

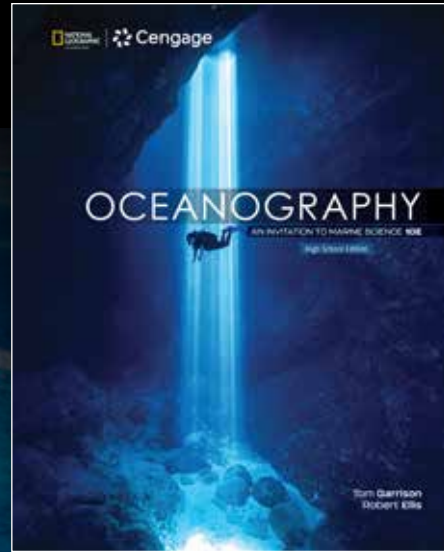
SCIENCE ELECTIVES AND AP[®] SCIENCE



MARINE SCIENCE

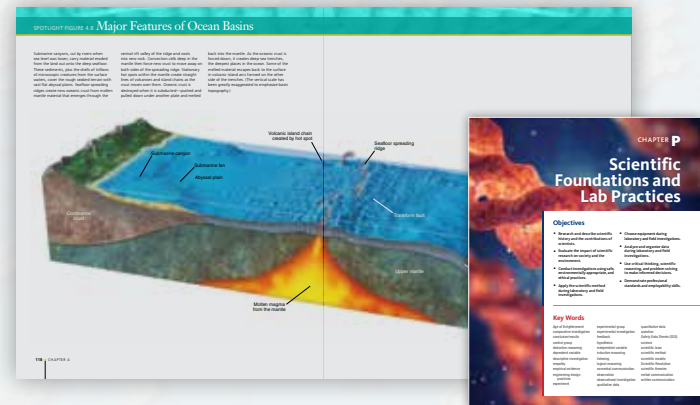
This version has been updated with new content to meet the Florida science standards for Marine Science and includes a new chapter on freshwater processes and ecosystems.

Oceanography: An Invitation to Marine Science, High School Edition, © 2024



National Geographic Experiences

Students hear stories of ocean discoveries from National Geographic Explorers and visualize marine science through photographs and maps from the National Geographic archives.



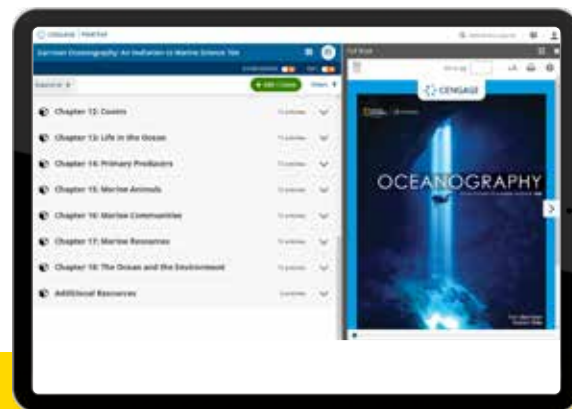
Hands-On Science Labs

A new Lab Manual gets students active in applying their knowledge of core marine science concepts and practicing lab skills and safety.

Cengage MindTap

Digital Power with MindTap

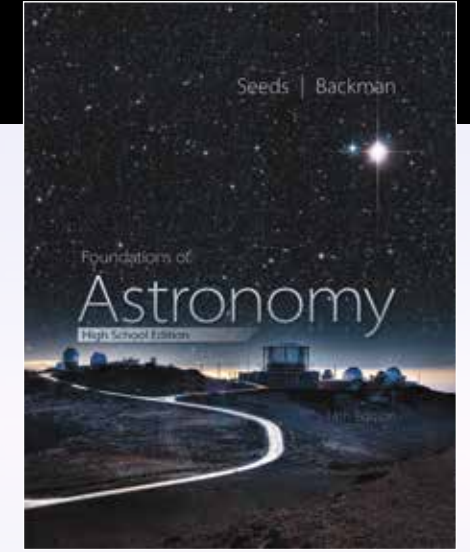
Combine an interactive eBook with a wide variety of media including animations, video quizzes, map activities, research articles, and auto-graded assessments.



ASTRONOMY

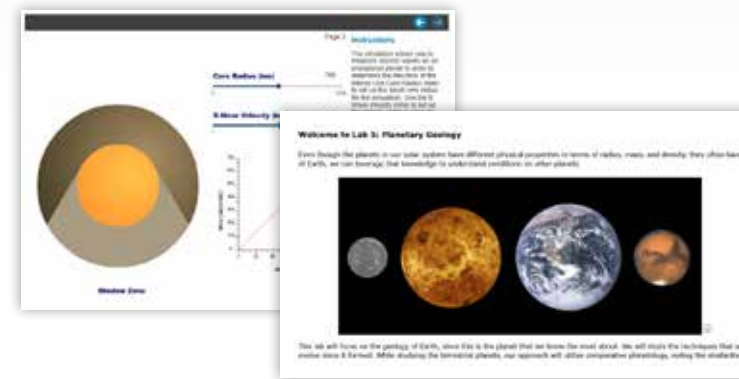
This version has been updated to meet the Florida science standards for Astronomy including a new chapter on scientific investigation and astronomy tools to address new dimensions of the standards.

Foundations of Astronomy, High School Edition, © 2024



Powerful Student Engagement

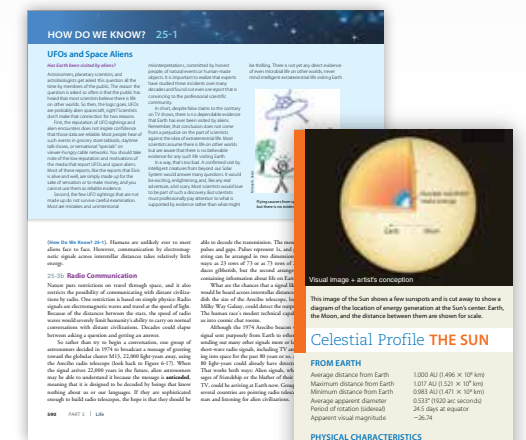
With a highly visual print text and eBook, along with interactive Virtual Labs and animations in the WebAssign digital platform, all students are able to understand and think critically about astronomy concepts.



Cengage WebAssign

Digital Interactivity with WebAssign

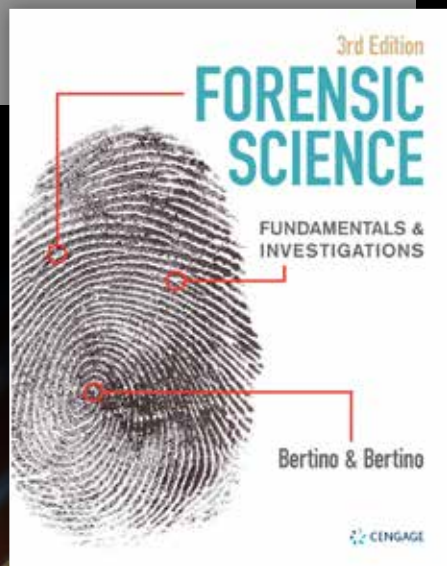
WebAssign is a powerful physics-based online homework tool with an interactive eBook, auto-graded assessments, tutorials, and Virtual Astronomy Lab series.



FORENSIC SCIENCE

Offer students a truly experiential approach to engage them in active learning and to emphasize the application of integrated science. Comprehensive teacher support and hundreds of lab activities ensure students of all backgrounds experience integrated science practices.

**Forensic Science:
Fundamentals & Investigations, © 2024**



Real-World Phenomenon

Current and relevant examples from the real-world show students how forensic techniques and skills help solve crimes and advance scientific knowledge.

Chapter opening scenarios and Case Studies give students a view of real cases and how scientists overcome challenges to solve problems.

Chapter 7

DNA Profiling

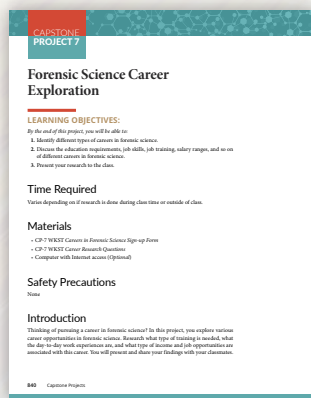
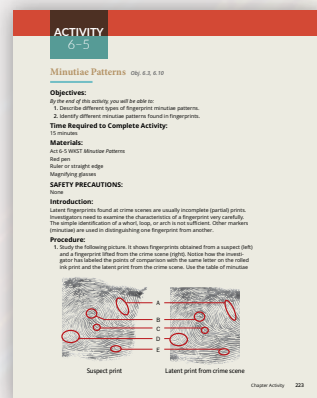
Who Are You? Cold Cases Solved Using Forensic Genetics

In April 1982, the body of a young girl with red, braided hair wearing a buckskin jacket (known as the "Buckskin Girl") was found mangled by the side of an Ohio road. Detailed fingerprint analysis, dental record comparisons, hair, pollen, and sewage analysis, and facial reconstructions completed by the National Center for Missing and Exploited Children (NCMEC) network failed to identify the young woman until 2018. At that time, a volunteer group known as John and Jane Doe Project used the stored 17-year-old blood sample with its degraded DNA to compare the unidentified person's DNA with the DNA found in public genealogical databases (GEDmatch genealogical analysis). Based on that...



Expansive Lab Program With Real-World Scenarios

Students learn the procedures and skills of real forensic scientists with hundreds of Activities and Capstone Projects. Connect students to the Florida science standards while building hands-on lab skills and critical thinking skills.



Chapter Activities available in print with additional digital-only activities in the MindTap platform

Transformative Teacher Support

The wraparound Teacher's Edition and additional downloadable resources provide thorough support for new forensic science teachers and advanced help for experienced teachers.

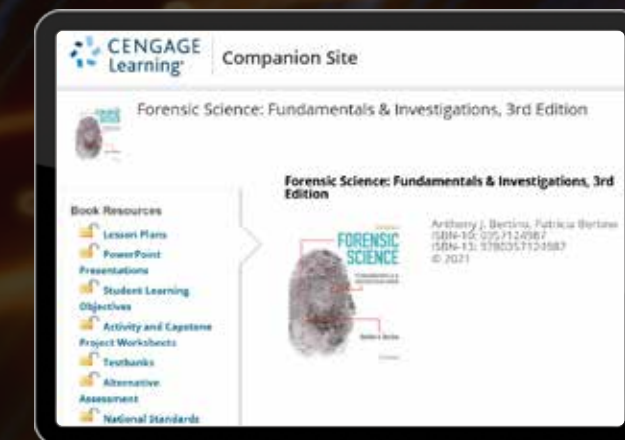
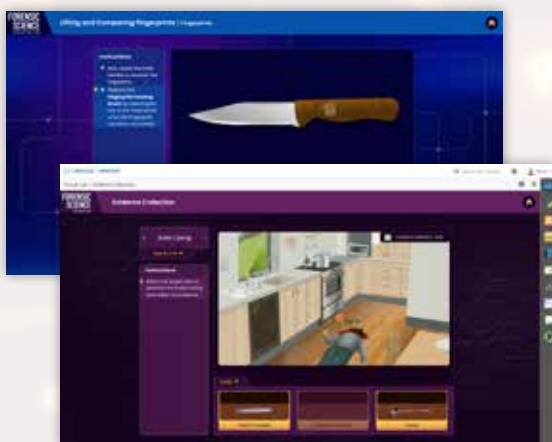
Support includes science background, differentiation to meet the needs of all students, teaching tips, enrichment and extension activities, and hands-on activity guidance



Cengage MindTap

Interactive Experiences in MindTap

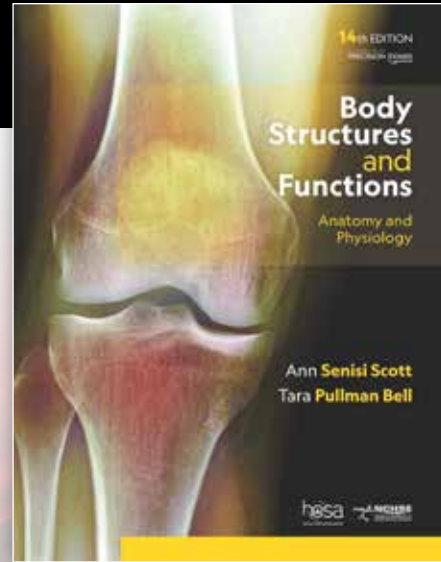
The MindTap digital platform provides even more virtual hands-on experiences with Interactive Labs for each chapter and a comprehensive Virtual Lab series where students work one detailed case from beginning to end, collecting and analyzing evidence to solve the crime.



A companion website offers downloadable resources including additional labs with worksheets, lecture slides, lesson plans, teacher notes, and alternative assessments.

ANATOMY AND PHYSIOLOGY

Guide students through exciting human body structures and body processes while introducing them to the concepts and skills required for the study of the human body and how it functions.



Body Structures and Functions: Anatomy and Physiology, © 2024



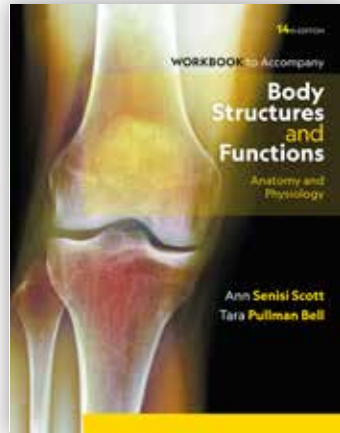
Achieve Results with MindTap Interactive Learning

The MindTap platform with simulations offers a complete learning experience with an interactive eBook, assessments, study tools, matching exercises, and Anatomy and Physiology Learning Labs.



Hands-on and Science Practices

Lab Activities, a student workbook, and interactive Learning Labs in the MindTap digital platform combine to allow students real experiences in learning and applying skills to identify organs and systems and to explain their functions.



The student workbook includes activities that focus on practical application exercises, including multiple choice, fill-in-the-blanks, matching, labeling, word puzzles, basic skill problems, and application of theory to practice.

Teacher Support and Student Assessment

Downloadable resources include an Instructor's Manual, PowerPoint lecture slides, assessments, test banks, and answer keys. These tools help teachers plan instruction, ensure success in hands-on labs, and customize quizzes and tests for formative and summative assessments.



INTRODUCTION TO THE INSTRUCTOR'S MANUAL
Teaching in an art and a science. The liberal arts education gives us insight into how students learn, how to develop instructional methods and strategies, and how students attain the education sought. The art of education is how the teacher imparts that knowledge to the student.

INTRODUCTION TO THE INSTRUCTOR COMPANION WEBSITE
The Instructor's Manual includes a wide variety of valuable resources to help with planning the course and implementing activities by chapter. Instructional methods and strategies are included. Chapter quizzes, a comprehensive final exam, and answer keys for the quizzes are also included. The companion website includes a wide variety of valuable resources to help with planning the course and implementing activities by chapter. Instructional methods and strategies are included. Chapter quizzes, a comprehensive final exam, and answer keys for the quizzes are also included. The companion website includes a wide variety of valuable resources to help with planning the course and implementing activities by chapter. Instructional methods and strategies are included. Chapter quizzes, a comprehensive final exam, and answer keys for the quizzes are also included.



278 CHAPTER 13 Blood

LAB ACTIVITY 13-1 Red Blood Cells (RBCs) and White Blood Cells (WBCs)

- Objective:** To observe the structure of red and white blood cells
- Materials needed:** prepared stained slides of blood cells, microscope, medicine dropper, disposable gloves, sharps or biohazard container, household bleach (1-part bleach to 10-parts water), test tube, pencil
- Note:** Remember to use all safety measures when in contact with blood or blood products and dispose of sharps or biohazard containers according to standard precautions.

Step 1: Put on gloves and safety goggles.	Step 4: What are the differences between RBCs and WBCs? Record your answer.
Step 2: Examine the stained slide of blood cells under a microscope. Draw and describe the structure of an RBC. Which are more numerous: RBCs or WBCs? Record your answer.	Step 5: Dispose of the blood cell slides in a biohazard or sharps container.
Step 3: Identify the five types of WBCs. Compare their appearance with the diagram in the textbook. What are the differences among the types of WBCs? What is the function of each type of WBC?	Step 6: Clean all other equipment with 1-part bleach to 10-parts water.
	Step 7: Remove goggles and gloves.
	Step 8: Wash hands.

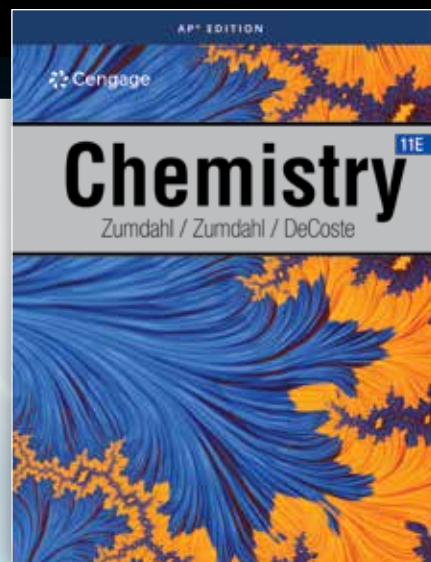
APPLYING THEORY TO PRACTICE

- You hear that your friend has been in a car accident and needs a blood transfusion; you want to donate blood. Your friend has type O+ blood, and you have type A+ blood. Can your blood be given to your friend? Explain the reason for your answer.
- Why is blood considered the "gift of life"?
- A female patient comes to the physician's office. She is pregnant and states that she is Rh negative and her husband is Rh positive. She has heard that there may be a problem with the baby. Explain to her about the Rh factor and how this situation is treated today.
- In the hospital, you are caring for a 6-year-old child with leukemia. The mother says the physicians want to do a bone marrow (stem cell) transplant. She asks you to re-explain what a stem cell transplant is because she was so upset when the physician first told her. She wants to know if she can be a donor or if a friend can be a donor. Explain the types of stem cell transplants to the mother.
- You are employed as a medical technologist. A patient comes to the lab and requires a complete blood count (CBC) and sedimentation rate. The patient asks you to explain these tests and their purpose.

AP[®] CHEMISTRY

Chemistry is focused on independent problem-solving. The author, Steven Zumdahl, gets students to think independently with a lot of support in early chapters and more student responsibility in later chapters. Students apply strategies they learn to become independent problem-solvers.

**Chemistry, AP[®] Edition,
© 2024**



AP Chemistry Support

Students have access to extended resources to help them prepare for the AP Chemistry Exam including chapter-level practice questions and a complete test preparation workbook.

AP[®] Chapter 8 Bonding: General Concepts
AP[®] Multiple-Choice Review Questions

1. Consider the reaction shown below.

4. Which diagram best represents the shape of the SF₆²⁻ ion?

9. The atomic radii of several third-period elements are shown below. Of the most common ions of the third-period elements Mg, Al, P, and S, which is the largest?

14. The graph below shows the potential energy and intermolecular distance between two oxygen atoms.

17. Ethyl caprate is an ester used in the manufacture of wine stoppers. It is sometimes called "organic essence." Combustion analysis of a sample of ethyl caprate shows it to be 71.89% C, 12.13% hydrogen, and 15.98% O by mass. Hydrolysis (reaction with water) of the ester produces ethanol and a carboxylic acid. The molar mass of the carboxylic acid is 200 g/mol. What is the structure of the R group attached to the COOH group in the straight chain alkane. What is the structure of the R group attached to the COOH group in the straight chain alkane. What is the structure of the R group attached to the COOH group in the straight chain alkane.

18. Estimate ΔH for the following reaction given in Table 8.5.

19. The enthalpies of formation for the following reactions are given in Table 8.5.

20. The enthalpies of formation for the following reactions are given in Table 8.5.

Bond	Bond Energy (kJ/mol)
C-C	347
C-H	413
C-O	336
C=O	799
O-O	201
O-H	463

21. Which of the following has a bent molecular geometry with a bond angle of approximately 120°?

22. Which of the following has a bent molecular geometry with a bond angle of approximately 120°?

23. Which of the following is amphoteric?

24. Which of the following is amphoteric?

25. The following energy level diagram shows the energy levels for the following reaction.

26. The following energy level diagram shows the energy levels for the following reaction.

27. The following energy level diagram shows the energy levels for the following reaction.

28. The following energy level diagram shows the energy levels for the following reaction.

29. The following energy level diagram shows the energy levels for the following reaction.

30. The following energy level diagram shows the energy levels for the following reaction.

The student book includes AP Review Questions for each chapter and Exam preparation support in the front pages

The Fast Track to a 5 student workbook includes chapter level content and practice questions as well as a complete Diagnostic Test and two full Practice Tests modeled after the real AP Chemistry Exam.



3.5 Learning to Solve Problems

One of the great rewards of studying chemistry is becoming a great problem solver. Being able to solve complex problems is a talent that will serve you well in all walks of life. It is our purpose in this text to help you learn to solve problems in a flexible, creative way based on understanding the fundamental ideas of chemistry. We call this approach **conceptual problem solving**.

The ultimate goal is for you to be able to solve new problems that are problems you have not seen before on your own. In this text, we will provide problems and offer solutions by explaining how to think about the problems. While the answers to these problems are important, it is perhaps even more important to understand the process—the thinking necessary to get the answer. Although at first we will be solving the problem for you, do not take a passive role. While studying the solution, it is crucial that you **interactively** think through the problem with us. Do not skip the discussion and jump to the answer. Usually, the solution will involve asking a series of questions. Make sure that you understand each step in the process. This active approach should apply to problems outside of chemistry as well. For example, imagine riding with someone in a car to an unfamiliar destination. If your goal is simply to have the other person get you to that destination, you will probably not pay much attention to how to get there (practice), and if you have to find the same place on the future on your own, you probably will not be able to do it. If, however, your goal is to learn how to get there, you would pay attention to directions, signs, and some (practice). This is how you should read the solutions in the text (and the text in general).

While actively studying our solutions to problems is helpful, at some point you will need to learn how to think through these problems on your own. If we help you too much as you solve a problem, you won't truly learn effectively. If we always "drive," you won't interact as meaningfully with the material. Eventually you need to learn to drive yourself. We will go through these problems on your own. If we help you too much as you solve a problem, you won't truly learn effectively. If we always "drive," you won't interact as meaningfully with the material. Eventually you need to learn to drive yourself. We will go through these problems on your own.

Challenge Problems

157. Ethyl caprate is an ester used in the manufacture of wine stoppers. It is sometimes called "organic essence." Combustion analysis of a sample of ethyl caprate shows it to be 71.89% C, 12.13% hydrogen, and 15.98% O by mass. Hydrolysis (reaction with water) of the ester produces ethanol and a carboxylic acid. The molar mass of the carboxylic acid is 200 g/mol. What is the structure of the R group attached to the COOH group in the straight chain alkane. What is the structure of the R group attached to the COOH group in the straight chain alkane. What is the structure of the R group attached to the COOH group in the straight chain alkane.

158. Estimate ΔH for the following reaction given in Table 8.5.

159. The enthalpies of formation for the following reactions are given in Table 8.5.

Enhance Problem-Solving and Critical Thinking Skills

Students are introduced to strategies for solving chemistry problems to model how real chemists work and will practice higher depth of knowledge with Critical Thinking and Challenge Problems.

Critical Thinking What if you were offered \$1 million to count from 1 to 6×10^{23} at a rate of one number each second? Determine your hourly wage. Would you do it? Could you do it?

Critical Thinking You and a friend are studying for a chemistry exam. What if your friend tells you that since acids are very reactive, all salts are more soluble in aqueous solutions of acids than in water? How would you explain to your friend that this is not true? Use a specific example to defend your answer.

Real-World Applications and Connections

Help students see how chemistry knowledge applies in the real world to solve practical problems and how chemistry knowledge and skills connect to careers.

Chemistry in Your Career

Advanced Emergency Medical Technician

Marissa Wilmer is an Advanced Emergency Medical Technician and first responder for medical emergencies. Marissa went through the EMT program to earn her certification before going on to earn a bachelor's degree in Neuroscience and Spanish to provide support to her growing career as a medical professional.



Marissa Wilmer

a concerted effort to hold herself accountable in order to start fully realizing success in her field of study. When a matter of seconds could mean the difference between life and death, her knowledge of respiratory anatomy or alkalosis and how the body chemically compensates are extremely important things to have mastery over.

But not so sticky to produce permanent adhesion, because the number of contact points between the landing surfaces was limited.

When he invented the adhesive, Silver had no specific idea for its use, so

in the years since the introduction of Post-it Notes, 3M has heard some remarkable stories connected to the use of these notes. For example, a Post-it Note was applied to the nose of a corporate jet, where it was intended

Chemical Connections

A Note-able Achievement

Post-it Notes, a product of the 3M Corporation, revolutionized casual written communications and personal reminders. Introduced in the United States in 1981, these sticky-but-not-too-sticky notes have now found countless uses in offices, cars, and homes.

He spread the word of his discovery to his fellow employees at 3M to see if anyone had an application for it. In addition, over the next several years, development was carried out to improve the adhesive's properties. It was not until 1994 that the



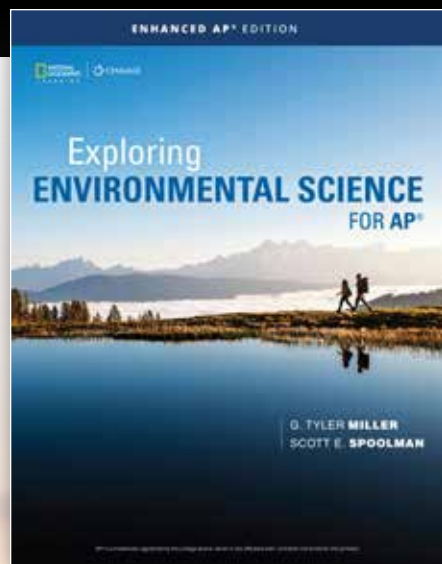
Notes popped up. Fry, a chemical class, was singing in his honor. Fry's glue—and the 3M Post-it Notes—were in his hand. He said that it would be a great idea to place a Post-it Note in a plane that was about to take off. Fry's idea was to place a Post-it Note in the nose of the plane when it landed in Minneapolis, having survived a takeoff, a landing, and speeds of 500 miles per hour at temperatures as low as -56°F. Stories show the how a Post-it Note on the front door of a home survived the 140-mile-per-hour winds of Hurricane Hugo and how a foreign official accepted Post-it Notes in lieu of cash when a small bribe was needed to cut through bureaucratic hassles.

Post-it Notes have definitely changed the way we communicate and remember things.

AP[®] ENVIRONMENTAL SCIENCE

With a key focus on sustainability, this program encourages students to think critically about all aspects of environmental science issues and how those issues impact the quality of life and the planet's health.

**Exploring Environmental Science for AP[®],
Enhanced AP[®] Edition, © 2024**



Hands-On Lessons and Data Analysis

Real environmental data is provided with analysis assessments and critical thinking connections.



278 CHAPTER 13 Blood

LAB ACTIVITY 13-1 Red Blood Cells (RBCs) and White Blood Cells (WBCs)

Objective: To observe the structure of red and white blood cells

Materials needed: prepared stained slides of blood cells, microscope, medicine dropper, disposable gloves, safety goggles, sharps or biohazard container, household bleach (1-part bleach to 10-parts water), textbook, paper, pencil

Note: Remember to use all safety measures when in contact with blood or blood products and dispose of items according to standard precautions.

Step 1: Put on gloves and safety goggles.

Step 2: Examine the stained slide of blood cells under a microscope. Draw and describe the structure of an RBC. Which are more numerous: RBCs or WBCs? Record your answer.

Step 3: Identify the five types of WBCs. Compare their appearance with the diagram in the textbook. What are the differences among the types of WBCs? What is the function of each type of WBC?

Step 4: What are the differences between RBCs and WBCs? Record your answer.

Step 5: Dispose of the blood cell slides in an approved biohazard or sharps container.

Step 6: Clean all other equipment with household bleach (1-part bleach to 10-parts water).

Step 7: Remove goggles and gloves.

Step 8: Wash hands.

Labs are available in the AP Teacher's Resource Guide downloadable from the Companion Website.

National Geographic Connections

Engage students with images and stories from real National Geographic Explorers who show how diverse perspectives help solve real-world issues.

Individuals Matter 18.1
Hayat Sindi: Health Science Entrepreneur

Growing up in a home of humble means in Saudi Arabia, Hayat Sindi was determined to get an education, become a scientist, and do something for humanity. She was the first Saudi woman to be accepted at Cambridge University. She earned a PhD and taught in the Cambridge's international medical program, and in 2012 she was named a National Geographic Explorer.

As a visiting scholar, Sindi worked with a team of scientists at Harvard University and co-founded a nonprofit company called Diagnostics for All to bring low-cost health monitoring to remote, poor areas of the world. The Harvard team sought to develop simple and inexpensive diagnostic tools that could be used to detect certain illnesses and medical problems in remote areas.

One such tool is a small piece of paper the size of a postage stamp, with tiny channels and wells etched into it. Technicians load it with various diagnostic chemicals and with the fluid to change its color. Res conditions such as declining liver function with minimal training and requires no spot to prevent the spread of any infection. Sindi has a passion for inspiring women and



Student AP Exam Preparation

Provide students with year-long support preparation for the AP Environmental Science Exam with ongoing practice questions and a complete Test Prep Workbook.

AP[®] Review Questions

1. Strip mining is a useful and economic way to extract mineral resources. However, strip mining has all of the following harmful environmental effects EXCEPT

(A) segments of vegetation where strip mining has occurred is very fast

(B) toxic substances are left behind

(C) recycling a resource causes it to be depleted quickly

(D) in an arid, arctic, and/or high-altitude environment, strip mining causes a loss of sustainable resources

2. Fertilizer runoff from agricultural operations will

(A) cause a shift in timing of low-grade seas

(B) have an environmental impact

(C) help to keep supplies of nutrients sustainable

(D) cause eutrophication

Use the diagram to answer question 3.

3. An agreement is negotiating soil particle size from a particular field. Over 90% of the particles range in size 0.08–1.1 mm in diameter. Which of the following is true of the soil?

(A) It should have a high moisture holding capacity

(B) It should have a high porosity

(C) It should have a high water retention rate

(D) It should be classified as a loam

AP[®] Free-Response Practice

Productive Capacity of Coal Mines by Mine Type, 2008–18

1. (A) As new energy technologies are being developed, the use of coal in the United States has begun to decline. The graph above shows the annual number of short tons (a short ton is equal to 2000 lb) produced from underground and surface mines.

(i) Calculate the percent decrease between 2009 and 2014 in short tons of coal mined, using the data in the graph.

(ii) In 2009, the population of the United States was approximately 307 million people. Assume all of the coal mined in the U.S. was used domestically to produce electricity. Determine the per capita consumption of coal in the U.S. that year. Express your answer in pounds per person.

(iii) Burning one ton of coal produces 9200 lb of CO₂. Calculate the amount in pounds of CO₂ produced per capita from burning coal, using the value you calculated in (ii).

(iv) Determine how many tons of CO₂ were generated from burning all of the coal mined in 2009.

(v) The use of coal in the U.S. has dropped consistently over the past decade.

(i) Provide ONE reason why coal use has declined in the United States.

(ii) Propose TWO ways to continue the decline in the use of coal in the United States.

(iii) Natural gas is expected to replace coal as an energy source in the United States over the next few decades. Discuss TWO reasons why natural gas is expected to replace coal.

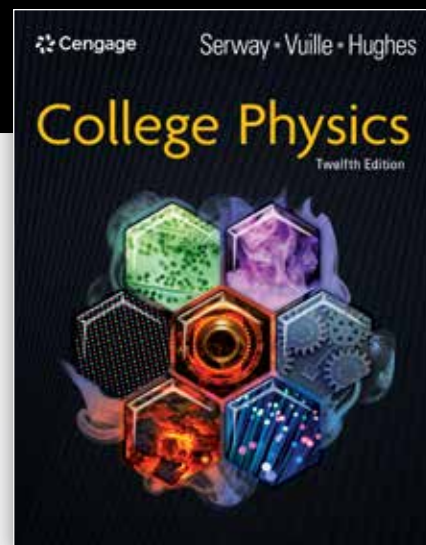
The Fast Track to a 5 student workbook includes chapter level content and practice questions as well as a complete Diagnostic Test and two full Practice Tests modeled after the real AP Environmental Science Exam.



AP[®] PHYSICS

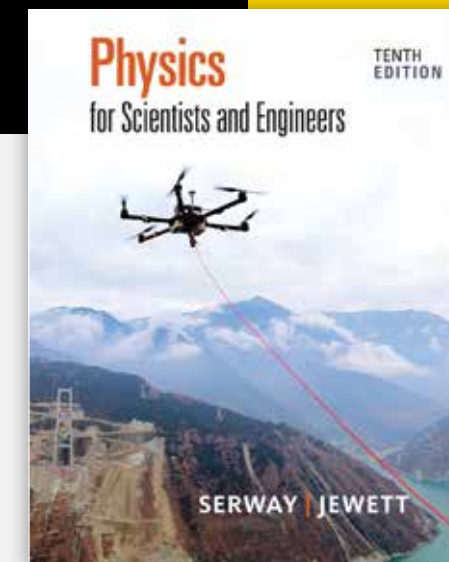
College Physics was created for algebra-based AP Physics courses and includes AP Essential Knowledge content along with student AP Exam preparation and teacher support.

**College Physics, AP[®] Edition,
© 2025**



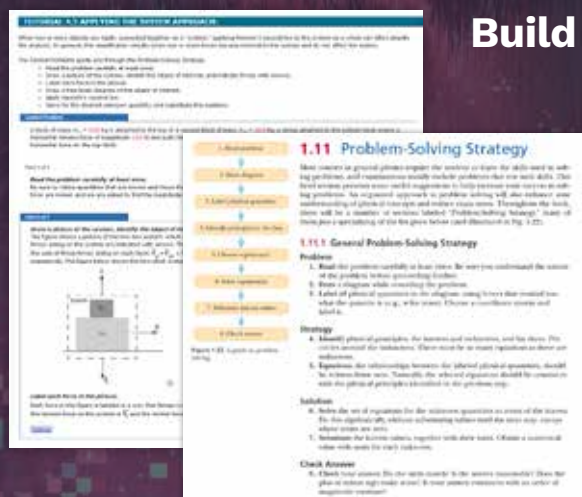
Support calculus-based AP Physics courses with AP-style practice questions for each chapter and problem-solving strategies with a powerful interactive digital platform.

**Physics for Scientists and Engineers, AP[®] Edition
© 2025**



Build Problem-Solving Skills

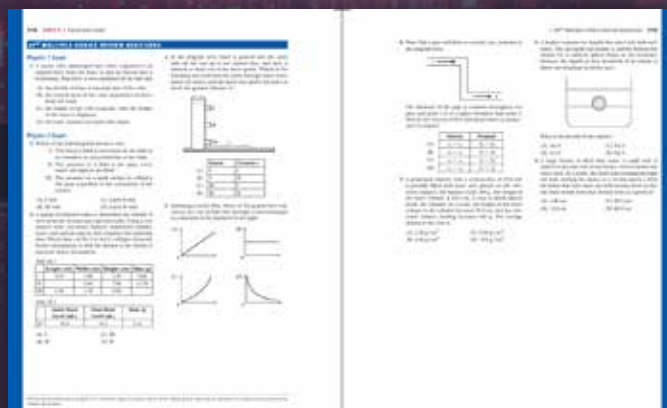
This program provides scaffolding for students to develop their problem-solving skills with strategies and guidance for students including online hints, support, and tutorials.



Each chapter ends with a set of AP-style questions so students are preparing for the AP Physics Exams throughout the school year

The Fast Track to a 5 Test Prep Workbook for students includes AP practice questions for each chapter, a Diagnostic Test, and two complete Practice Tests

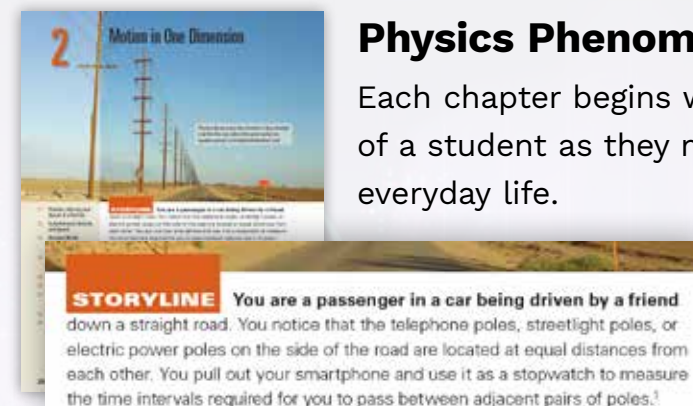
AP Physics Exam Preparation



Physics Phenomena Stories Frame the Learning

Each chapter begins with a physics story told through the eyes of a student as they make physics observations throughout their everyday life.

These phenomena are introduced as a way for students to see relevance and application of physics in the real world.

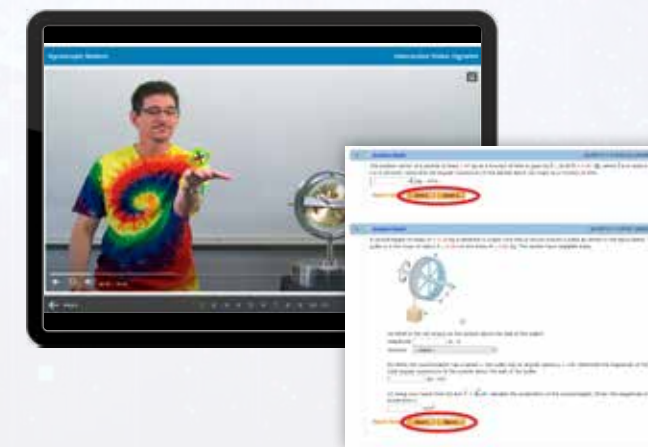


Interactive Digital Activities and Labs

The online platform offers students a wide variety of problem-solving support including tutorials, "Watch It" walk-through videos, and interactive video labs.

Interactive Video Vignettes in the digital platform walk students through a series of videos with demonstrations, hypotheses practice, and live video analysis to more deeply understand physics problems.

Cengage WebAssign



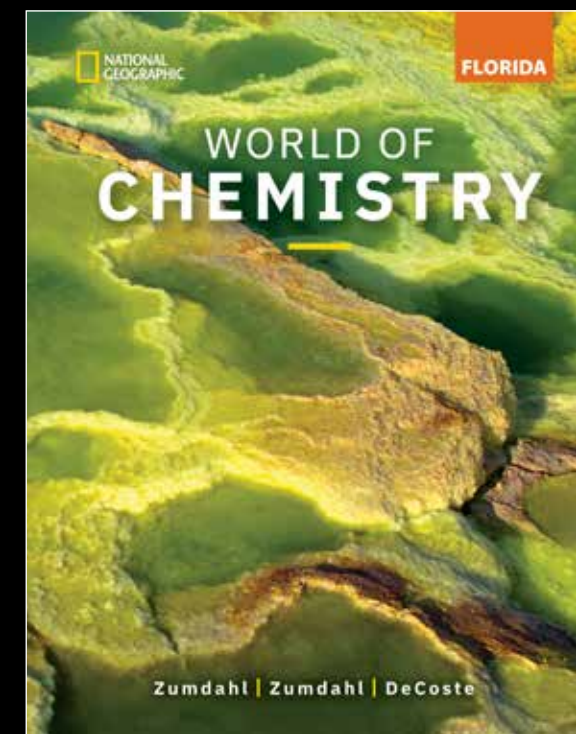
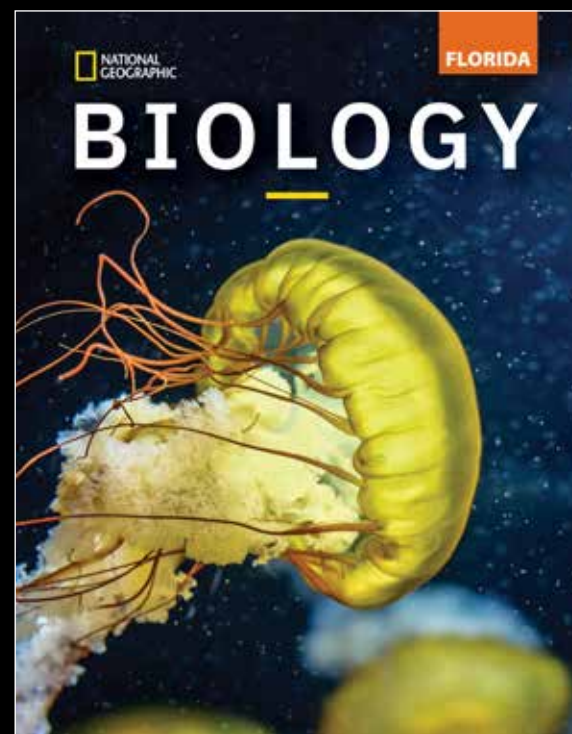
AP[®] BIOLOGY

The combination of a supportive text with engaging images and an online resource that builds student skills in understanding concepts is designed to help students master AP Biology course requirements.

Biology: The Unity and Diversity of Life, AP[®] Edition Update, © 2023

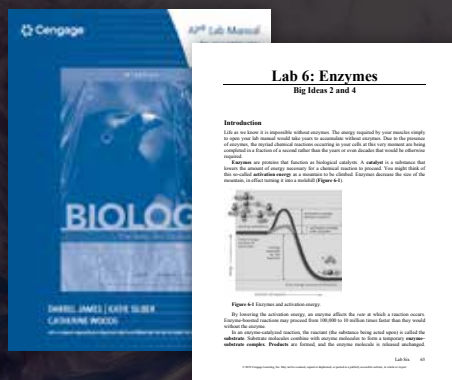


EXPLORE OUR OTHER SCIENCE SOLUTIONS FOR FLORIDA



Hands-On Applications of Biology with Labs

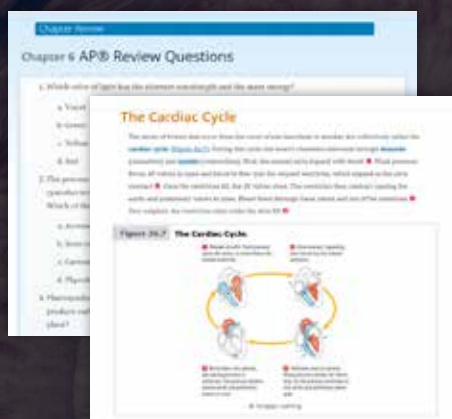
An AP Lab Manual provides dozens of Biology labs for hands-on experiences to practice and apply biology knowledge and skills. These labs are designed to provide the background and real-world knowledge needed for the AP Biology Exam.



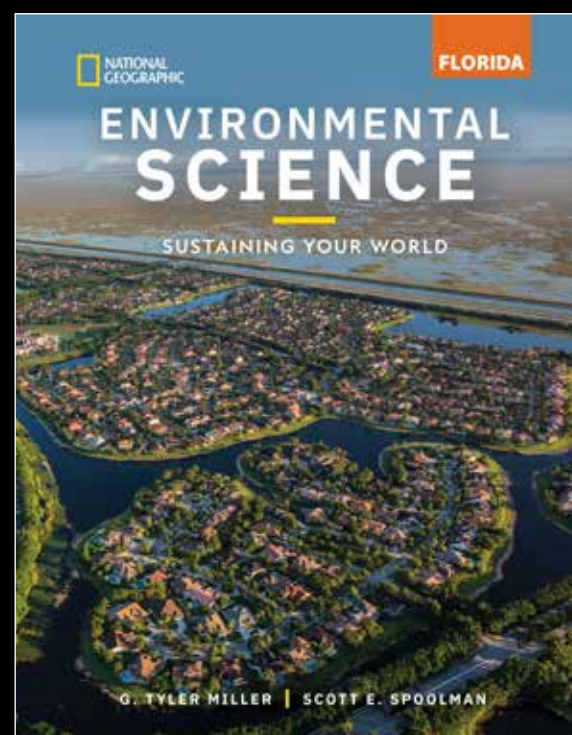
Digital Preparation with MindTap

The MindTap digital platform builds student confidence and practice in AP Biology that includes an interactive eBook with videos, tutorials, animations, concept and vocabulary practice exercises, and assessments.

 Cengage MindTap



The Fast Track to a 5 Test Prep Workbook helps students study essential concepts needed for the highest score on the AP Biology Exam with practice questions, a diagnostic test to uncover areas for improvement, and multiple Practice Tests



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