 Hz, what is its wavelength?

Answer:

Using $\lambda = v / f$,

$$\lambda = 300 \text{ m/s} / 15 \text{ Hz} = 20 \text{ meters}$$

This reinforces the direct link between wavelength and frequency.

Question 4: Sound Intensity and Amplitude

Explain how the amplitude of a sound wave relates to its loudness.

Answer:

The amplitude of a sound wave is directly related to its energy and perceived loudness. Larger amplitude waves produce louder sounds because they cause greater pressure variations in the air. Conversely, smaller amplitudes correspond to softer sounds.

Strategies for Mastering Section 17.3 Concepts

- Practice Using the Wave Equation

Become comfortable manipulating $v = f \times \lambda$ for different scenarios to quickly solve problems involving wave speed, frequency, or wavelength.

- Visualize Wave Phenomena

Use diagrams to understand wave behaviors such as reflection, refraction, and interference. Visualizing the wave interactions helps in grasping complex concepts.

- Relate Concepts to Real-World Applications

Connect abstract concepts to real-world phenomena like Doppler shifts in astronomy, sonar imaging, or musical instruments to deepen understanding.

- Pay Attention to Units

Always check units when performing calculations to avoid errors, especially when converting between meters, seconds, and Hertz.

- Review Practice Problems

Go through Holt Physics review answers and practice problems to reinforce understanding and identify areas needing more focus.

Additional Resources and Tips

- Online Simulations: Utilize physics simulations to see wave behavior visually.
- Flashcards: Create flashcards for wave properties, formulas, and effects.
- Study Groups: Collaborate with classmates to discuss challenging concepts and solutions.
- Ask Questions: Don't hesitate to seek clarification from teachers or online forums for complex problems.

Final Thoughts

Understanding Section 17.3 Holt Physics review answers is crucial for mastering wave phenomena in physics. By focusing on core concepts, practicing calculations, and applying real-world examples, students can develop a strong grasp of how waves behave and interact. This not only prepares you for exams but also enhances your appreciation for the physics underlying many technologies and natural phenomena around us. Remember, consistent practice and visualization are key to success in mastering wave physics concepts.

Question What topics are covered in Section 17.3 of Holt Physics, and how do they relate to the review answers? Section 17.3 typically covers concepts related to electromagnetic induction, such as Faraday's Law and induced emf. The review answers provide explanations and problem-solving strategies for these topics to help students understand the principles and prepare for assessments. **Answer** How can I effectively use Holt Physics Section 17.3 review answers to improve my understanding? Use the review answers to check your work, clarify concepts you're struggling with, and practice solving similar problems. Revisit the explanations provided to reinforce your grasp of electromagnetic induction topics and ensure you understand the reasoning behind each solution. Are the Holt Physics Section 17.3 review answers suitable for exam preparation? Yes, the review answers are designed to reinforce key concepts and problem-solving techniques from Section 17.3, making them a valuable resource for exam preparation. They help you identify common question types and understand how to approach them effectively. What are some common challenges students face with Section 17.3, and how do the Holt review answers address them? Students often struggle with applying Faraday's Law and calculating induced emf. The Holt review answers break down these problems step-by-step, providing clear explanations and examples to help students overcome these difficulties. Where can I find the official Holt Physics Section 17.3 review answers online? Official Holt Physics review answers are typically available through your teacher's resource portal, or you may access them via authorized online educational platforms or textbook companion

websites. Be sure to use legitimate sources to ensure accuracy. How do the concepts in Section 17.3 connect to real-world applications? The principles of electromagnetic induction in Section 17.3 underpin many technologies such as transformers, electric generators, and induction cooktops. Understanding these review answers helps students see the practical relevance of physics concepts in everyday life. Can reviewing Holt Physics Section 17.3 answers help me grasp advanced topics like Lenz's Law and motional emf? Absolutely. The review answers explain these advanced topics clearly, illustrating how Lenz's Law predicts the direction of induced currents and how motional emf is generated. Reviewing these solutions enhances comprehension and problem-solving skills for complex concepts.

Related keywords: Section 17.3 Holt physics review answers, physics review questions, Holt physics solutions, physics textbook answers, section 17.3 concepts, Holt physics practice problems, physics chapter 17 section 3, Holt physics answer key, physics problem solutions, Holt physics review guide

Serway Physics 8th Edition

Serway Physics 8th Edition: An In-Depth Guide for Students and Educators

Serway Physics 8th Edition is a comprehensive textbook widely used by physics students and educators to understand foundational and advanced concepts in physics. Authored by Raymond A. Serway, this edition continues the tradition of providing clear explanations, engaging problems, and real-world applications that enhance the learning experience. Whether you're a student preparing for exams or an instructor seeking a dependable teaching resource, the 8th edition of Serway's physics book offers valuable insights into the fundamental principles of physics, making complex topics accessible and engaging.

Overview of Serway Physics 8th Edition

Key Features and Highlights

- **Clear and Concise Explanations:** The book breaks down complex physics concepts into easily understandable segments, making it suitable for both beginners and advanced learners.
- **Rich Visual Content:** The inclusion of detailed diagrams, illustrations, and graphs helps visualize phenomena and reinforce understanding.
- **Variety of Problems:** The book offers numerous practice problems, from basic to challenging, to

test comprehension and develop problem-solving skills.

- Real-World Applications: Examples drawn from everyday life and current technology demonstrate the relevance of physics principles.
- Integrated Learning Tools: Supplementary online resources, including quizzes, animations, and tutorials, are available to enhance the learning experience.

Target Audience

Serway Physics 8th Edition is primarily designed for:

- Undergraduate students taking introductory or intermediate physics courses
- Instructors seeking a reliable textbook for classroom teaching
- Self-learners interested in gaining a solid understanding of physics fundamentals

Content Structure of Serway Physics 8th Edition

Organizational Layout

The book is organized into multiple chapters, each focusing on specific areas of physics, such as mechanics, thermodynamics, electromagnetism, optics, and modern physics. This logical flow ensures a progressive build-up of concepts, facilitating better comprehension.

Major Sections Covered

- Introduction to Physics and Measurement: Fundamentals of scientific measurement, units, and dimensional analysis.
- Kinematics: Describing motion in one and two dimensions.
- Dynamics: Newton's laws, applications, and friction.
- Work, Energy, and Power: Conservation laws and energy transfer.
- Momentum and Collisions: Impulse, conservation of momentum.
- Rotational Motion: Angular velocity, torque, and rotational dynamics.
- Oscillations and Waves: Simple harmonic motion, wave properties.
- Thermodynamics: Heat, temperature, laws of thermodynamics.
- Electromagnetism: Electric fields, circuits, magnetic fields.
- Optics: Reflection, refraction, lenses, and mirrors.
- Modern Physics: Quantum mechanics, atomic physics, nuclear physics.

Why Choose Serway Physics 8th Edition?

Comprehensive Coverage and Depth

The 8th edition provides in-depth explanations of core physics concepts, making it suitable for courses that require a thorough understanding. It balances theory with practical applications, ensuring students grasp both the "how" and the "why."

Effective Learning Resources

The textbook is complemented by online tools, including:

- Interactive simulations
- Video tutorials
- Practice quizzes
- Problem-solving guides

These resources aid in reinforcing learning and preparing for exams effectively.

Updated Content and Pedagogical Approach

The 8th edition incorporates:

- Recent scientific developments
- Updated problem sets reflecting current technology
- Pedagogical features such as summary boxes, key terms, and review questions to facilitate active learning

How to Maximize Learning with Serway Physics 8th Edition

Study Strategies

- Read Actively: Engage with the text by highlighting key points and taking notes.
- Work Through Problems: Practice a variety of problems to strengthen problem-solving skills.
- Use Online Resources: Supplement your study with online tutorials and simulations.
- Form Study Groups: Collaborate with peers to discuss complex topics.
- Regular Review: Revisit previous chapters to reinforce retention.

Supplementary Tools and Resources

- Solution Manuals: For guided problem-solving.
- Online Quizzes: To assess understanding.
- Instructor Resources: Lecture slides and test banks for educators.

Where to Find Serway Physics 8th Edition

Purchasing Options

- Bookstores: Academic and general bookstores often stock the latest editions.
- Online Retailers: Amazon, eBay, and other e-commerce platforms offer new and used copies.
- Digital Versions: E-books and PDF formats available for quick access and portability.
- Library Access: University and public libraries may have copies available for borrowing.

Pricing and Editions

While newer editions are available, the 8th edition remains popular for its proven content and teaching approach. Prices vary based on condition, format, and seller.

Conclusion: The Value of Serway Physics 8th Edition

Choosing the right physics textbook can significantly impact your learning journey. **Serway Physics 8th Edition** stands out as a trusted, comprehensive resource that bridges theory and practice. Its well-structured content, rich visual aids, and variety of problems make it an ideal choice for students aiming to excel in physics. Educators also benefit from its pedagogical features and supplementary resources, making it a versatile tool for effective teaching.

Whether you're tackling your first physics course or delving into more advanced topics, the 8th edition of Serway's physics book provides a solid foundation and a pathway to mastery. Invest in this edition to enhance your understanding of the universe's fundamental laws and prepare for future scientific pursuits.

Keywords for SEO Optimization:

Serway physics 8th edition, physics textbook, introductory physics, physics problems, physics solutions, physics study guide, physics concepts, physics learning resources, physics for students, physics for educators

Serway Physics 8th Edition: A Comprehensive Review and In-Depth Analysis

Physics textbooks are foundational tools for students and educators alike, serving as both

instructional guides and reference materials. Among these, Serway Physics 8th Edition has garnered substantial attention for its thorough content, pedagogical approach, and clarity. This article aims to provide an in-depth, expert-level review of this edition, exploring its features, strengths, and areas for improvement.

Introduction to Serway Physics 8th Edition

Serway Physics 8th Edition, authored primarily by Raymond A. Serway and John W. Jewett, stands as a pivotal resource in college-level physics education. Building upon previous editions, the 8th edition emphasizes conceptual understanding, problem-solving skills, and real-world applications. Its comprehensive coverage spans classical mechanics, electromagnetism, thermodynamics, waves, optics, and modern physics.

This edition is tailored for undergraduate students, aiming to foster both conceptual insight and mathematical proficiency. Its pedagogical design integrates visual aids, examples, and exercises to enhance learning outcomes.

Content Organization and Scope

Structured Approach to Physics Topics

One of the defining features of Serway Physics 8th Edition is its logical, systematic organization of topics. The book begins with fundamental concepts, gradually progressing toward more complex theories. The typical structure includes:

- Mechanics ? motion, forces, energy, momentum
- Thermal Physics ? temperature, heat, thermodynamics
- Electromagnetism ? electric and magnetic fields, circuits
- Waves and Optics ? wave properties, light behavior
- Modern Physics ? quantum mechanics, nuclear physics

This progression ensures students build a solid foundation before tackling advanced material.

Depth and Breadth of Content

The 8th edition offers an expansive treatment of topics, including:

- Classical Mechanics: Newtonian principles, rotational motion, oscillations
- Electromagnetic Theory: Maxwell's equations, electromagnetic waves

- Thermodynamics: laws of thermodynamics, entropy, applications
- Quantum Physics: photoelectric effect, wave-particle duality
- Nuclear Physics: radioactivity, nuclear reactions

The content depth is appropriate for introductory courses but also provides enough detail for advanced exploration, making it versatile across different levels.

Pedagogical Features and Learning Tools

Clear Explanations and Visual Aids

Serway's writing style emphasizes clarity. Complex concepts are broken down into manageable parts, often accompanied by diagrams, illustrations, and graphs that clarify the material. For example:

- Illustrations of vectors, forces, and fields
- Diagrams depicting experimental setups
- Graphs illustrating relationships between variables

These visual tools aid in conceptual understanding and retention.

Worked Examples and Practice Problems

The textbook features numerous worked examples that demonstrate problem-solving techniques step-by-step. These examples are critical for bridging theory and application, fostering analytical skills.

The end-of-chapter problems vary in difficulty, including:

- Basic comprehension questions
- Application-based problems
- Challenging exercises for advanced students

Solutions are provided for selected problems, encouraging self-assessment.

Special Features

- Conceptual Questions: To test understanding beyond calculations

- Summary Sections: Brief overviews of each chapter's key points
- Real-World Applications: Connecting physics principles to everyday phenomena
- Online Resources: Companion website offering additional quizzes, animations, and supplementary materials

Strengths of Serway Physics 8th Edition

Comprehensive Coverage

The textbook covers a wide array of topics thoroughly, making it suitable for a full semester or even a two-course sequence. Its balanced approach ensures students grasp fundamental principles while appreciating their applications.

Pedagogical Design

The combination of clear explanations, visual aids, and varied exercises caters to diverse learning styles. The inclusion of conceptual questions enhances critical thinking.

Problem-Solving Focus

Serway emphasizes developing problem-solving skills. The step-by-step worked examples and end-of-chapter problems bolster confidence and competence in tackling physics questions.

Quality of Visual Content

High-quality illustrations and diagrams significantly enhance comprehension. Visual learning is particularly vital in physics, where spatial reasoning is often key.

Relevance and Applications

Real-world examples and applications help students see the relevance of physics in everyday life, motivating engagement and curiosity.

Limitations and Areas for Improvement

Mathematical Rigor

While the book balances conceptual and mathematical content, some students may find certain derivations and formulas presented without sufficient background explanation, potentially posing challenges for complete novices.

Digital Integration

Although the accompanying online resources are valuable, their integration could be more seamless. Interactive simulations, for example, could be more prominently featured to enhance engagement.

Coverage of Modern Physics

Modern physics topics, such as quantum mechanics and nuclear physics, are introduced but could benefit from more in-depth discussion or additional supplementary materials for students interested in advanced concepts.

Accessibility

Language and explanations are generally clear, but some sections contain dense technical language that may require supplementary tutoring or guidance for struggling readers.

Comparison with Other Textbooks

When compared to other introductory physics texts like Halliday & Resnick or Knight's Physics for Scientists and Engineers, Serway 8th Edition holds its own in clarity and pedagogical approach. Its strengths lie in the structured presentation and emphasis on conceptual understanding.

However, some educators and students prefer the more mathematically rigorous or application-focused content found in alternative texts. The choice ultimately depends on the course objectives and student preparedness.

Target Audience and Usage Recommendations

Serway Physics 8th Edition is ideally suited for:

- Undergraduate students taking introductory physics courses
- Instructors seeking a balanced, student-friendly textbook
- Self-learners interested in foundational physics concepts

For maximum benefit, students should complement the textbook with online simulations, problem-solving practice, and supplemental resources, especially if they aim to pursue more advanced physics topics.

Conclusion: Is Serway Physics 8th Edition a Worthy Investment?

In sum, Serway Physics 8th Edition remains a highly valuable resource in the realm of introductory physics education. Its comprehensive coverage, pedagogical clarity, and emphasis on problem-solving make it a dependable choice for students and educators alike.

While it has areas where enhancements could be made—particularly in integrating more interactive digital content and expanding on modern physics topics—it continues to serve as a robust foundation for understanding the physical universe.

For those seeking a well-structured, conceptually rich, and pedagogically sound physics textbook, Serway Physics 8th Edition stands out as a commendable option that can support learning at various levels of expertise.

Question What are the main topics covered in Serway Physics 8th Edition? Serway Physics 8th Edition covers fundamental topics such as mechanics, thermodynamics, electromagnetism, optics, and modern physics, providing a comprehensive overview suitable for introductory physics courses. **Answer** How does Serway Physics 8th Edition incorporate real-world applications? The book integrates real-world examples and problem-solving scenarios to help students understand the practical relevance of physics principles in everyday life and technological advancements. Are there online resources or supplements available for Serway Physics 8th Edition? Yes, students can access online resources like solution manuals, practice problems, and interactive tutorials through the publisher's website to enhance their learning experience. What are the most effective ways to use Serway Physics 8th Edition for exam preparation? Focus on understanding core concepts, practice end-of-chapter problems, utilize online resources, and review summary sections to reinforce learning and prepare effectively for exams. How does Serway Physics 8th Edition address modern physics topics? The edition introduces modern physics topics such as quantum mechanics, atomic physics, and relativity, providing foundational knowledge aligned with current scientific understanding. Is Serway Physics 8th Edition suitable for self-study students? Yes, the clear explanations, worked examples, and problem sets make it a valuable resource for self-study students seeking to learn physics independently. What are the updates or new features in Serway Physics 8th Edition compared to previous editions? The 8th edition includes updated problem sets, new illustrations, expanded sections on contemporary physics topics, and enhanced online resources to improve clarity and engagement. Can Serway Physics 8th Edition help with understanding laboratory physics experiments? While primarily a theoretical textbook, it offers explanations of fundamental principles behind experiments, aiding students in understanding laboratory concepts and procedures. How do instructors typically incorporate Serway Physics 8th Edition into their curriculum? Instructors use the book for lecture material, assign problem sets from the end-of-chapter exercises, and leverage the online resources to supplement classroom instruction.

Related keywords: Serway physics, physics textbook, college physics, physics problems, physics solutions, physics exercises, physics concepts, physics study guide, physics practice problems,

introductory physics

Read the full article online: [SERWAY PHYSICS 8TH EDITION](#)