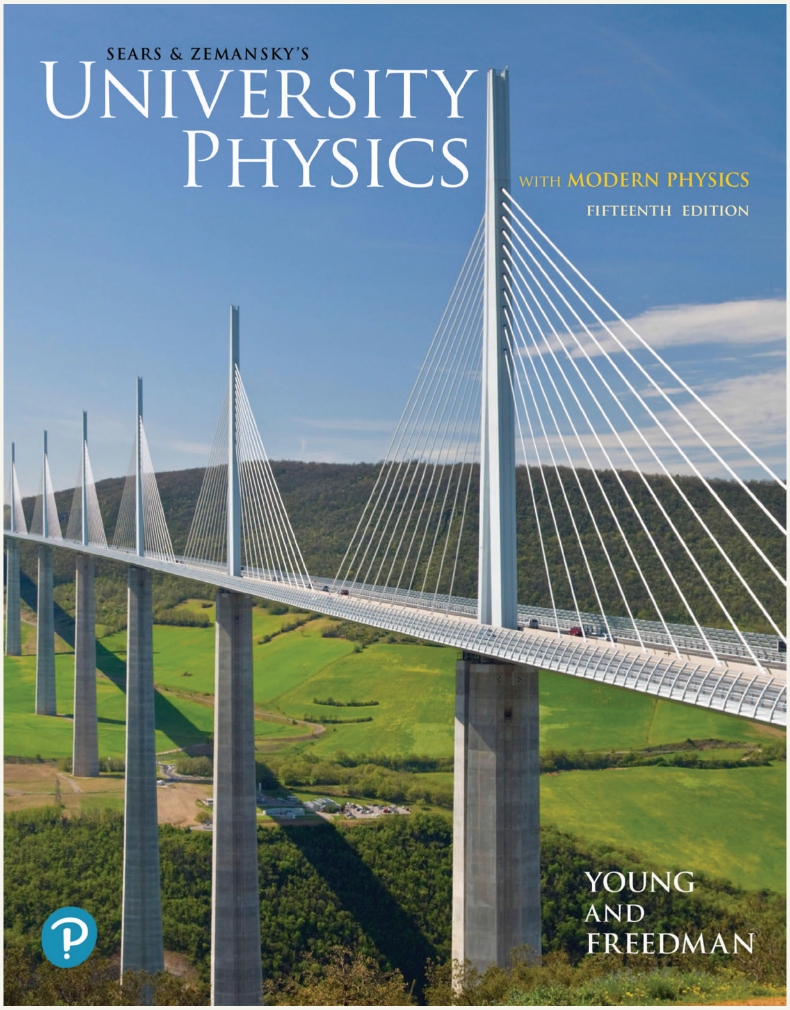
Practice makes perfect: Guided practice helps students develop into expert problem solvers

The new 15th Edition of *University Physics with Modern Physics* draws on data insights from hundreds of faculty and thousands of student users to address one of the biggest challenges for students in introductory physics courses: seeing the connections between worked examples in their textbook and related homework or exam problems. This edition offers multiple resources to address students' tendency to focus on the objects, situations, numbers, and questions posed in a problem, rather than recognizing the underlying principle or the problem's type. Mastering™ Physics gives students instructional support and just-in-time remediation as they work through problems, and links all end-of-chapter problems directly to the Pearson eText for additional guidance.



Pearson

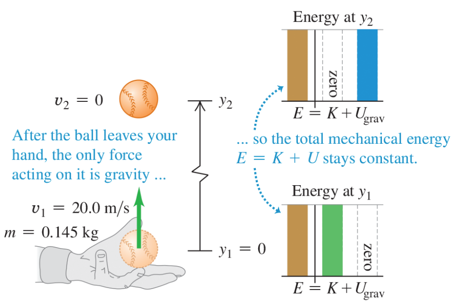
Guided practice features to help...

EXAMPLE 7.1 Height of a baseball from energy conservation WITH VARIATION PROBLEMS

You throw a 0.145 kg baseball straight up, giving it an initial velocity of magnitude 20.0 m/s. Find how high it goes, ignoring air resistance.

IDENTIFY and SET UP After the ball leaves your hand, only gravity does work on it. Hence total mechanical energy is conserved, and we can use Eq. (7.4). We take point 1 to be where the ball leaves your hand and point 2 to be where it reaches its maximum height. As in Fig. 7.2, we take the positive y-direction to be upward. The ball's speed at point 1 is $v_1 = 20.0$ m/s; at its maximum height it is instantaneously at rest, so $v_2 = 0$. We take the origin at point 1, so $y_1 = 0$ (**Fig. 7.4**). Our target variable, the distance the ball moves vertically between the two points, is the displacement $y_2 - y_1 = y_2 - 0 = y_2$.

Figure 7.4 After a baseball leaves your hand, total mechanical energy $E = K + U$ is conserved.



EXECUTE We have $y_1 = 0$, $U_{grav,1} = mgy_1 = 0$, and $K_2 = \frac{1}{2}mv_2^2 = 0$. Then Eq. (7.4), $K_1 + U_{grav,1} = K_2 + U_{grav,2}$, becomes

$$K_1 = U_{grav,2}$$

As the energy bar graphs in Fig. 7.4 show, this equation says that the kinetic energy of the ball at point 1 is completely converted to gravitational potential energy at point 2. We substitute $K_1 = \frac{1}{2}mv_1^2$ and $U_{grav,2} = mgy_2$ and solve for y_2:

$$\frac{1}{2}mv_1^2 = mgy_2$$

$$y_2 = \frac{v_1^2}{2g} = \frac{(20.0 \text{ m/s})^2}{2(9.80 \text{ m/s}^2)} = 20.4 \text{ m}$$

EVALUATE As a check, use the given value of v_1 and our result for y_2 to calculate the kinetic energy at point 1 and the gravitational potential energy at point 2. You should find that these are equal: $K_1 = \frac{1}{2}mv_1^2 = 29.0$ J and $U_{grav,2} = mgy_2 = 29.0$ J. Note that we could have found the result $y_2 = v_1^2/2g$ by using Eq. (2.13) in the form $v_{2y}^2 = v_{1y}^2 - 2g(y_2 - y_1)$.

What if we put the origin somewhere else—for example, 5.0 m below point 1, so that $y_1 = 5.0$ m? Then the total mechanical energy at point 1 is part kinetic and part potential; at point 2 it's still purely potential because $v_2 = 0$. You'll find that this choice of origin yields $y_2 = 25.4$ m, but again $y_2 - y_1 = 20.4$ m. In problems like this, you are free to choose the height at which $U_{grav} = 0$. The physics doesn't depend on your choice.

KEYCONCEPT Total mechanical energy (the sum of kinetic energy and gravitational potential energy) is conserved when only the force of gravity does work.

P. 204

NEW! Worked Example Key Concept statements appear at the end of every example, providing a brief summary of the key idea used in the solution to consolidate what was most important and what can be broadly applied to other problems, helping students identify strategies that can be used in future problems.

NEW! Key Example Variation Problems in the new Guided Practice section at the end of each chapter are based on selected worked examples. They build in difficulty by changing scenarios, swapping the knowns vs. unknowns, and adding complexity and/or steps of reasoning to provide the most helpful range of related problems that students must use the same basic approach to solve. Assignable in Mastering Physics, these "warm-up" exercises help students build problem-solving skills.

GUIDED PRACTICE

KEY EXAMPLE VARIATION PROBLEMS

Be sure to review EXAMPLES 7.1 and 7.2 (Section 7.1) before attempting these problems.

VP7.2.1 You throw a baseball (mass 0.145 kg) vertically upward. It leaves your hand moving at 12.0 m/s. Air resistance can be neglected. At what height above your hand does the ball have (a) half as much upward velocity, (b) half as much kinetic energy as when it left your hand?

VP7.2.2 You toss a rock of mass m vertically upward. Air resistance can be neglected. The rock reaches a maximum height h above your hand. What is the speed of the rock when it is at height (a) $h/4$ and (b) $3h/4$?

VP7.2.3 You throw a tennis ball (mass 0.0570 kg) vertically upward. It leaves your hand moving at 15.0 m/s. Air resistance cannot be neglected, and the ball reaches a maximum height of 8.00 m. (a) By how much does the total mechanical energy decrease from when the ball leaves your hand to when it reaches its maximum height? (b) What is the magnitude of the average force of air resistance?

VP7.2.4 You catch a volleyball (mass 0.270 kg) that is moving downward at 7.50 m/s. In stopping the ball, your hands and the volleyball descend together a distance of 0.150 m. (a) How much work do your hands do on the volleyball in the process of stopping it? (b) What is the magnitude of the force (assumed constant) that your hands exert on the volleyball?

P. 225

. . . develop problem-solving skills

BRIDGING PROBLEM Entropy Changes: Cold Ice in Hot Water

An insulated container of negligible mass holds 0.600 kg of water at 45.0°C. You put a 0.0500 kg ice cube at −15.0°C in the water (**Fig. 20.23**). (a) Calculate the final temperature of the water once the ice has melted. (b) Calculate the change in entropy of the system.

SOLUTION GUIDE

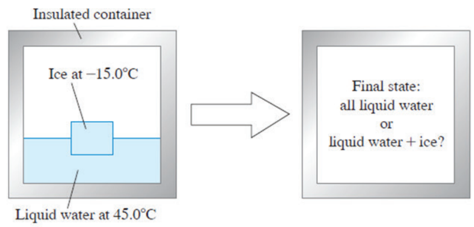
IDENTIFY and SET UP

1. Make a list of the known and unknown quantities, and identify the target variables.
2. How will you find the final temperature of the ice–water mixture? How will you decide whether or not all the ice melts?
3. Once you find the final temperature of the mixture, how will you determine the changes in entropy of (i) the ice initially at −15.0°C and (ii) the water initially at 45.0°C?

EXECUTE

4. Use the methods of Chapter 17 to calculate the final temperature T. (*Hint:* First assume that all of the ice melts, then write an equation which says that the heat that flows into the ice equals the heat that flows out of the water. If your assumption is correct, the final temperature that you calculate will be greater than 0°C. If your assumption is incorrect, the final temperature will be 0°C or less, which means that some ice remains. You'll then need to redo the calculation to account for this.)

Figure 20.23 What becomes of this ice–water mixture?



5. Use your result from step 4 to calculate the entropy changes of the ice and the water. (*Hint:* You must include the heat flow associated with temperature changes, as in Example 20.6, as well as the heat flow associated with the change of phase.)
6. Find the total change in entropy of the system.

EVALUATE

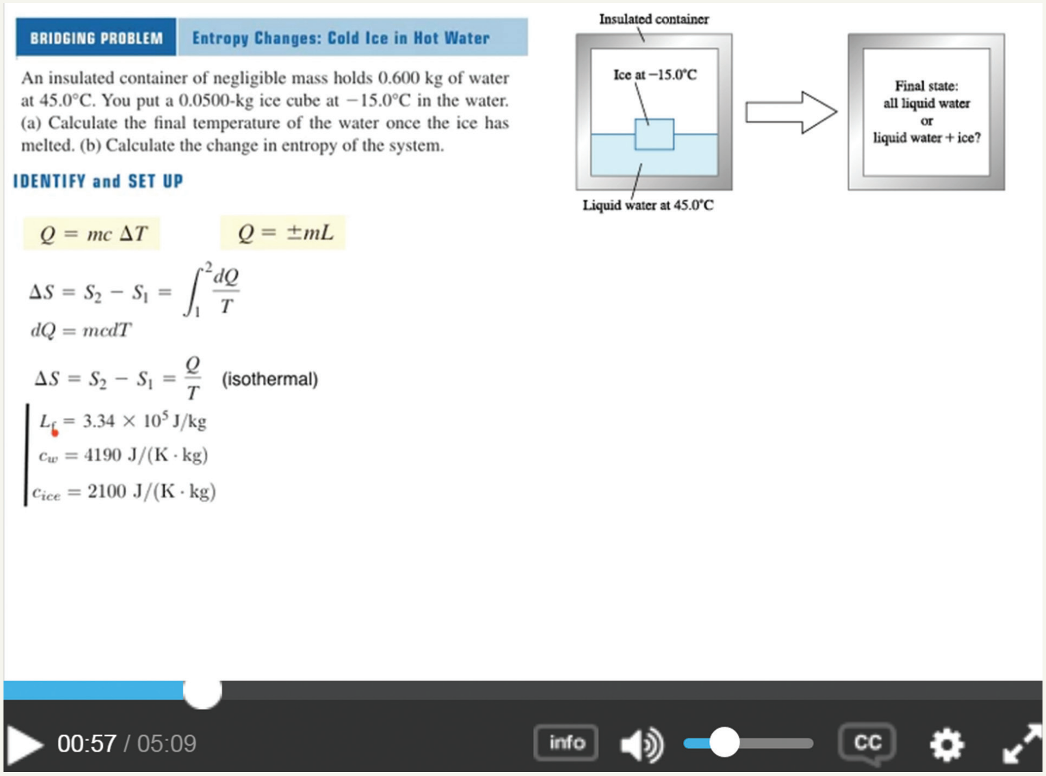
7. Do the signs of the entropy changes make sense? Why or why not?

P. 671

Scaffolded Bridging Problems

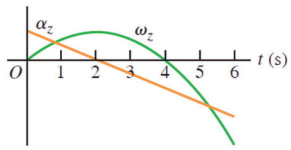
Scaffolded Bridging Problems now follow the Key Example Variation Problems in the Guided Practice section and help students move from single-concept worked examples to multiconcept homework problems.

NEW! Bridging Problem Tutorials, now assignable in Mastering Physics, walk students through the problem-solving process and provide links to the eText and detailed Video Tutor Solutions. In the Study Area in Mastering, these Video Tutor Solutions, as well as ones for every Worked Example in the book, provide a virtual teaching assistant on a round-the-clock basis.



Develop students' conceptual understanding of physics . . .

TEST YOUR UNDERSTANDING OF SECTION 9.1 The figure shows a graph of ω_z and α_z versus time for a particular rotating body. (a) During which time intervals is the rotation speeding up? (i) $0 < t < 2$ s; (ii) $2 \text{ s} < t < 4$ s; (iii) $4 \text{ s} < t < 6$ s. (b) During which time intervals is the rotation slowing down? (i) $0 < t < 2$ s; (ii) $2 \text{ s} < t < 4$ s; (iii) $4 \text{ s} < t < 6$ s.



ANSWER

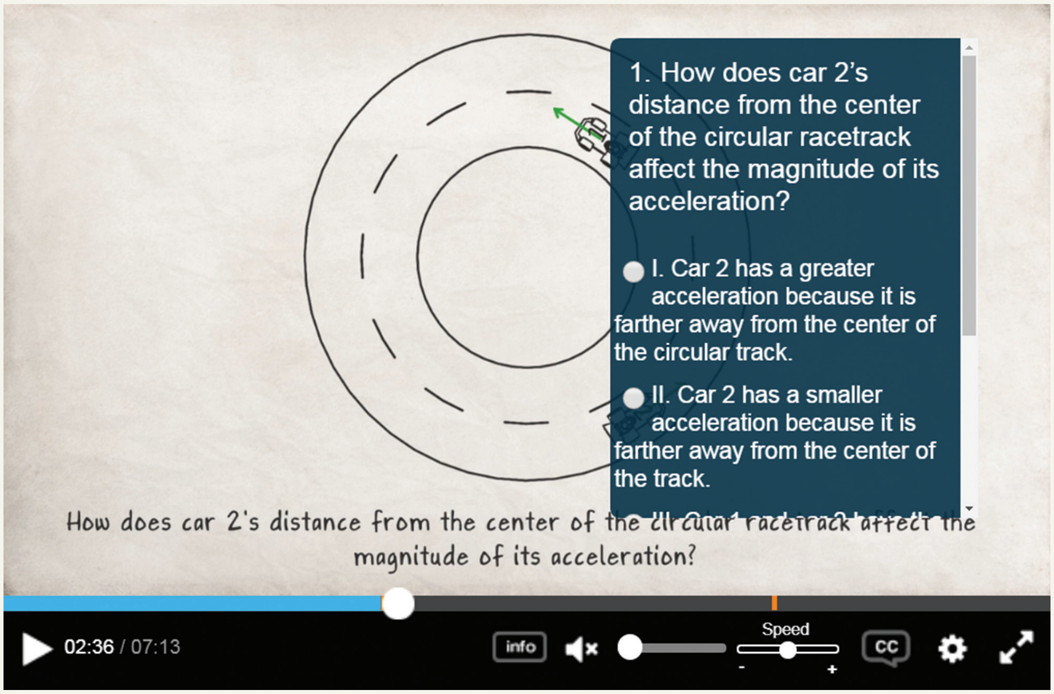
(a) **(i) and (iii)**, (b) **(ii)** The rotation is speeding up when the angular velocity and angular acceleration have the same sign, and slowing down when they have opposite signs. Hence it is speeding up for $0 < t < 2$ s (both ω_z and α_z are positive) and for $4 \text{ s} < t < 6$ s (both ω_z and α_z are negative) but is slowing down for $2 \text{ s} < t < 4$ s (ω_z is positive and α_z is negative). Note that the body is rotating in one direction for $t < 4$ s (ω_z is positive) and in the opposite direction for $t > 4$ s (ω_z is negative).

P. 277

Test Your Understanding questions at the end of most sections let students check their grasp of the material and use a multiple-choice or ranking-task format to probe for common misconceptions. The answers to these questions are now provided immediately after the question in order to encourage students to try them.

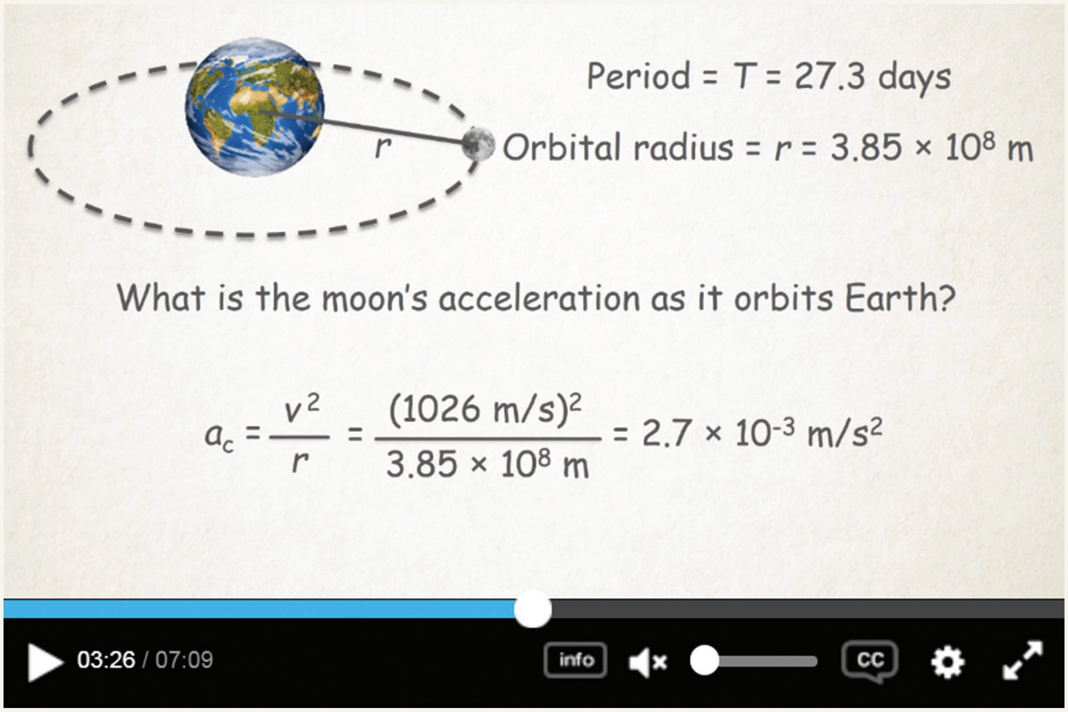
NEW! Direct Measurement Videos are short videos that show real situations of physical phenomena. Grids, rulers, and frame counters appear as overlays, helping students to make precise measurements of quantities such as position and time. Students then apply these quantities along with physics concepts to solve problems and answer questions about the motion of the objects in the video. These videos are assignable within Mastering.

. . . even before they come to class



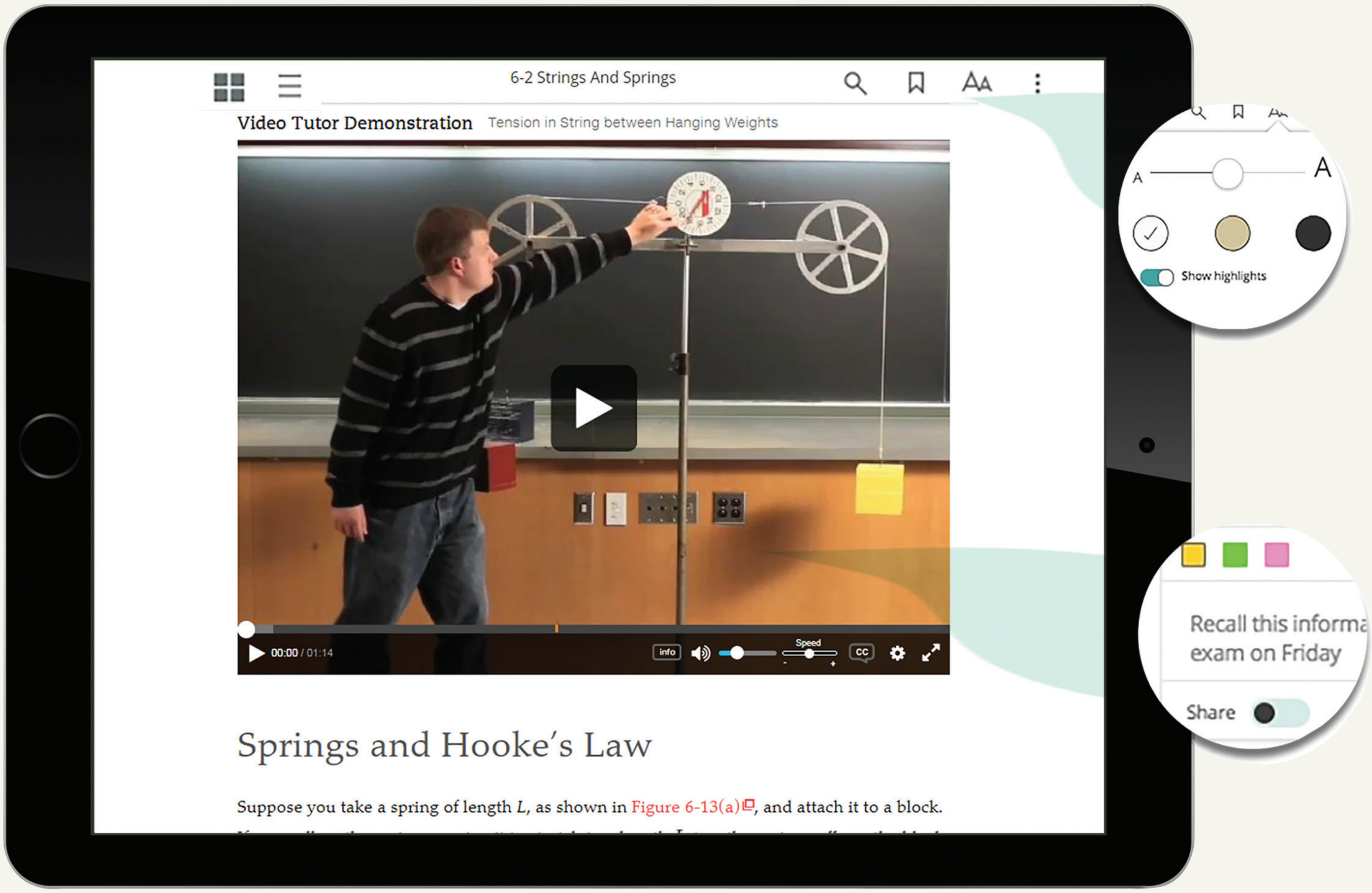
Conceptual Interactive Pre-lecture Videos provide an introduction to key topics with embedded assessment to help students prepare before lecture and to help professors identify students' misconceptions. These videos are assignable within Mastering.

NEW! Quantitative Pre-lecture Videos now complement the conceptual Interactive Pre-lecture Videos designed to expose students to concepts before class and help them learn how problems for a specific concept are worked. These videos are assignable within Mastering.

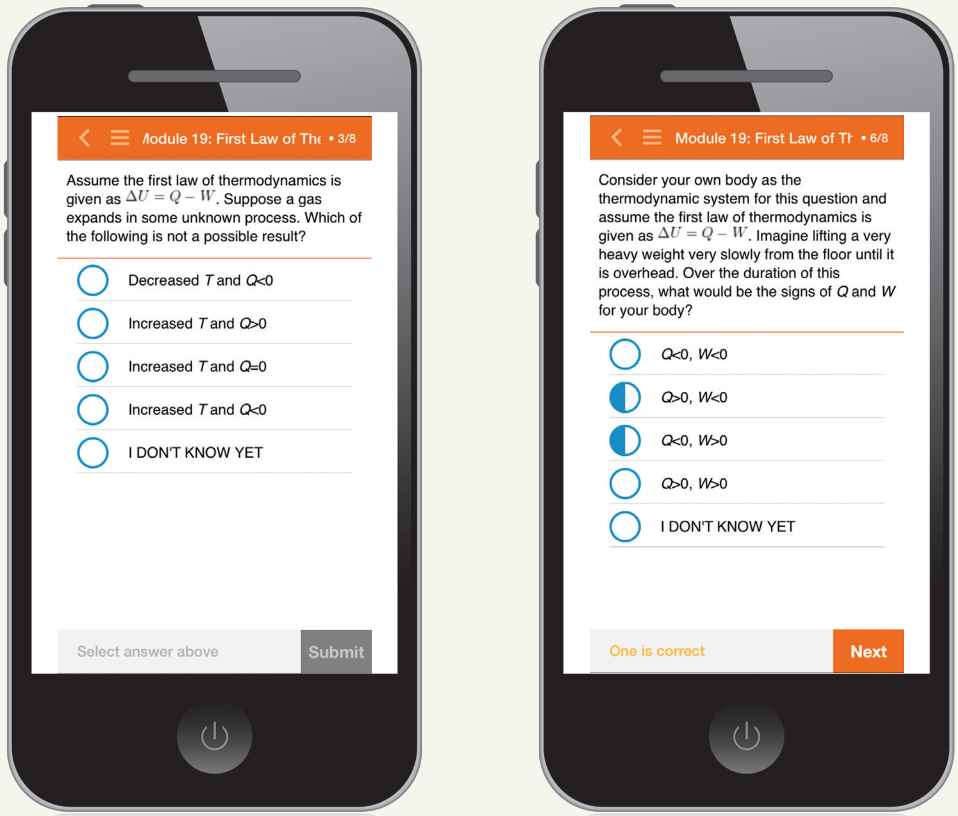


Reach every student . . .

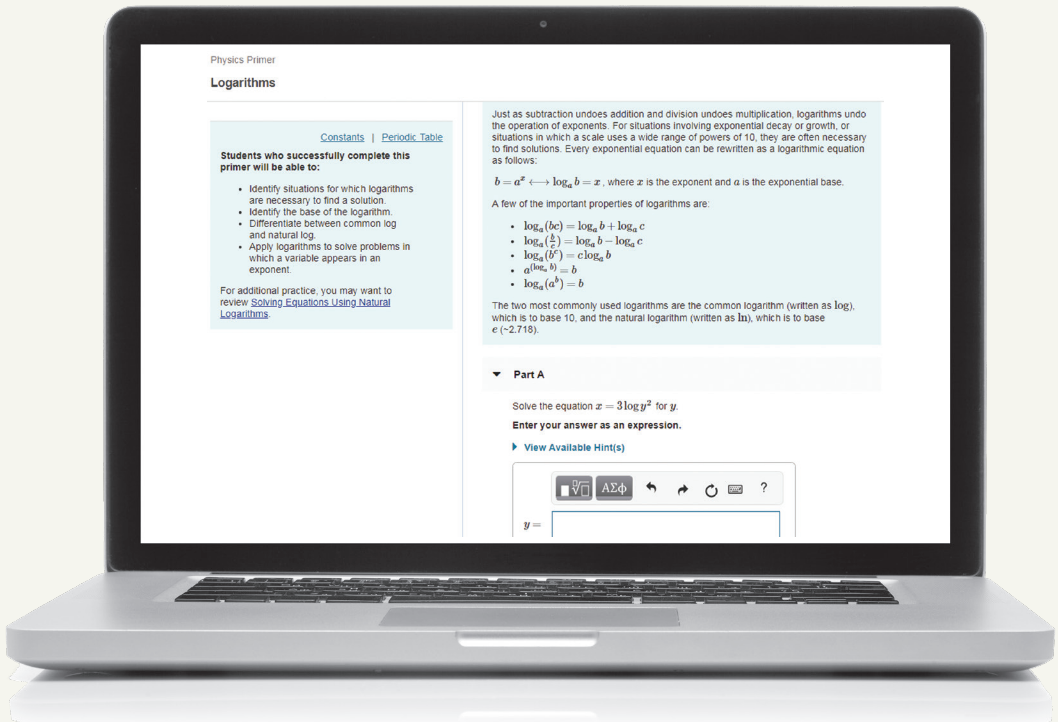
NEW! ***University Physics with Modern Physics*** **is now available in Pearson eText.** Pearson eText is a simple-to-use, mobile-optimized, personalized reading experience available within Mastering. It allows students to easily highlight, take notes, and review key vocabulary all in one place—even when offline. Seamlessly integrated videos, rich media, and embedded interactives engage students and give them access to the help they need when they need it. Pearson eText is available within Mastering when packaged with a new book or as an upgrade students can purchase online.



. . . with Mastering Physics

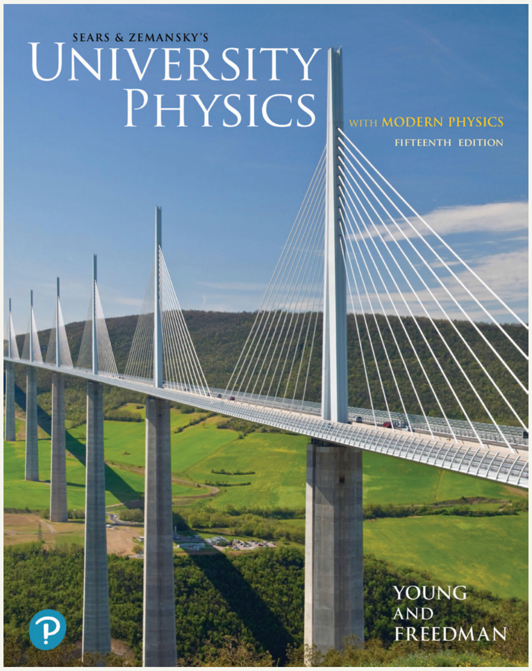


Dynamic Study Modules in Mastering Physics help students study effectively—and at their own pace—by keeping them motivated and engaged. The assignable modules rely on the latest research in cognitive science, using methods such as adaptivity, gamification, and intermittent rewards, to stimulate learning and improve retention.

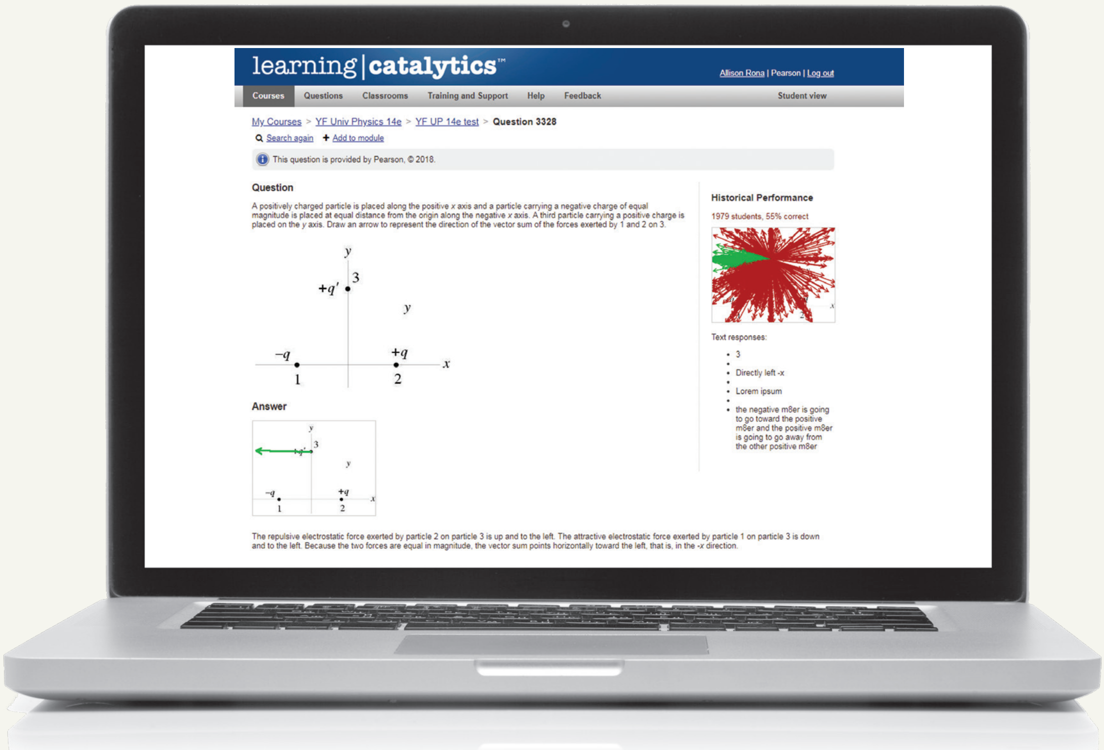


The Physics Primer refreshes students' math skills in the context of physics and prepares them for success in the course. These tutorials can be assigned before the course begins or throughout the course as just-in-time remediation. They utilize videos, hints, and feedback to ensure that students can practice and maintain their math skills, while tying together mathematical operations and physics analysis.

Instructor support you can rely on



University Physics with Modern Physics includes a full suite of instructor support materials in the Instructor Resources area in Mastering Physics. Resources include accessible PowerPoint lecture outlines; all annotated equations and problem-solving strategies; all figures, photos, tables, and end-of-chapter elements from the text; simulations; plus a solutions manual and test bank.



Instructors also have access to **Learning Catalytics**. With Learning Catalytics, you'll hear from every student when it matters most. You pose a variety of questions that help students recall ideas, apply concepts, and develop critical-thinking skills. Your students respond using their own smartphones, tablets, or laptops. You can monitor responses with real-time analytics and find out what your students do—and don't—understand. Then, you can adjust your teaching accordingly and even facilitate peer-to-peer learning, helping students stay motivated and engaged.

TO THE STUDENT

HOW TO SUCCEED IN PHYSICS BY REALLY TRYING

Mark Hollabaugh, Normandale Community College, Emeritus

Physics encompasses the large and the small, the old and the new. From the atom to galaxies, from electrical circuitry to aerodynamics, physics is very much a part of the world around us. You probably are taking this introductory course in calculus-based physics because it is required for subsequent courses that you plan to take in preparation for a career in science or engineering. Your professor wants you to learn physics and to enjoy the experience. He or she is very interested in helping you learn this fascinating subject. That is part of the reason your professor chose this textbook for your course. That is also the reason Drs. Young and Freedman asked me to write this introductory section. We want you to succeed!

The purpose of this section of *University Physics* is to give you some ideas that will assist your learning. Specific suggestions on how to use the textbook will follow a brief discussion of general study habits and strategies.

PREPARATION FOR THIS COURSE

If you had high school physics, you will probably learn concepts faster than those who have not because you will be familiar with the language of physics. If English is a second language for you, keep a glossary of new terms that you encounter and make sure you understand how they are used in physics. Likewise, if you are further along in your mathematics courses, you will pick up the mathematical aspects of physics faster. Even if your mathematics is adequate, you may find a book such as Edward Adelson's *Get Ready for Physics* to be a great help for sharpening your math skills as well as your study skills.

LEARNING TO LEARN

Each of us has a different learning style and a preferred means of learning. Understanding your own learning style will help you to focus on aspects of physics that may give you difficulty and to use those components of your course that will help you overcome the difficulty. Obviously you will want to spend more time on those aspects that give you the most trouble. If you learn by hearing, lectures will be very important. If you learn by explaining, then working with other students will be useful to you. If solving problems is difficult for you, spend more time learning how to solve problems. Also, it is important to understand and develop good study habits. Perhaps the most important thing you can do for yourself is set aside adequate, regularly scheduled study time in a distraction-free environment.

Answer the following questions for yourself:

- Am I able to use fundamental mathematical concepts from algebra, geometry, and trigonometry? (If not, plan a program of review with help from your professor.)
- In similar courses, what activity has given me the most trouble? (Spend more time on this.) What has been the easiest for me? (Do this first; it will build your confidence.)
- Do I understand the material better if I read the book before or after the lecture? (You may learn best by skimming the material, going to lecture, and then undertaking an in-depth reading.)
- Do I spend adequate time studying physics? (A rule of thumb for a class like this is to devote, on average, 2.5 hours out of class for each hour in class. For a course that meets 5 hours each week, that means you should spend about 10 to 15 hours per week studying physics.)
- Do I study physics every day? (Spread that 10 to 15 hours out over an entire week!) At what time of the day am I at my best for studying physics? (Pick a specific time of the day and stick to it.)
- Do I work in a quiet place where I can maintain my focus? (Distractions will break your routine and cause you to miss important points.)

WORKING WITH OTHERS

Scientists or engineers seldom work in isolation from one another but rather work cooperatively. You will learn more physics and have more fun doing it if you work with other students. Some professors may formalize the use of cooperative learning or facilitate the formation of study groups. You may wish to form your own informal study group with members of your class. Use e-mail to keep in touch with one another. Your study group is an excellent resource when you review for exams.

LECTURES AND TAKING NOTES

An important component of any college course is the lecture. In physics this is especially important, because your professor will frequently do demonstrations of physical principles, run computer simulations, or show video clips. All of these are learning activities that will help you understand the basic principles of physics. Don't miss lectures. If for some reason you do, ask a friend or member of your study group to provide you with notes and let you know what happened.

Take your class notes in outline form, and fill in the details later. It can be very difficult to take word-for-word notes, so just write down key ideas. Your professor may use a diagram from the textbook. Leave a space in your notes and add the diagram later. After class, edit your notes, filling in any gaps or omissions and noting things that you need to study further. Make references to the textbook by page, equation number, or section number.

Ask questions in class, or see your professor during office hours. Remember that the only "dumb" question is the one that is not asked. Your college may have teaching assistants or peer tutors who are available to help you with any difficulties.

EXAMINATIONS

Taking an examination is stressful. But if you feel adequately prepared and are well rested, your stress will be lessened. Preparing for an exam is a continuous process; it begins the moment the previous exam is over. You should immediately go over the exam to understand any mistakes you made. If you worked a problem and made substantial errors, try this: Take a piece of paper and divide it down the middle with a line from top to bottom. In one column, write the proper solution to the problem. In the other column, write what you did and why, if you know, and why your solution was incorrect. If you are uncertain why you made your mistake or how to avoid making it again, talk with your professor. Physics constantly builds on fundamental ideas, and it is important to correct any misunderstandings immediately. *Warning:* Although cramming at the last minute may get you through the present exam, you will not adequately retain the concepts for use on the next exam.

TO THE INSTRUCTOR

PREFACE

In the years since it was first published, *University Physics* has always embraced change, not just to include the latest developments in our understanding of the physical world, but also to address our understanding of how students learn physics and how they study.

In preparing for this new Fifteenth Edition, we listened to the thousands of students who have told us that they often struggle to see the connections between the worked examples in their textbook and problems on homework or exams. Every problem seems different because the objects, situations, numbers, and questions posed change with each problem. As a result, students experience frustration and a lack of confidence. By contrast, expert problem-solvers categorize problems by type, based on the underlying principles.

Several of the revisions we have made therefore address this particular challenge by, for example, helping students see the big picture of what each worked example is trying to illustrate and allowing them to practice sets of related problems to help them identify repeating patterns and strategies. These new features are explained in more detail below.

NEW TO THIS EDITION

- **Worked example KEYCONCEPT statements** appear at the end of every Example and Conceptual Example, providing a brief summary of the key idea used in the solution to consolidate what was most important and what can be broadly applied to other problems, to help students identify strategies that can be used in future problems.
- **KEY EXAMPLE VARIATION PROBLEMS** in the new Guided Practice section at the end of each chapter are based on selected worked examples. They build in difficulty by changing scenarios, swapping the knowns and unknowns, and adding complexity and/or steps of reasoning to provide the most helpful range of related problems that use the same basic approach to solve. These scaffolded problem sets help students see patterns and make connections between problems that can be solved using the same underlying principles and strategies so that they are more able to tackle different problem types when exam time comes.
- **Expanded Caution paragraphs** focus on typical student misconceptions and problem areas. Over a dozen more have been added to this edition based on common errors made in Mastering™ Physics.
- **Updated and expanded Application sidebars** give students engaging and relevant real-world context.
- **Based on data from Mastering Physics and feedback from instructors, changes to the homework problems include the following:**
  - **Over 500 new problems,** with scores of other problems revised to improve clarity.
  - **Expanded three-dot-difficulty and Challenge Problems** significantly stretch students by requiring sophisticated reasoning that often involves multiple steps or concepts and/or mathematical skills. Challenge Problems are the most difficult problems in each chapter and often involve calculus, multiple steps that lead students through a complex analysis, and/or the exploration of a topic or application not explicitly covered in the chapter.
  - **New estimation problems** help students learn to analyze problem scenarios, assess data, and work with orders of magnitude. This problem type engages students to more thoroughly explore the situation by requiring them to not only estimate some of the data in the problem but also decide what data need to be estimated based on real-world experience, reasoning, assumptions, and/or modeling.
  - **Expanded cumulative problems** promote more advanced problem-solving techniques by requiring knowledge and skills covered in previous chapters to be integrated with understanding and skills from the current chapter.
  - **Expanded alternative problem sets** in Mastering Physics provide textbook-specific problems from previous editions to assign for additional student practice.

Standard, Extended, and Three-Volume Editions

With Mastering Physics:

- **Standard Edition:** Chapters 1–37 (ISBN 978-0-135-64663-2)
- **Extended Edition:** Chapters 1–44 (ISBN 978-0-135-15970-5)

Without Mastering Physics:

- **Standard Edition:** Chapters 1–37 (ISBN 978-0-135-21611-8)
- **Extended Edition:** Chapters 1–44 (ISBN 978-0-135-15955-2)
- **Volume 1:** Chapters 1–20 (ISBN 978-0-135-21672-9)
- **Volume 2:** Chapters 21–37 (ISBN 978-0-135-21612-5)
- **Volume 3:** Chapters 37–44 (ISBN 978-0-135-21673-6)

KEY FEATURES OF *UNIVERSITY PHYSICS*

- A **QR code** at the beginning of the new Guided Practice section in each chapter allows students to use a mobile phone to access the Study Area of Mastering Physics, where they can watch interactive videos of a physics professor giving a relevant physics demonstration (Video Tutor Demonstrations) or showing a narrated and animated worked Example (Video Tutor Solutions). All videos also play directly through links within the Pearson eText.
- End-of-chapter **Bridging Problems** provide a transition between the single-concept Examples and the more challenging end-of-chapter problems. Each Bridging Problem poses a difficult, multiconcept problem that typically incorporates physics from earlier chapters. The **Solution Guide** that follows each problem provides questions and hints that help students approach and solve challenging problems with confidence.
- Deep and extensive **problem sets** cover a wide range of difficulty (with blue dots to indicate relative difficulty level) and exercise both physical understanding and problem-solving expertise. Many problems are based on complex real-life situations.
- This textbook offers more **Examples** and **Conceptual Examples** than most other leading calculus-based textbooks, allowing students to explore problem-solving challenges that are not addressed in other textbooks.
- A research-based **problem-solving approach (Identify, Set Up, Execute, Evaluate)** is used in every Example as well as in the Problem-Solving Strategies, in the Bridging Problems, and throughout the Instructor's Solutions Manual and the Study Guide. This consistent approach teaches students to tackle problems thoughtfully rather than cutting straight to the math.
- **Problem-Solving Strategies** coach students in how to approach specific types of problems.
- The **figures** use a simplified graphical style to focus on the physics of a situation, and they incorporate blue **explanatory annotations.** Both techniques have been demonstrated to have a strong positive effect on learning.
- Many figures that illustrate Example solutions take the form of black-and-white **pencil sketches,** which directly represent what a student should draw in solving such problems themselves.
- The popular **Caution paragraphs** focus on typical misconceptions and student problem areas.
- End-of-section **Test Your Understanding** questions let students check their grasp of the material and use a multiple-choice or ranking-task format to probe for common misconceptions. Answers are now provided immediately after the question in order to encourage students to try them.
- **Visual Summaries** at the end of each chapter present the key ideas in words, equations, and thumbnail pictures, helping students review more effectively.

Mastering™ is the teaching and learning platform that empowers you to reach *every* student. By combining trusted author content with digital tools developed to engage students and emulate the office-hour experience, Mastering personalizes learning and improves results for each student. Now providing a fully integrated experience, the eText is linked to every problem within Mastering for seamless integration among homework problems, practice problems, the textbook, worked examples, and more.

Reach every student with Mastering

- **Teach your course your way:** Your course is unique. Whether you'd like to build your own auto-graded assignments, foster student engagement during class, or give students anytime, anywhere access, Mastering gives you the flexibility to easily create *your* course to fit *your* needs.
  - With **Learning Catalytics,** you'll hear from every student when it matters most. You pose a variety of questions that help students recall ideas, apply concepts, and develop critical-thinking skills. Your students respond using their own smartphones, tablets, or laptops. You can monitor responses with real-time analytics and find out what your students do—and don't—understand. Then you can adjust your teaching accordingly and even facilitate peer-to-peer learning, helping students stay motivated and engaged.

    - **Expanded alternative problem sets,** with hundreds of vetted problems from previous editions of the book, provide additional problem-solving practice and offer instructors more options when creating assignments.
- **Empower each learner:** Each student learns at a different pace. Personalized learning, including adaptive tools and wrong-answer feedback, pinpoints the precise areas where each student needs practice and gives all students the support they need—when and where they need it—to be successful.
    - **Interactive Pre-lecture Videos** provide an introduction to key topics with embedded assessment to help students prepare before lecture and to help professors identify student misconceptions.
        - **NEW! Quantitative Pre-lecture Videos** now complement the conceptual Interactive Pre-lecture Videos designed to expose students to concepts before class and help them learn how problems for a specific concept are worked.
    - **NEW! Direct Measurement Videos** are short videos that show real situations of physical phenomena. Grids, rulers, and frame counters appear as overlays, helping students to make precise measurements of quantities such as position and time. Students then apply these quantities along with physics concepts to solve problems and answer questions about the motion of the objects in the video. The problems are assignable in Mastering Physics and can be used to replace or supplement traditional word problems; they can also serve as open-ended questions to help develop problem-solving skills.
    - **NEW! Dynamic Study Modules** help students study effectively—and at their own pace. How? By keeping them motivated and engaged. The assignable modules rely on the latest research in cognitive science, using methods—such as adaptivity, gamification, and intermittent rewards—to stimulate learning and improve retention. Each module poses a series of questions about a course topic. These question sets adapt to each student's performance and offer personalized, targeted feedback to help students master key concepts.
    - **NEW! The Physics Primer** relies on videos, hints, and feedback to refresh students' math skills in the context of physics and prepares them for success in the course. These tutorials can be assigned before the course begins or throughout the course as just-in-time remediation. They ensure that students practice and maintain their math skills, while tying together mathematical operations and physics analysis.
- **Deliver trusted content:** We partner with highly respected authors to develop interactive content and course-specific resources that keep students on track and engaged.
    - **Video Tutor Demonstrations and Video Tutor Solutions** tie directly to relevant content in the textbook and can be accessed through Mastering Physics, via the eText, or from QR codes in the textbook.
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