Houghton Mifflin Harcourt

HOLT McDOUGAL

Environmental Science

Reviewer's Guide

hmhco.com/environmentalscience

HOLT McDOUGAL

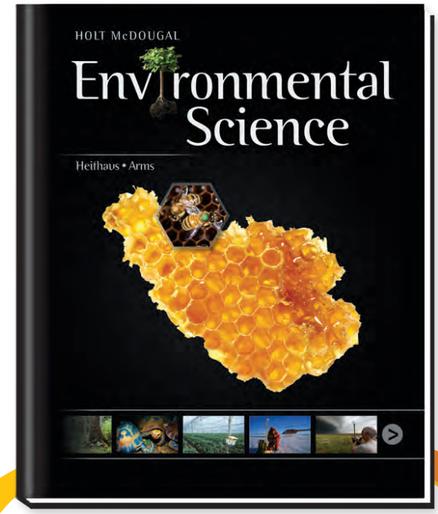
Environmental Science

Make environmental science more MEANINGFUL and ENGAGING for your 21ST-CENTURY students with the new features in this UPDATED edition.

Welcome to Environmental Science

What Sets *Environmental Science* Apart?

- A print and digital program **developed specifically for high school students** offers a wealth of motivating, supportive features.
- **Updated content and case studies** provide a balanced approach to environmental topics, including ecology, Earth science, health, and policy issues.
- **Full-featured Teacher Edition** provides differentiated resources to support success at all ability levels.
- **Widest array of labs** of any high school environmental science program builds inquiry and critical-thinking skills.
- **Engaging online resources—**including EcoZine, an interactive magazine—expand learning and involvement outside the classroom.



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Less paper, more convenience, more support.

GO GREEN

PLUS—
- 24/7 access to all of your program components
- Organized for easy access—right at point-of-use
- Easy to modify and customize to fit your needs
- Built on HTML5 for tablet compatibility

HMDScience.com
24/7 point-of-use access to all your program components

EcoZine—an exciting interactive online environmental science magazine

Teacher Resources
- Presentation Tools
- Teacher Edition Pages
- Labs and Field Studies with Teacher Notes
- Worksheets with Answers
- English Language Learners' Resources with Answers
- Quizzes and Tests
- Multimedia Activities and Resources
- Interactive Review
- Online Assessment and Remediation

eBook—Online version of textbook

Student Resources
- Labs and Field Studies
- Worksheets
- English Language Learners' Resources
- Multimedia Activities and Resources
- Interactive Review

Try it now!

Just follow these steps to see how interactive and engaging online texts can be!

1	Go to:	HMDScience.com
2	Click on	PREVIEW
3	Enter Sample Word:	NASC13
4	Fill in the Required Personal Information and Click :	Next >
5	Write down your username and follow the on-screen instructions to set a password. Log in at: HMDScience.com	

Everything right where you want it, right when you need it.

Print

Student Edition

Written specifically for high school students. Engaging Case Studies, relevant feature articles, and in-text labs are all included to actively engage students.

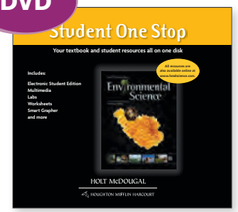
Teacher Edition

- Support for reading, notetaking, labs, and activities
- Instructional Lesson Cycle: *Focus and Motivate, Teach,* and *Assess and Reteach*
- Differentiated instruction strategies in each lesson

Study Guide

- Skill worksheets for every chapter to reinforce key terms and main ideas
- Available in English and Spanish, in print and online

DVD

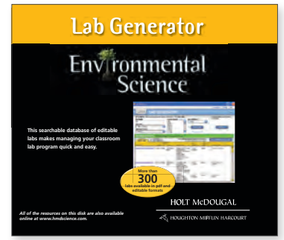


Student One Stop™ DVD

- Includes the entire Student Edition chapter audio in MP3 format
- Links to downloadable versions of all student labs and worksheets

Teacher One Stop™ DVD

- Editable worksheets and PuzzlePro™ for student practice
- Customizable lesson planner and PowerPoint® resources
- ExamView® Assessment Suite



Lab Generator DVD

- Customizable database of Earth and environmental science labs
- Searchable by topic, difficulty level, duration, or standard

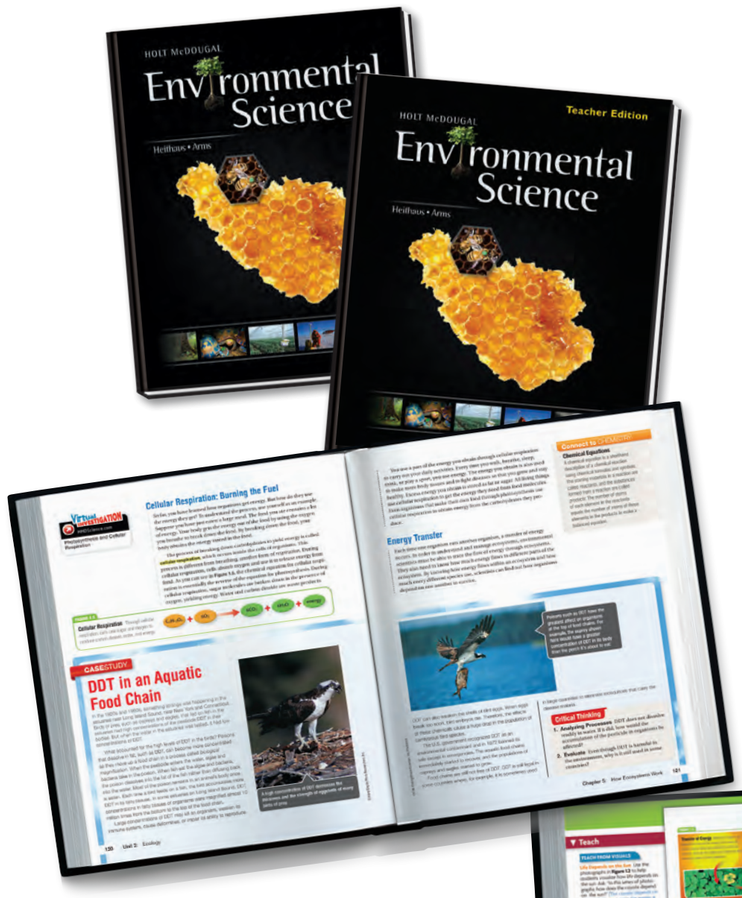
eTextbooks

A digital version of the Student Edition is available with embedded interactive features for use on a range of tablet devices, including:
- iBooks® textbooks for iPad®

Available on the iBookstore

Top Features in Holt McDougal *Environmental Science* © 2013

Motivating content combines clear navigation features and graphics to help students visualize and apply key concepts.

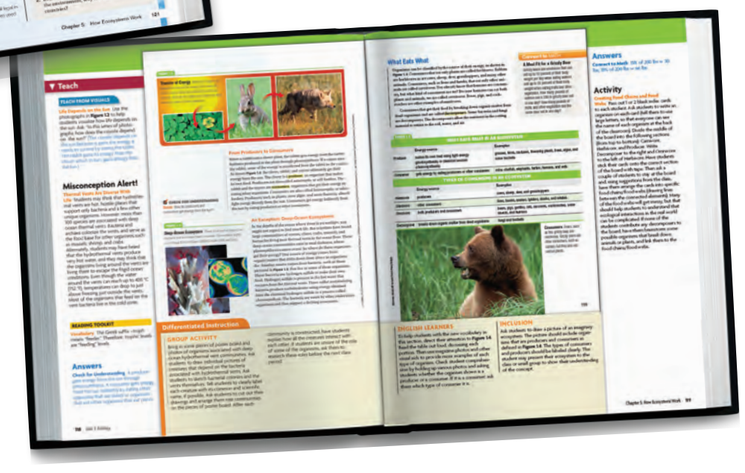


"Designed to help students understand the environmental issues of today and the future."
—Michael Heithaus, Ph.D.

New Contributing Author
Michael Heithaus, Ph.D., brings his speciality in Marine Biology and a passion for engaging students in the wonders of the natural world and the application of the scientific method.

Expanded Case Studies in the Student Edition encourage students to take action. These compelling features are introduced in the Chapter Opener and revisited in the Chapter Review.

See page 7 for more information.



Differentiated Instruction support in the Teacher Edition helps you reach all learners, with features provided for: **Below Level, English Language Learners, Group Activity, Inclusion, Pre-AP***, and **Teach with Technology.**

See page 9 for more information.

Innovative technology engages today's students and gives environmental science topics real-world relevance.

Interactive Online Edition offers 24/7 access to ALL program components and encourages your students to "Go Green."

EcoZine interactive online magazine keeps students up to date, informed, and involved.

Engaging Virtual Investigations reinforce learning and strengthen inquiry skills with interactive presentations, activities, and simulated explorations.

A dynamic Student Edition developed specifically for today's high school students.

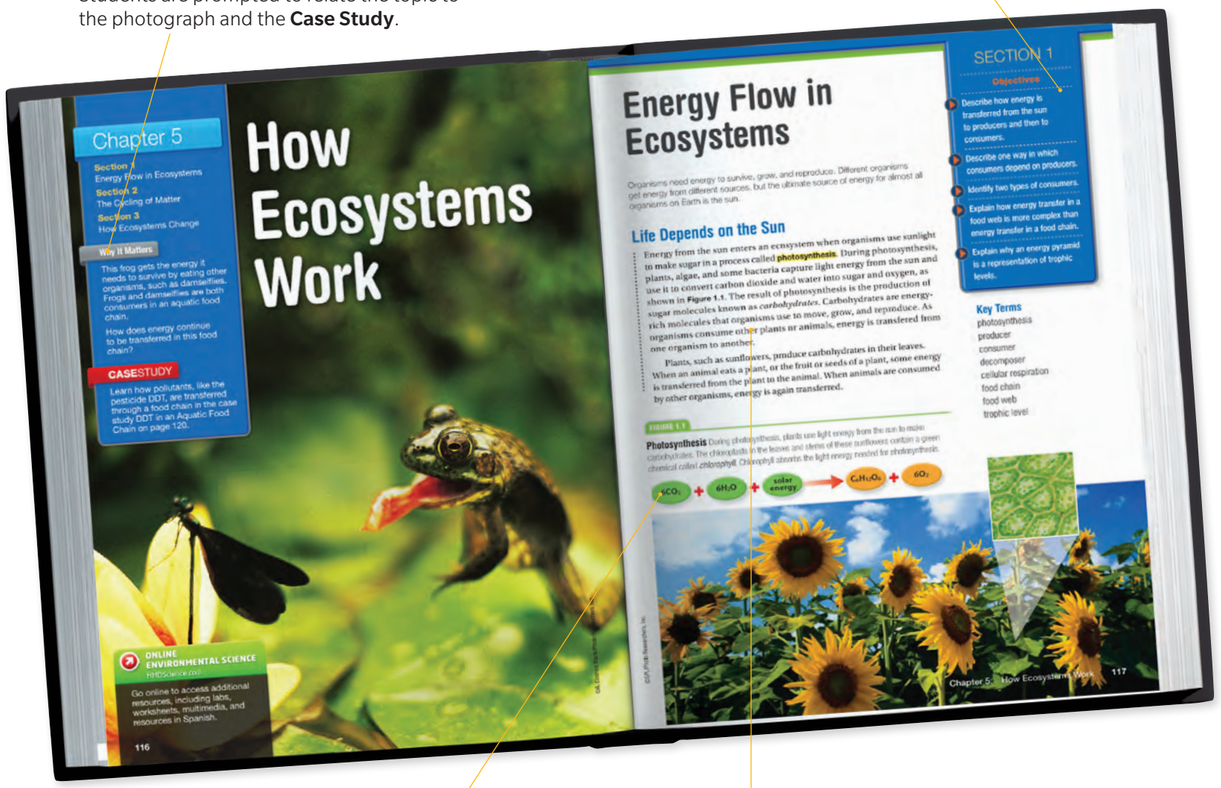
With a wealth of relevant, motivating features, the Student Edition engages and supports students with labs and activities for hands-on involvement; review for test-readiness; and reinforcement for building reading, writing, math, and science skills.

Science in the Real World

Each chapter introduces a **Why It Matters** strand that helps students connect environmental science topics to the world around them. Students are prompted to relate the topic to the photograph and the **Case Study**.

Section Objectives and Key Terms

Each section begins with lists of **Objectives and Key Terms** that focus student attention on the material they are about to read.

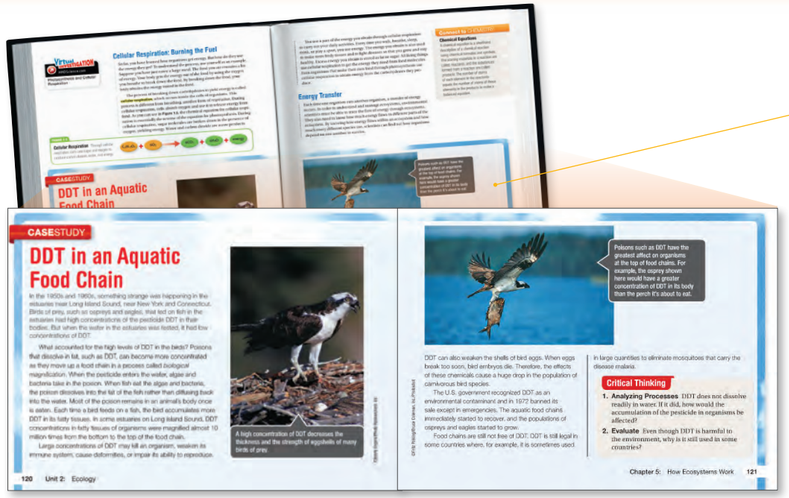


Learn from Visuals

The **charts**, **graphs**, **photographs**, and **illustrations** help students visualize key concepts. Many include questions to help students apply what they have learned.

Accessible Text

Easy navigation, outline-style headings, and manageable content sections keep students engaged in the material.



Engaging Case Studies

Case Studies make science relevant to students by presenting current real-world issues. Critical-thinking questions build students' analytical skills and help them make connections. Case Studies are introduced in Chapter Opener and revisited in Chapter Review.

Check for Understanding

To reinforce comprehension, **Check for Understanding** questions are placed strategically throughout the text.

CHECK FOR UNDERSTANDING
Recognize How do algal blooms harm aquatic ecosystems?

Hands-On Labs and Activities

QuickLabs provide short, hands-on experiences and require minimal materials. **Field Activities** give students the opportunity to observe and apply new knowledge in a real-world setting. Chapter Labs, including **Exploration** and **Inquiry Labs**, provide in-depth exploration of a concept using scientific methods.

QUICKLAB
Make Every Breath Count
Procedure
1. Pour 100 mL of water from a graduated cylinder into a 250 mL beaker. Add several drops of bromthymol blue to the beaker of water. Make sure you add enough to make the solution a dark blue color.
2. Exhale through a straw into the solution until the solution turns yellow. (CAUTION: Be sure not to inhale or ingest the solution.)
3. Pour the yellow solution into a large test tube that contains a sprig of Elodea.
4. Stopper the test tube, and place it

Connect to...

Cross-disciplinary **Connect to**... features show how environmental science relates to other sciences and disciplines.

Connect to MATH
A Meal Fit for a Grizzly Bear
Grizzly bears are omnivores that can eat up to 15 percent of their body weight per day when eating salmon and up to 33 percent of their body weight when eating fruits and other vegetation. How many pounds of salmon can a 200 lb grizzly bear eat in one day? How many pounds of fruits and other vegetation can the

High-Interest Features

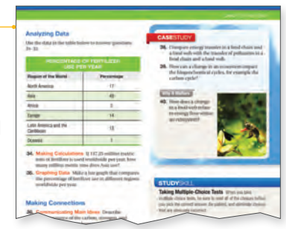
Relevant and engaging features designed to extend learning with real-world examples include **Maps in Action, Society and the Environment, Points of View**, and **Making a Difference**.

EcoFacts

EcoFacts present brief tidbits of interesting, related information to spark inquiry and exploration.

ECOFACT
Minerals in Your Mouth
Phosphorus is the 11th most abundant element in the Earth's crust and occurs naturally as phosphate in the mineral apatite. Apatite can exist in igneous, metamorphic, and sedimentary rocks as well as in your teeth and bones.

Review for Test-Readiness



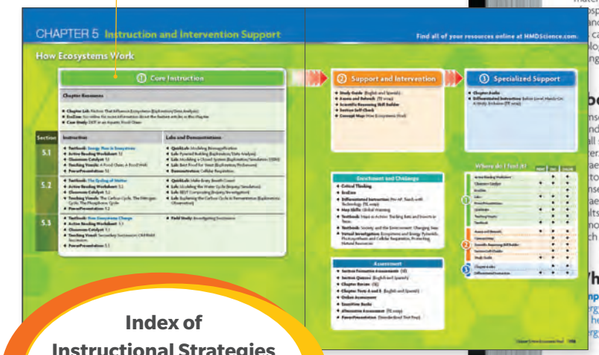
- The **Chapter Review** connects the **Case Study** and **Why It Matters** strand to the section objectives.
- Each **Chapter Summary** highlights key terms and concepts to help students study for the **Chapter Review.**
- Each section ends with **Formative Assessment** questions that enable students to check their understanding and apply problem-solving skills.
- A **StudySkill**, included in the Chapter Review, helps students practice study and test-taking skills.

A full-featured Teacher Edition with all the support and strategies you've come to expect.

With a wealth of activities, strategies, and exciting features to ignite class discussion and critical thinking, the Teacher Edition is designed to help you reach all levels of learners.

Instruction and Intervention Support

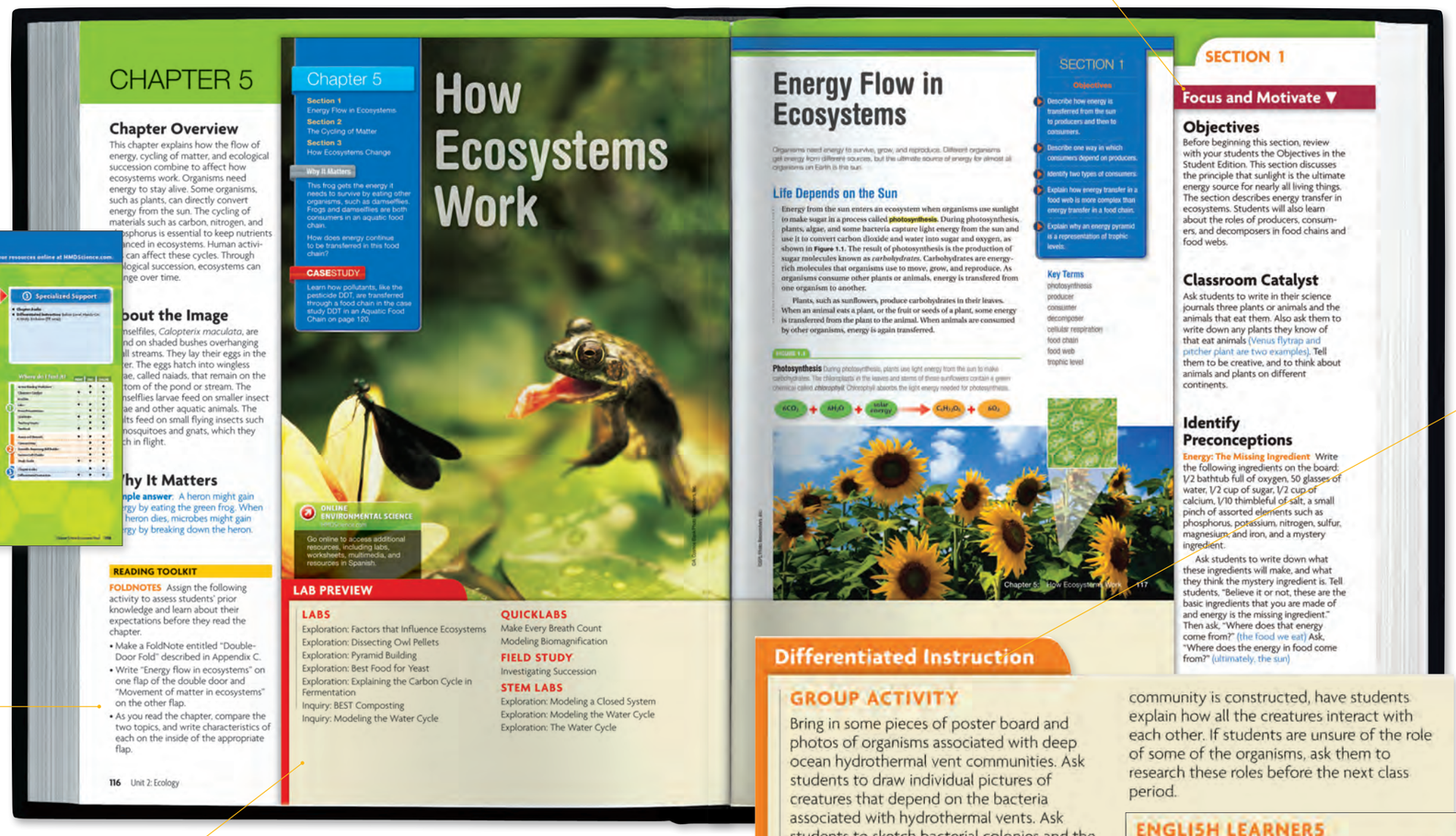
To simplify lesson planning, the **Instruction and Intervention Support** pages at the beginning of each chapter provide a full listing of the activities and classroom resources available for each section.



Index of Instructional Strategies includes **Teaching Strategies** and **21st-Century Skills and Themes.**

Reading Toolkit

A prereading activity includes **FoldNote** instructions to help students organize their ideas and improve comprehension and retention. Illustrations of how to construct various FoldNote designs are located in Appendix C. Animated illustrations demonstrating how to create the 10 FoldNote designs are available online.



Lab Preview

This section lists and previews all of the chapter's labs—including **QuickLabs**, and **Field Study**. Labs can also be accessed online or on the Lab Generator DVD.

Built-in Instructional Framework

The Teacher Edition wrap features a predictable, three-part instructional model—**Focus and Motivate, Teach**, and **Assess and Reteach**—to ensure that students understand and retain science concepts.

ABOVE STRATEGIES ARE FROM PAGES 118 AND 119

Options for Instruction

A wealth of activities and teaching tips allows you to customize your classroom to fit your students' needs. These include:

- Career
- Citizen Science
- Classroom Catalyst
- Connect to...Biology, History, Language Arts, Math, Medicine, and more
- Global Awareness
- Homework
- Identify Preconceptions
- Interpret Data, Interpret Statistics
- Make It Relevant
- Reading Toolkit/ Vocabulary
- Science in Action
- Teach from Visuals

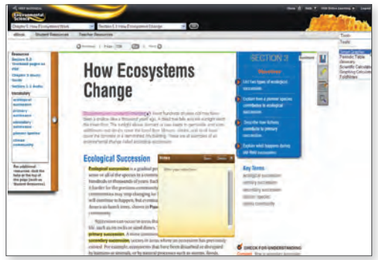
Differentiated Instruction

Differentiated Instruction strategies are provided for every lesson to assist you in helping students with a wide range of needs. The strategies include:

- Below Level
- Group Activity
- Pre-AP*
- English Learners
- Inclusion
- Teach with Technology

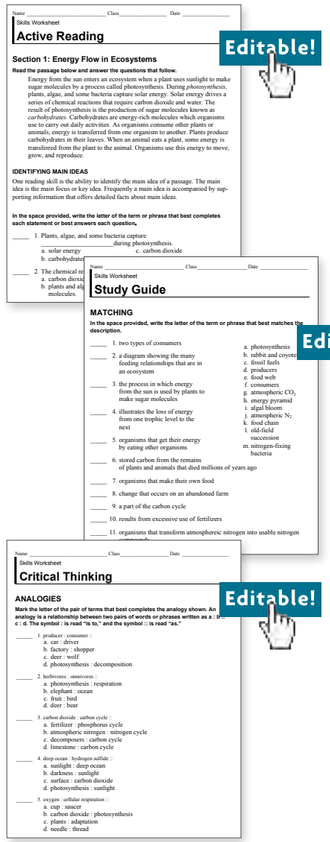
Online Reading Tools Build Critical-Thinking and Comprehension Skills.

Students using Holt McDougal *Environmental Science* will get the most out of their reading with point-of-use resources that help build critical reading skills and comprehension.



Enhanced eBook

This online version of the Student Edition, accessed via the "eBook" tab on HMDScience.com, enables students to access all the textbook pages on a desktop, laptop, or netbook computer. A separate tab offers access to the Study Guide, audio, and Key Terms definitions, and the "Tools" menu provides point-of-use access to the Smart Grapher, Periodic Table, full Glossary, FoldNotes, and other interactive features. Additional motivating functionality includes bookmarking, highlighting, notetaking, and keyword searching.



Active Reading Worksheets

Editable skills worksheets for every section help students learn to analyze text passages to build comprehension. The following skills are emphasized: recognizing cause and effect, sequencing, recognizing similarities and differences, and organizing information. Assign the worksheets as homework, use them to assess reading skills in struggling readers, or help advanced students practice for standardized tests.

See Chapter 5 sample on page 20.

Study Guide

These worksheets help ensure that students understand the key terms and main concepts in each chapter. These can be assigned for homework or used as an in-class review in preparation for the Chapter Test. Also available in the print Study Guide.

See Chapter 5 sample on page 21.

Critical Thinking

On these editable worksheets, students use cognitive skills to draw well-reasoned conclusions. Critical-thinking skills covered include distinguishing between fact and opinion; identifying bias; identifying fallacies in logic; judging the authenticity, worth, or accuracy of a position or claim; and synthesizing and evaluating information from various sources.

See Chapter 5 sample on page 22.

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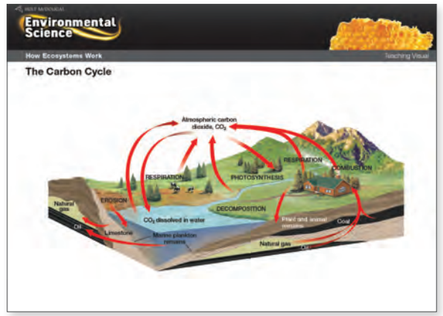
24/7 point-of-use access to all your program components

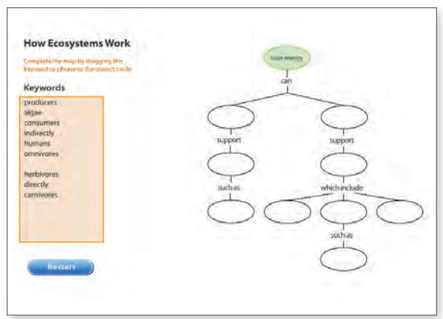


Teaching Visuals

More than 200 digital illustrations and diagrams (many from the textbook) support and enhance whole-class instruction.

FoldNotes

Ten reading study tools featured in the Appendix of the Student Edition (and in the Teacher Edition wrap) are also demonstrated online in step-by-step animated instructions to help students organize concepts and review main ideas



Interactive Concept Maps

Available for every chapter, these interactive graphic organizers show the relationships among concepts and help students develop logical thinking and study skills.

Online Resources for Differentiation
Reach a Wide Range of Learners.

Holt McDougal *Environmental Science* helps you reach all learners by providing time-saving, easy-to-use resources that enable students of all abilities to achieve understanding and success.

Audio Files in English
The entire Student Edition has been professionally recorded and is available online at point of use to help bolster comprehension. Downloadable to MP3 players, the audio files are also included on the Student One Stop™ DVD.

Map Skills Worksheets
Worksheets designed to improve student map-reading and interpretation skills are ideal for in-class activities or as homework assignments.

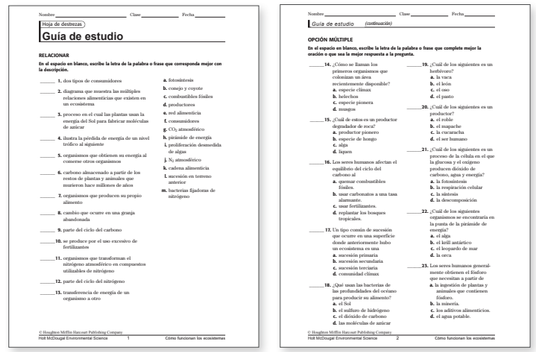
See Chapter 5 sample on page 24.

EcoZine
Give students access to current information from the community and the world, updated regularly with live news feeds and feature articles. **EcoZine** is a free online magazine that puts students on a fast track to what's happening in the ever-changing world of environmental science. Interactive features help to extend learning for advanced students and support comprehension for visual learners.

Scientific Reasoning Skill Builder*
The Exercises in these practice worksheets help students to develop the thinking skills that form the building blocks of quantifying and comparing—and to integrate these thought modes into their reading, writing, and thinking. Skills covered include observing and describing; describing time; defining, classifying and categorizing; cause-and-effect relationships; comparison; hypothesis; probability; prediction; generalizations; and analogies. The worksheets are especially useful for English language learners and students who are at-risk.

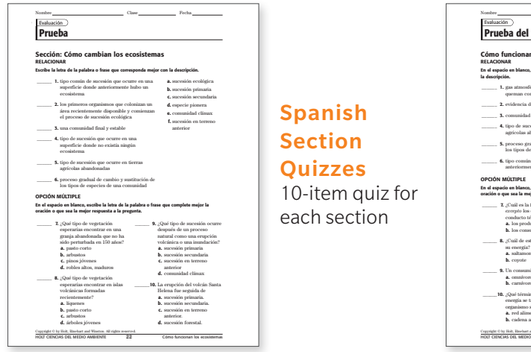
See Chapter 5 sample on pages 24–25.

Online Resources for English Language Learners

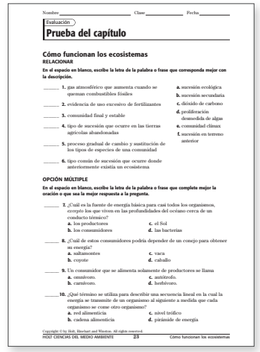


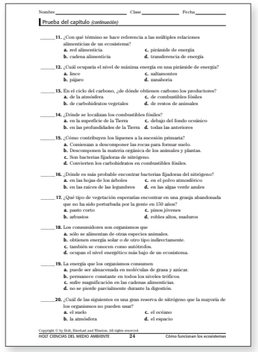
Spanish Study Guide
Study Skills worksheets help ensure that students understand the key terms and main ideas in each chapter.

See Chapter 5 sample on page 21.

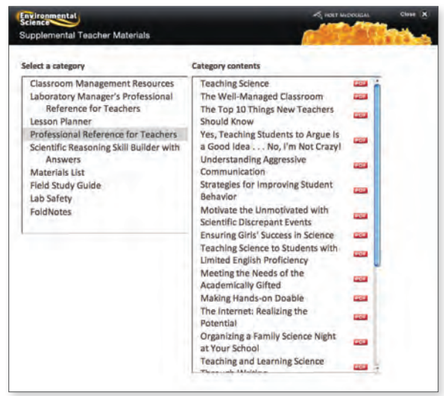


Spanish Section Quizzes
10-item quiz for each section





Spanish Chapter Test A
General-level chapter test



Professional Reference for Teachers*
Three sections to support ELL instruction include:
- Teaching Science to Students with Limited English Proficiency
- Meeting the Needs of Standard English Learners
- Teaching Reading to English Language Learners in the Science Classroom

HMDScience.com

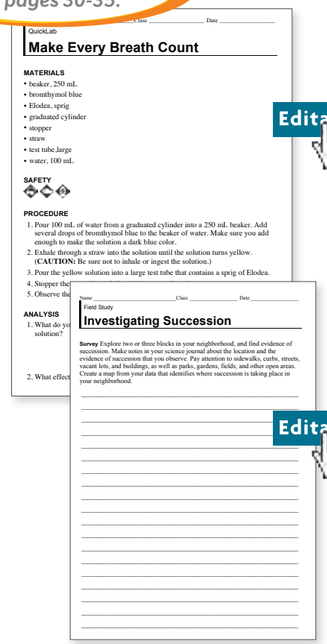
*ITEMS LOCATED IN TEACHER RESOURCES ENGLISH LANGUAGE LEARNERS DROPDOWN MENU.

Online Labs and Data Analysis Promote Inquiry.

Because inquiry is the cornerstone of understanding science concepts, Holt McDougal *Environmental Science* offers the widest array of labs available in a high school program to promote hands-on exploration and application. All labs are accompanied by Teacher Notes, and are available online.

See lab samples on pages 30-35.

Lab types include:


Name _____ Class _____ Date _____

QuickLab

Make Every Breath Count

MATERIALS
- beaker, 250 mL
- bromthymol blue
- Elodea, sprig
- graduated cylinder
- stopper
- straw
- test tube,large
- water, 100 mL

SAFETY

PROCEDURE
1. Pour 100 mL of water from a graduated cylinder into a 250 mL beaker. Add several drops of bromthymol blue to the beaker of water. Make sure you add enough to make the solution a dark blue color.
2. Exhale through a straw into the solution until the solution turns yellow. (**CAUTION:** Be sure not to inhale or ingest the solution.)
3. Pour the yellow solution into a large test tube that contains a sprig of Elodea.
4. Stopper the
5. Observe the

ANALYSIS
1. What do yo solution?
2. What effect

Editable!

QuickLabs
Minilabs that reinforce key concepts with simple, everyday materials and minimal planning

Name _____ Class _____ Date _____

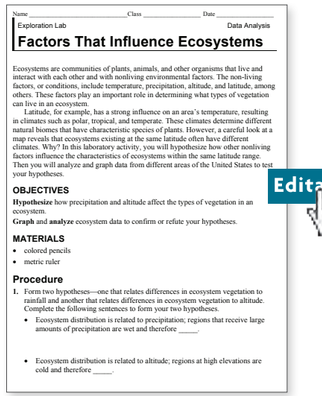
Field Study

Investigating Succession

Survey Explore two or three blocks in your neighborhood, and find evidence of succession. Make notes in your science journal about the location and the evidence of succession that you observe. Pay attention to sidewalks, curbs, streets, vacant lots, and buildings, as well as parks, gardens, fields, and other open areas. Create a map from your data that identifies where succession is taking place in your neighborhood.

Editable!

Field Studies
Hands-on environment-focused activities referenced in each chapter and located in Student Resources at the back of the Student Edition


Name _____ Class _____ Date _____

Exploration Lab Data Analysis

Factors That Influence Ecosystems

Ecosystems are communities of plants, animals, and other organisms that live and interact with each other and with nonliving environmental factors. The non-living factors, or conditions, include temperature, precipitation, altitude, and latitude, among others. These factors play an important role in determining what types of vegetation can live in an ecosystem.

Latitude, for example, has a strong influence on an area's temperature, resulting in climates such as polar, tropical, and temperate. These climates determine different natural biomes that have characteristic species of plants. However, a careful look at a map reveals that ecosystems existing at the same latitude often have different climates. Why? In this laboratory activity, you will hypothesize how other nonliving factors influence the characteristics of ecosystems within the same latitude range. Then you will analyze and graph data from different areas of the United States to test your hypotheses.

OBJECTIVES

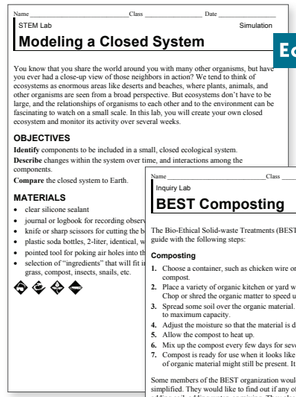
Hypothesize how precipitation and altitude affect the types of vegetation in an ecosystem.
Graph and **analyze** ecosystem data to confirm or refute your hypotheses.

MATERIALS
- colored pencils
- metric ruler

Procedure
1. Form two hypotheses—one that relates differences in ecosystem vegetation to rainfall and another that relates differences in ecosystem vegetation to altitude. Complete the following sentences to form your two hypotheses.
   - Ecosystem distribution is related to precipitation; regions that receive large amounts of precipitation are wet and therefore _____.
   - Ecosystem distribution is related to altitude; regions at high elevations are cold and therefore _____.

Editable!

Exploration Labs
Exercises that prompt students to explore a situation or phenomenon to improve their understanding of a new concept, and then produce a written analysis


Name _____ Class _____ Date _____

STEM Lab Simulation

Modeling a Closed System

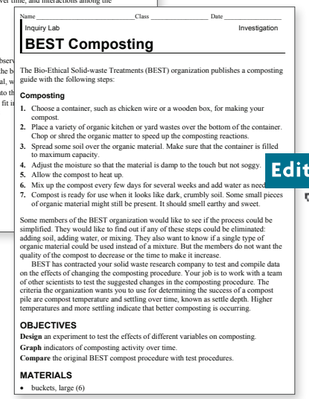
You know that you share the world around you with many other organisms, but have you ever had a close-up view of those neighbors in action? We tend to think of ecosystems as enormous areas like deserts and beaches, where plants, animals, and other organisms are seen from a broad perspective. But ecosystems don't have to be large, and the relationships of organisms to each other and to the environment can be fascinating to watch on a small scale. In this lab, you will create your own closed ecosystem and monitor its activity over several weeks.

OBJECTIVES

Identify components to be included in a small, closed ecological system.
Describe changes within the system over time, and interactions among the components.
Compare the closed system to Earth.

MATERIALS
- clear silicone sealant
- journal or logbook for recording observ
- knife or sharp scissors for cutting the h
- plastic soda bottles, 2-liter, identical, w
- pointed tool for poking air holes into th
- selection of "ingredients" that will fit i grass, compost, insects, snails, etc.

Editable!


Name _____ Class _____ Date _____

Inquiry Lab Investigation

BEST Composting

The Bio-Ethical Solid-waste Treatments (BEST) organization publishes a composting guide with the following steps:

Composting
1. Choose a container, such as chicken wire or a wooden box, for making your compost.
2. Place a variety of organic kitchen or yard wastes over the bottom of the container. Chop or shred the organic matter to speed up the composting reactions.
3. Spread some soil over the organic material. Make sure that the container is filled to maximum capacity.
4. Adjust the moisture so that the material is damp to the touch but not soggy.
5. Allow the compost to heat up.
6. Mix up the compost every few days for several weeks and add water as need
7. Compost is ready for use when it looks like dark, crumbly soil. Some small pieces of organic material might still be present. It should smell earthy and sweet.

Some members of the BEST organization would like to see if the process could be simplified. They would like to find out if any of these steps could be eliminated: adding soil, adding water, or mixing. They also want to know if a single type of organic material could be used instead of a mixture. But the members do not want the quality of the compost to decrease or the time to make it increase.

BEST has contracted your solid waste research company to test and compile data on the effects of changing the composting procedure. Your job is to work with a team of other scientists to test the suggested changes in the composting procedure. The criteria the organization wants you to use for determining the success of a compost pile are compost temperature and settling over time, known as settle depth. Higher temperatures and more settling indicate that better composting is occurring.

OBJECTIVES

Design an experiment to test the effects of different variables on composting.
Graph indicators of composting activity over time.
Compare the original BEST compost procedure with test procedures.

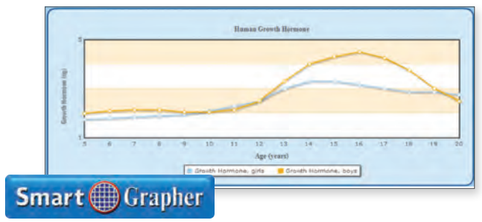
MATERIALS
- buckets, large (6)

Editable!

STEM Labs
60 STEM activities that bring the application of science, technology, engineering, and mathematics into your classroom

Inquiry Labs
Student-developed labs that encourage students to perform their own procedure to solve a problem, often using a real-life example

Virtual Investigations
21 multimedia lessons, each approximately 30 minutes in length, combine engaging presentations, interactive activities, and simulated scientific investigations to reinforce students' understanding of environmental science while strengthening inquiry and lab skills.



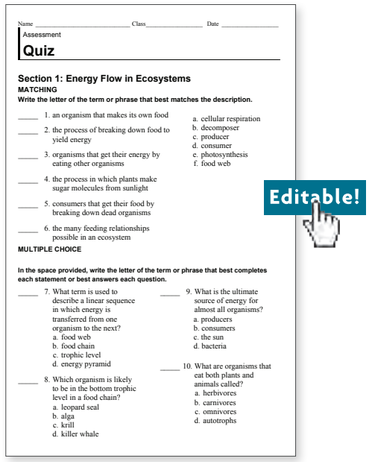
Smart Grapher
A powerful, easy-to-use online graphing tool enables students to use their own data to create line graphs, circle graphs, and more.

Additional Lab Resources
The Lab Resources menu under the Labs and Field Studies link on the Teacher Dashboard provides a wide variety of resources to support your lab program, including:

- Materials List
- Field Study Guide
- Lab Safety

Online Assessment Opportunities Help Track Student Progress.

The comprehensive and varied assessment options located at HMDScience.com bring together all Holt McDougal *Environmental Science* assessment tools in one convenient place, helping you make the best decision for assessing every student.


Name _____ Class_____ Date _____

Assessment

Quiz

Section 1: Energy Flow in Ecosystems

MATCHING

Write the letter of the term or phrase that best matches the description.

_____ 1. an organism that makes its own food
_____ 2. the process of breaking down food to yield energy
_____ 3. organisms that get their energy by eating other organisms
_____ 4. the process in which plants make sugar molecules from sunlight
_____ 5. consumers that get their food by breaking down dead organisms
_____ 6. the many feeding relationships possible in an ecosystem

a. cellular respiration
b. decomposer
c. producer
d. consumer
e. photosynthesis
f. food web

MULTIPLE CHOICE

In the space provided, write the letter of the term or phrase that best completes each statement or best answers each question.

_____ 7. What term is used to describe a linear sequence in which energy is transferred from one organism to the next?
a. food web
b. food chain
c. trophic level
d. energy pyramid

_____ 8. Which organism is likely to be in the bottom trophic level in a food chain?
a. leopard seal
b. alga
c. krill
d. killer whale

_____ 9. What is the ultimate source of energy for almost all organisms?
a. producers
b. consumers
c. the sun
d. bacteria

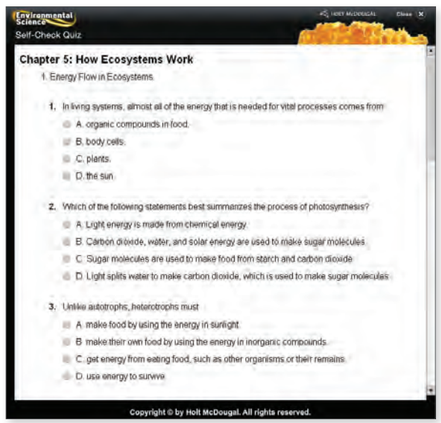
_____ 10. What are organisms that eat both plants and animals called?
a. herbivores
b. carnivores
c. omnivores
d. autotrophs

Editable!

Section Quiz

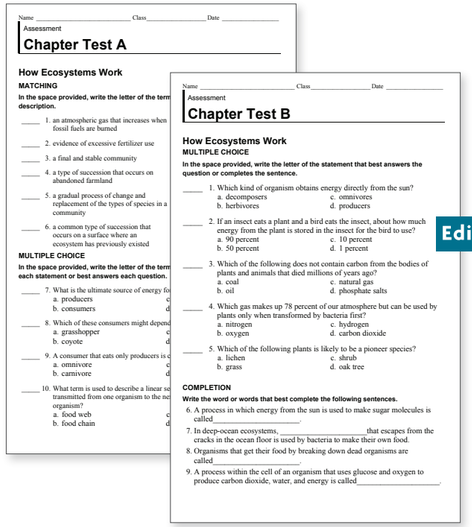
Use this quick comprehension check to guide your reteaching options.

See Chapter 5 sample on page 26.



Section Self-Quizzes

Eight to ten questions for each section provide immediate feedback for students.


Name _____ Class_____ Date _____

Assessment

Chapter Test A

How Ecosystems Work

MATCHING

In the space provided, write the letter of the term description.

_____ 1. an atmospheric gas that increases when fossil fuels are burned
_____ 2. evidence of excessive fertilizer use
_____ 3. a final and stable community
_____ 4. a type of succession that occurs on abandoned farmland
_____ 5. a gradual process of change and replacement of the types of species in a community
_____ 6. a common type of succession that occurs on a surface where an ecosystem has previously existed

MULTIPLE CHOICE

In the space provided, write the letter of the term each statement or best answers each question.

_____ 7. What is the ultimate source of energy fo
a. producers
b. consumers

_____ 8. Which of these consumers might depend
a. grasshopper
b. coyote

_____ 9. A consumer that eats only producers is c
a. omnivore
b. carnivore

_____ 10. What term is used to describe a linear se transmitted from one organism to the ne organism?
a. food web
b. food chain

Name _____ Class_____ Date _____

Assessment

Chapter Test B

How Ecosystems Work

MULTIPLE CHOICE

In the space provided, write the letter of the statement that best answers the question or completes the sentence.

_____ 1. Which kind of organism obtains energy directly from the sun?
a. decomposers
b. herbivores
c. omnivores
d. producers

_____ 2. If an insect eats a plant and a bird eats the insect, about how much energy from the plant is stored in the insect for the bird to use?
a. 90 percent
b. 50 percent
c. 10 percent
d. 1 percent

_____ 3. Which of the following does not contain carbon from the bodies of plants and animals that died millions of years ago?
a. coal
b. oil
c. natural gas
d. phosphate salts

_____ 4. Which gas makes up 78 percent of our atmosphere but can be used by plants only when transformed by bacteria first?
a. nitrogen
b. oxygen
c. hydrogen
d. carbon dioxide

_____ 5. Which of the following plants is likely to be a pioneer species?
a. lichen
b. grass
c. shrub
d. oak tree

COMPLETION

Write the word or words that best complete the following sentences.

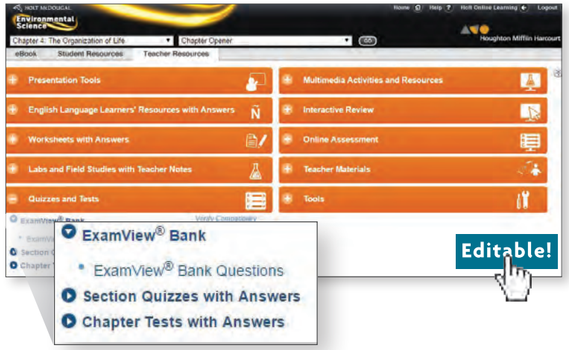
6. A process in which energy from the sun is used to make sugar molecules is called_____.
7. In deep-ocean ecosystems, _____ that escapes from the cracks in the ocean floor is used by bacteria to make their own food.
8. Organisms that get their food by breaking down dead organisms are called_____.
9. A process within the cell of an organism that uses glucose and oxygen to produce carbon dioxide, water, and energy is called_____.

Editable!

Chapter Tests A and B

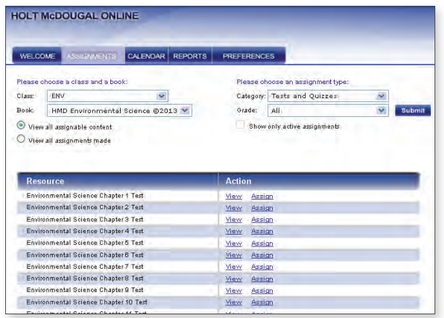
Each chapter has two tests—for general and advanced levels—which can be edited directly or customized in ExamView.

See Chapter 5 sample on pages 27–29.



ExamView® Test Banks

All chapter and section quizzes are available in these banks online at **HMDScience.com** or on the **Teacher One Stop DVD**. Use them to create customized tests, and use questions with classroom clickers.

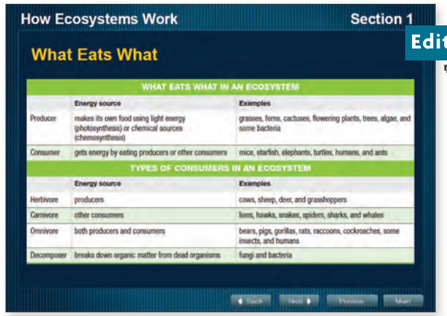


Online Assessment

For teachers who prefer to deliver online testing with automatic scoring, this option offers a 20-item multiple-choice test for every chapter, different from the quizzes available in ExamView.

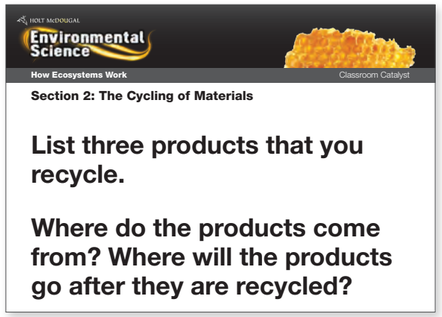
Online Resources That Save Time and Make Teaching Easier.

Holt McDougal *Environmental Science* was developed to help you reach students with a wide range of abilities and needs. Additional online teacher support components will save you time and fit easily with your instructional model.



PowerPresentations

Editable PowerPoint® files offer engaging multimedia presentations that cover the core material of each chapter—a valuable resource that saves on class-preparation time.

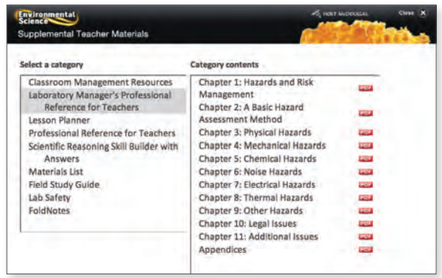


Classroom Catalyst

For each section, a motivating question or brainstorming task is provided to help spark students' interest in the topic at hand.

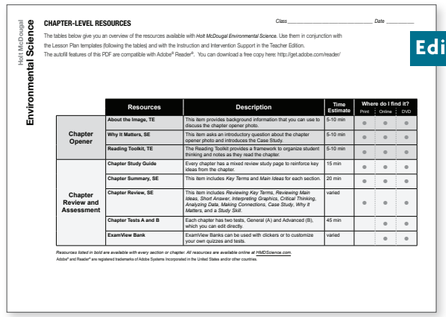
Classroom Management Resources*

These useful resources include an overview of lab techniques, letters to parents/guardians, progress-evaluation forms for students, a science fair guide, and much more.



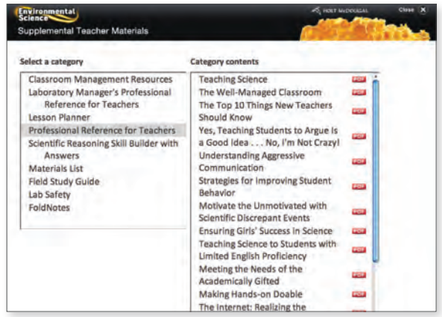
Laboratory Manager's Professional Reference for Teachers*

A must-have for anyone overseeing lab activities, this 150-page resource provides valuable guidelines and suggestions for managing student labs, including an overview of lab techniques, letters to parents/guardians, progress evaluation forms for students, science fair guide, and much more.



Lesson Planner*

An editable lesson planner provides a flexible tool to use in tailoring your lessons to your classroom's specific needs.



Professional Reference for Teachers*

Articles written by science educators target 21 issues related to the science classroom. Topics include teaching science to students with limited English proficiency, meeting the needs of academically gifted students, and teaching science through writing.

Sample Reading and Vocabulary Worksheets

Name _____ Class_____ Date _____

Skills Worksheet

Active Reading

Section 1: Energy Flow in Ecosystems

Read the passage below and answer the questions that follow.

Energy from the sun enters an ecosystem when a plant uses sunlight to make sugar molecules by a process called photosynthesis. During *photosynthesis,* plants, algae, and some bacteria capture solar energy. Solar energy drives a series of chemical reactions that require carbon dioxide and water. The result of photosynthesis is the production of sugar molecules known as *carbohydrates.* Carbohydrates are energy-rich molecules which organisms use to carry out daily activities. As organisms consume other plants or animals, energy is transferred from one organism to another. Plants produce carbohydrates in their leaves. When an animal eats a plant, some energy is transferred from the plant to the animal. Organisms use this energy to grow, and reproduce.

IDENTIFYING MAIN IDEAS

One reading skill is the ability to identify the main idea of a passage. The ma idea is the main focus or key idea. Frequently a main idea is accompanied by porting information that offers detailed facts about main ideas.

In the space provided, write the letter of the term or phrase that best complet each statement or best answers each question.

_____ 1. Plants, algae, and some bacteria capture _____during photosynthesis.
a. solar energy
b. carbohydrates
c. carbon dioxide
d. organisms

_____ 2. The chemical reactions driven by solar energy require
a. carbon dioxide and water.
b. plants and algae.
c. organisms and water.
d. carbon dioxide and sugar molecules.

_____ 3. During photosynthesis, plants make
a. carbohydrates.
b. carbon dioxide.
c. water.
d. None of the above

_____ 4. Where does the production of carbohydrates in a plant take place
a. in the carbohydrates
b. in the leaves
c. in the ecosystem
d. in the stems

Editable!

Active Reading worksheets help students learn to analyze text passages to build comprehension.

Name _____ Class_____ Date _____

Active Reading *continued*

VOCABULARY DEVELOPMENT

Read each question and write the answer in the space provided.

5. Energy-rich molecules that organisms use to carry out daily activities are.

_____

6. The process by which a plant uses sunlight to make sugar molecules is called

_____

SEQUENCING INFORMATION

One reading skill is the ability to sequence information, or to logically place items or events in the order in which they occur.

Sequence the statements below to show the steps in the process of energy production and consumption. Write "1" on the line in front of the first step, "2" on the line in front of the second step, and so on.

_____ 7. Photosynthesis produces carbohydrates.

_____ 8. Plants, algae, and some bacteria capture solar energy.

_____ 9. Energy is transferred from one organism to another.

_____ 10. Solar energy drives a series of chemical reactions.

_____ 11. Other organisms consume carbohydrates found in plants, algae, and some bacteria.

RECOGNIZING CAUSE AND EFFECT

One reading skill is the ability to recognize cause and effect.

In the space provided, write the letter of the effect that best matches the cause.

_____ 12. Organisms consume food and use energy from carbohydrates.

_____ 13. A plant uses sunlight for photosynthesis.

_____ 14. An animal eats a plant.

a. Carbohydrates are produced.
b. Energy is transferred from one organism to another.
c. Energy from the plant is transferred and used to move, grow, and reproduce.

Name _____ Class_____ Date _____

Skills Worksheet

Study Guide

MATCHING

In the space provided, write the letter of the term or phrase that best matches the description.

_____ 1. two types of consumers

_____ 2. a diagram showing the many feeding relationships that are in an ecosystem

_____ 3. the process in which energy from the sun is used by plants to make sugar molecules

_____ 4. illustrates the loss of energy from one trophic level to the next

_____ 5. organisms that get their energy by eating other organisms

_____ 6. stored carbon from the remains of plants and animals that died millions of years ago

_____ 7. organisms that make their own food

_____ 8. change that occurs on an abandoned farm

_____ 9. a part of the carbon cycle

_____ 10. results from excessive use of fertilizers

_____ 11. organisms that transform atmosphereic nitrogen into usable compounds

_____ 12. part of the nitrogen cycle

_____ 13. transfer of energy from one organism to another

a. photosynthesis
b. rabbit and coyote
c. fossil fuels
d. producers
e. food web
f. consume
g. atmosph
h. energy p
i. algal blo
j. atmosph
k. food cha
l. old-field successi
m. nitrogen- bacteria

Editable!

Study Guide worksheets—ideal for homework or in-class review—ensure that students understand key terms and concepts.

Name _____ Class_____ Date _____

Study Guide *continued*

MULTIPLE CHOICE

In the space provided, write the letter of the term or phrase that best completes each statement or best answers each question.

_____ 14. What are the first organisms to colonize any newly available area called?
a. climax species
b. ferns
c. pioneer species
d. mosses

_____ 15. Which of the following is a producer that breaks down rock?
a. pioneer producer
b. fungal species
c. algae
d. lichen

_____ 16. Humans are affecting the balance of the carbon cycle by
a. burning fossil fuels.
b. using carbonates at an alarming rate.
c. using fertilizers.
d. replanting the rain forests.

_____ 17. What is a pattern of change that occurs on a surface where an ecosystem has previously existed?
a. primary succession
b. secondary succession
c. tertiary succession
d. climax community

_____ 18. What do deep-ocean bacteria use to make their food?
a. the sun
b. hydrogen sulfide
c. carbon dioxide
d. sugar molecules

_____ 19. Which of the following is an herbivore?
a. cow
b. lion
c. bear
d. grass

_____ 20. Which of the following is a producer?
a. oak tree
b. raccoon
c. cockroach
d. human

_____ 21. Which of the following is a process in the cell where by glucose and oxygen produce carbon dioxide, water, and energy?
a. photosynthesis
b. cellular respiration
c. synthesis
d. decomposition

_____ 22. Which of the following organisms would be found at the top of an energy pyramid?
a. alga
b. krill
c. leopard seal
d. killer whale

_____ 23. Humans usually get the phosphorus that their bodies need from
a. eating plants and animals that contain phosphorus.
b. mining.
c. food additives.
d. drinking water.

Sample Reading and Vocabulary Worksheets

Name _____ Class_____ Date _____

Skills Worksheet

Critical Thinking

ANALOGIES

Mark the letter of the pair of terms that best completes the analogy shown. An analogy is a relationship between two pairs of words or phrases written as a : b :: c : d. The symbol : is read "is to," and the symbol :: is read "as."

_____ 1. producer : consumer ::
a. car : driver
b. factory : shopper
c. deer : wolf
d. photosynthesis : decomposition

_____ 2. herbivores : omnivores ::
a. photosynthesis : respiration
b. elephant : ocean
c. fruit : bird
d. deer : bear

_____ 3. carbon dioxide : carbon cycle ::
a. fertilizer : phosphorus cycle
b. atmospheric nitrogen : nitrogen cycle
c. decomposers : carbon cycle
d. limestone : carbon cycle

_____ 4. deep ocean : hydrogen sulfide ::
a. sunlight : deep ocean
b. darkness : sunlight
c. surface : carbon dioxide
d. photosynthesis : sunlight

_____ 5. oxygen : cellular respiration ::
a. cup : saucer
b. carbon dioxide : photosynthesis
c. plants : adaptation
d. needle : thread

_____ 6. climax forest : clear-cut forest ::
a. plants : animals
b. food web : food chain
c. sun : fire
d. full : empty

Editable!

Critical Thinking worksheets ask students to use cognitive skills to draw well-reasoned conclusions.

Name _____ Class_____ Date _____

Critical Thinking *continued*

INTERPRETING OBSERVATIONS

Read the following passage, and then answer the questions below.

Your family is considering buying a house near a nature preserve that has been established to maintain a portion of the original ecosystem. You attend a meeting in which the developer is explaining the plans for the project. One woman in the audience complains that she does not like the natural prairie grasses on the nature preserve. She wants the grasses removed and replanted with an imported grass. A man in the audience suggests that exotic animals on the preserve would make it more beautiful. One woman proposes that the developer construct a playground in the center of the preserve and build a paved road to it. She wants picnic tables set up throughout the preserve for family picnics.

7. What would be your response to the woman who wants to replace the native grasses?

8. What would be your response to the man who wants exotic animals placed on the site?

9. What would be your response to the woman who wants to put a playground on the site?

Name _____ Class_____ Date _____

Critical Thinking *continued*

AGREE OR DISAGREE

Agree or disagree with the following statements, and support your answer

10. There would be no life on Earth without the sun.

11. Our activities do not affect the carbon cycle.

12. A seve
entire e

Name _____ Class_____ Date _____

Critical Thinking *continued*

REFINING CONCEPTS

The statements below challenge you to refine your understanding of concepts covered in the chapter. Think carefully, and answer the questions that follow.

13. Explain why the difference between primary and secondary succession is not always clear.

k would happen to the phosphorus, carbon, and nitrogen
to burn out.

Name _____ Class_____ Date _____

Critical Thinking *continued*

15. Energy pyramids are useful for describing the energy losses in a food chain. Describe an energy pyramid for a group of organisms in your area.

16. Explain the importance of lichens to primary succession.

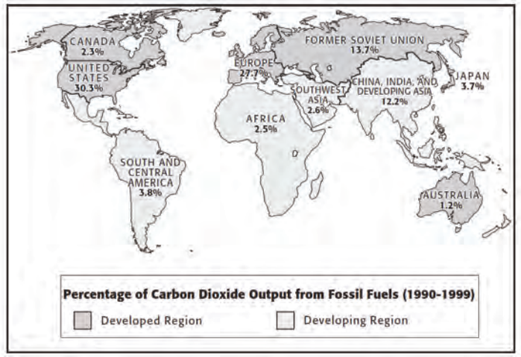
17. Explain how a clover is part of the carbon, nitrogen, and phosphorus cycles.

Sample Differentiated Resources

Name _____ Class _____ Date _____

Skills Worksheet **GLOBAL WARMING**

Map Skills



Global warming is a rise in the average temperature of Earth's atmosphere over a long period of time. It is caused by the release of gases, especially carbon dioxide. Harmful levels of carbon dioxide are emitted into the air by car exhaust, power plants, and other human activities. This map shows which regions of Earth contribute most to global warming.

Use the map above to answer the questions below.

1. **Using a Key** Are developed regions or developing regions responsible for the highest percentage of carbon dioxide output from fossil fuels?

2. **Finding Locations** Which region has the highest percentage of carbon dioxide output? the lowest?

3. **Making Conclusions** Why do you think developed regions have a higher output of carbon dioxide?

4. **Making a Hypothesis** What might explain the fact that although Australia is developed, it has the lowest percentage of carbon dioxide output?

Editable!

Map Skills worksheets develop students' map-reading and interpretation abilities.

Scientific Reasoning Skill Builder worksheets offer practice in building quantifying and comparing skills.

Name _____ Date _____ Class _____

CHAPTER 7 HYPOTHESIS, PROBABILITY, AND PREDICTION

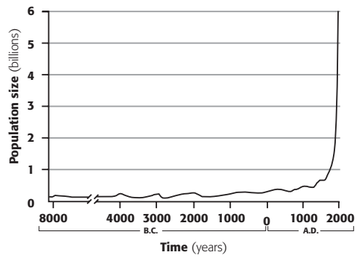
7-3 Prediction

Some hypotheses explain why events happened in a certain way. Some hypotheses predict what will happen in the future. These hypotheses tell you how things will *probably* behave in the future. Suppose one student says to another, "If you study hard, you will pass the test." This statement is a **prediction.** For example, some astronomers hypothesize that the solar system will be destroyed in 10 billion years. Others predict that the universe will go on expanding forever.

To make good predictions, scientists begin with evidence that gives some indication of what will happen. For example, astronomers can tell that the universe is currently expanding and that it has been expanding for as long as they can determine. This evidence leads them to predict that the universe might go on expanding forever. Exercise 3 gives you practice looking at evidence and using it to make predictions. Exercises 4 and 5 require that you seek out evidence to make accurate predictions.

Exercise 3 **Making Predictions**

Study the information in the two images below. Think of some primary predictions and their secondary effects; that is, things that may or will happen as a result of other things. You will be asked to make specific predictions based on the information in these images and the other images that follow.

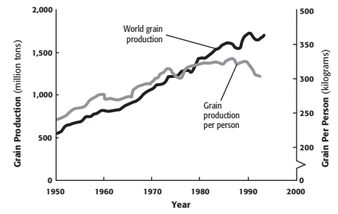


World Population Growth

Name _____ Date _____ Class _____

Section 7-3 Prediction, continued

a. What will happen if the world population continues to grow at its present rate?

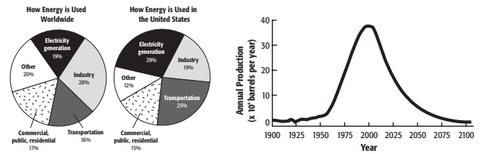


Changes in World Grain Production

b. What do you think will happen if the current trends in both population growth and in grain production continue?

Name _____ Date _____ Class _____

Section 7-3 Prediction, continued



Energy Usage **Oil Production**

c. If all energy came from oil, which aspect of life in the United States would have the greatest problem in the year 2100? Why?

d. Air pollution threatens the health of all people. The three main sources of air pollution are transportation, burning fuel apart from transportation, and industry. If population growth continues along its current trend without an increase in industrial growth, which source of pollution will become the biggest problem?

Sample Assessments

Name _____ Class_____ Date _____

Assessment

Quiz

Section 1: Energy Flow in Ecosystems

MATCHING

Write the letter of the term or phrase that best matches the description.

_____ 1. an organism that makes its own food

_____ 2. the process of breaking down food to yield energy

_____ 3. organisms that get their energy by eating other organisms

_____ 4. the process in which plants make sugar molecules from sunlight

_____ 5. consumers that get their food by breaking down dead organisms

_____ 6. the many feeding relationships possible in an ecosystem

a. cellular respiration
b. decomposer
c. producer
d. consumer
e. photosynthesis
f. food web

MULTIPLE CHOICE

In the space provided, write the letter of the term or phrase that best completes each statement or best answers each question.

_____ 7. What term is used to describe a linear sequence in which energy is transferred from one organism to the next?
a. food web
b. food chain
c. trophic level
d. energy pyramid

_____ 8. Which organism is likely to be in the bottom trophic level in a food chain?
a. leopard seal
b. alga
c. krill
d. killer whale

_____ 9. What is the ultimate source of energy for almost all organisms?
a. producers
b. consumers
c. the sun
d. bacteria

_____ 10. What are organisms that eat both plants and animals called?
a. herbivores
b. carnivores
c. omnivores
d. autotrophs

Editable!

Section Quizzes provide a quick comprehension check to guide reteaching options.

Name _____ Class_____ Date _____

Assessment

Chapter Test A

How Ecosystems Work

MATCHING

In the space provided, write the letter of the term or phrase that best matches the description.

_____ 1. an atmospheric gas that increases when fossil fuels are burned

_____ 2. evidence of excessive fertilizer use

_____ 3. a final and stable community

_____ 4. a type of succession that occurs on abandoned farmland

_____ 5. a gradual process of change and replacement of the types of species in a community

_____ 6. a common type of succession that occurs on a surface where an ecosystem has previously existed

a. ecological succession
b. secondary succession
c. carbon diox
d. algal bloom
e. climax community
f. old-field succession

MULTIPLE CHOICE

In the space provided, write the letter of the term or phrase that best comple each statement or best answers each question.

_____ 7. What is the ultimate source of energy for almost all organisms?
a. producers
b. consumers
c. the sun
d. bacteria

_____ 8. Which of these consumers might depend on a rabbit for its energy?
a. grasshopper
b. coyote
c. cow
d. horse

_____ 9. A consumer that eats only producers is called a(n)
a. omnivore
b. carnivore
c. autotroph
d. herbivore

_____ 10. What term is used to describe a linear sequence in which energy is transmitted from one organism to the next as each organism eats anoth organism?
a. food web
b. food chain
c. trophic level
d. energy pyramid

Editable!

Leveled Chapter Test A is a general-level test.

Name _____ Class_____ Date _____

Chapter Test A *continued*

_____ 11 What term is used to refer to the many feeding relationships that are possible in an ecosystem?
a. food web
b. food chain
c. energy pyramid
d. energy transfer

_____ 12. Which organism would occupy the level on an energy pyramid with the most energy?
a. bobcat
b. bird
c. grasshopper
d. carrot

_____ 13. In the carbon cycle, where do the producers get their carbon?
a. the atmosphere
b. carbohydrates in plants
c. fossil fuels
d. animal remains

_____ 14. Where are fossil fuels located?
a. on the surface of Earth
b. deep within Earth
c. beneath the ocean floor
d. all of the above

_____ 15. How do lichens contribute to primary succession?
a. Lichens begin to break down rock to form soil.
b. Lichens decompose organic matter from animals and plants.
c. Lichens are nitrogen-fixing bacteria.
d. Lichens convert carbohydrates into fossil fuels.

_____ 16. Where would you most likely find nitrogen-fixing bacteria?
a. in leaves of trees
b. on the roots of legumes
c. on dust particles in the atmosphere
d. in blue-green algae

_____ 17. What type of vegetation would you expect to find on an abandoned farm that has been undisturbed by humans for 150 years?
a. short grasses
b. shrubs
c. young pine trees
d. tall, mature oak trees

_____ 18. Consumers are organisms that
a. eat only other animal species.
b. get their energy by eating other organisms.
c. are also known as self-feeders.
d. occupy an ecosystem's lowest energy level.

_____ 19. The energy consumed by organisms
a. can be stored in fat and sugar molecules.
b. remains constant at all trophic levels.
c. undergoes magnification in food chains.
d. is not partially lost during digestion.

_____ 20. Which of these is a large reservoir of nitrogen that is unusable by most organisms?
a. soil
b. atmosphere
c. ocean
d. space

Sample Assessments

Name _____ Class_____ Date _____

Assessment

Chapter Test B

How Ecosystems Work

MULTIPLE CHOICE

In the space provided, write the letter of the statement that best answers the question or completes the sentence.

_____ 1. Which kind of organism obtains energy directly from the sun?
a. decomposers c. omnivores
b. herbivores d. producers

_____ 2. If an insect eats a plant and a bird eats the insect, about how much energy from the plant is stored in the insect for the bird to use?
a. 90 percent c. 10 percent
b. 50 percent d. 1 percent

_____ 3. Which of the following does not contain carbon from the bodies of plants and animals that died millions of years ago?
a. coal c. natural gas
b. oil d. phosphate salts

_____ 4. Which gas makes up 78 percent of our atmosphere but can be used b plants only when transformed by bacteria first?
a. nitrogen c. hydrogen
b. oxygen d. carbon dioxide

_____ 5. Which of the following plants is likely to be a pioneer species?
a. lichen c. shrub
b. grass d. oak tree

COMPLETION

Write the word or words that best complete the following sentences.

6. A process in which energy from the sun is used to make sugar molecules is called_____.
7. In deep-ocean ecosystems, _____ that escapes from th cracks in the ocean floor is used by bacteria to make their own food.
8. Organisms that get their food by breaking down dead organisms are called_____.
9. A process within the cell of an organism that uses glucose and oxygen to produce carbon dioxide, water, and energy is called_____

Editable!

Leveled Chapter Test B offers a differentiated assessment option for advanced students.

Name _____ Class_____ Date _____

Chapter Test B *continued*

10. Nitrogen-fixing bacteria live within the nodules on the roots of plants called_____.
11. Some natural disasters such as _____ help forest communities by allowing some trees to release their seeds, by clearing away deadwood, and by encouraging new growth.
12. On new islands formed by volcanic activity, you will most likely find _____succession.

SHORT ANSWER

Write the answers to the following questions in the spaces provided.

13. Describe one way in which consumers depend on producers.

14. Explain why an energy pyramid is used to represent the amount of energy at each trophic level.

15. Explain how carbon is cycled from the atmosphere through producers and consumers, and back into the atmosphere.

16. Briefly explain how fossil fuels are formed and where they are located.

Name _____ Class_____ Date _____

Chapter Test B *continued*

17. A local lake is experiencing algal bloom and many of the fish are dying. Explain why this may be occurring.

18. A student noticed that lichens were growing on the surface of a rocky cliff. Describe how lichens contribute to primary succession.

ESSAY

Write your response to the following question on the lines provided.

19. All living things must be able to make proteins, and protein molecules alw contain nitrogen. Explain how the nitrogen used for making proteins in a l body traveled from the atmosphere to the lion. How will it be returned to t atmosphere after the lion dies?

Name _____ Class_____ Date _____

Chapter Test B *continued*

PROBLEM SOLVING

Write the answer to the following question in the space provided.

20. Your grandparents, who love to garden, are thinking about buying a house in the country. Next weekend, they are going to look at two houses. One has a large garden that hasn't been cultivated since the owners moved back to the city three years ago. The other is part of a small farm that was abandoned 25 years ago. Use what you know about succession to make a list of some of the likely advantages of each place.

Sample Labs

Name _____ Class _____ Date _____

QuickLab

Make Every Breath Count

MATERIALS

- beaker, 250 mL
- bromthymol blue
- Elodea, sprig
- graduated cylinder
- stopper
- straw
- test tube,large
- water, 100 mL

SAFETY

PROCEDURE

1. Pour 100 mL of water from a graduated cylinder into a 250 mL beaker. Add several drops of bromthymol blue to the beaker of water. Make sure you add enough to make the solution a dark blue color.
2. Exhale through a straw into the solution until the solution turns yellow. (**CAUTION:** Be sure not to inhale or ingest the solution.)
3. Pour the yellow solution into a large test tube that contains a sprig of Elodea.
4. Stopper the test tube, and place it in a sunny location.
5. Observe the solution in the test tube after 15 minutes.

ANALYSIS

1. What do you think happened to the carbon dioxide that you exhaled into the solution?

2. What effect do plants, such as the Elodea, have on the carbon cycle?

Editable!

QuickLabs are minilabs that reinforce key concepts with simple, everyday materials and minimal planning.

Name _____ Class _____ Date _____

Field Study

Investigating Succession

Survey Explore two or three blocks in your neighborhood, and find evidence of succession. Make notes in your science journal about the location and the evidence of succession that you observe. Pay attention to sidewalks, curbs, streets, vacant lots, and buildings, as well as parks, gardens, fields, and other open areas. Create a map from your data that identifies where succession is taking place in your neighborhood.

Field Studies are hands-on environment-focused activities referenced in each chapter and located in Student Resources at the back of the Student Edition.

Editable!

Name _____ Class _____ Date _____

Exploration Lab Data Analysis

Factors That Influence Ecosystems

Ecosystems are communities of plants, animals, and other organisms that live and interact with each other and with nonliving environmental factors. The non-living factors, or conditions, include temperature, precipitation, altitude, and latitude, among others. These factors play an important role in determining what types of vegetation can live in an ecosystem.

Latitude, for example, has a strong influence on an area's temperature, resulting in climates such as polar, tropical, and temperate. These climates determine different natural biomes that have characteristic species of plants. However, a careful look at a map reveals that ecosystems existing at the same latitude often have different climates. Why? In this laboratory activity, you will hypothesize how other nonliving factors influence the characteristics of ecosystems within the same latitude range. Then you will analyze and graph data from different areas of the United States to test your hypotheses.

OBJECTIVES

Hypothesize how precipitation and altitude affect the types of vegetation in an ecosystem.

Graph and **analyze** ecosystem data to confirm or refute your hypotheses.

MATERIALS

- colored pencils
- metric ruler

Procedure

1. Form two hypotheses—one that relates differences in ecosystem vegetation to rainfall and another that relates differences in ecosystem vegetation to altitude. Complete the following sentences to form your two hypotheses.
   - Ecosystem distribution is related to precipitation; regions that receive large amounts of precipitation are wet and therefore _____.

   - Ecosystem distribution is related to altitude; regions at high elevations are cold and therefore _____.

Editable!

Exploration Labs are exercises that prompt students to explore a situation or phenomenon to improve their understanding of a new concept, and then produce a written analysis.

Name _____ Class _____ Date _____

STEM Lab Simulation

Modeling a Closed System

You know that you share the world around you with many other organisms, but have you ever had a close-up view of those neighbors in action? We tend to think of ecosystems as enormous areas like deserts and beaches, where plants, animals, and other organisms are seen from a broad perspective. But ecosystems don't have to be large, and the relationships of organisms to each other and to the environment can be fascinating to watch on a small scale. In this lab, you will create your own closed ecosystem and monitor its activity over several weeks.

OBJECTIVES

Identify components to be included in a small, closed ecological system.

Describe changes within the system over time, and interactions among the components.

Compare the closed system to Earth.

MATERIALS

- clear silicone sealant
- journal or logbook for recording observations
- knife or sharp scissors for cutting the bottles
- plastic soda bottles, 2-liter, identical, with labels removed (2)
- pointed tool for poking air holes into the bottles
- selection of "ingredients" that will fit in the ecosystem: soil, soil nutrients, wat grass, compost, insects, snails, etc.

Editable!

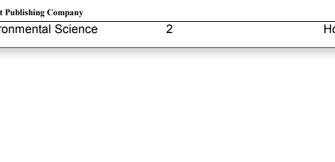
STEM Labs provide 60 activities that bring the application of science, technology, engineering, and mathematics into your classroom.

Name _____ Class _____ Date _____

Modeling a Closed System *continued*

Procedure

1. Inspect the bottles to be sure they are clean. Cut base off of one bottle (Bottle A), about 1 cm below where it tapers downward. Cut the top off of the same bottle, about 1 cm below where it flares outward.



2. Cut the top off the second bottle (Bottle B), at the same spot where you cut the top off Bottle A.
3. Slide the top of Bottle A, cap side up, down into the lower portion of Bottle A.
4. If you want your ecosystem to hold water, seal with silicone the joint where the top of Bottle A now meets the sides of the lower portion.
5. Poke drainage/air holes all the way around the top portion of Bottle A.
6. Stack the Bottle A "unit" into Bottle B, to create a two-chambered ecosystem.
7. Determine which habitats you want to create in your chambers by using your choice of the ecosystem "ingredients" supplied. The bottom habitat can be aquatic (water-based) or terrestrial (land-based). Set up the habitats by adding nonliving components (soil, water, etc.) as well as the appropriate organisms.
8. Once you have set up your bottle ecosystem, monitor it for six weeks, noting all observed changes in your logbook.

Analysis

1. **Describing Events** Which nonliving components did you include in your ecosystem? Did you include soil nutrients at the start?

Name _____ Class _____ Date _____

Modeling a Closed System *continued*

2. **Describing Events** Which organisms did you choose to include? How many of each type did you add initially?

3. **Describing Events** In what order did you introduce your organisms?

4. **Describing Events** Did you maintain a specific range of temperatures an light? Was your ecosystem kept on a dark/light cycle that simulated night a day?

5. **Explaining Events** How many of each organism did your ecosystem ever support?

6. **Explaining Events** Did any of the organisms in your ecosystem enter any phases in their life cycles? If so, describe your observations in detail.

7. **Explaining Events** What changes or interactions within the system did y notice over time?

Name _____ Class _____ Date _____

Modeling a Closed System *continued*

8. **Explaining Events** Describe the movement of water in your bottle ecosystem. What parts of the water cycle appear to be represented in the bottle?

Conclusions

9. **Drawing Conclusions** How is Earth similar to the ecosystem that you constructed? Are Earth and your bottle ecosystem truly closed systems?

10. **Drawing Conclusions** Which changes in your ecosystem surprised you the most? What did you learn from observing the changes?

Extension

1. **Designing Experiments** Alter your bottle ecosystem in one of the following ways, and monitor the results of the changes: add decomposing fruit and breeding fruit flies; add predators above the fruit flies; change the light routine; experiment with different soil types.

Sample Labs

Name _____ Class _____ Date _____

Inquiry Lab Investigation

BEST Composting

The Bio-Ethical Solid-waste Treatments (BEST) organization publishes a composting guide with the following steps:

Composting

1. Choose a container, such as chicken wire or a wooden box, for making your compost.
2. Place a variety of organic kitchen or yard wastes over the bottom of the conta Chop or shred the organic matter to speed up the composting reactions.
3. Spread some soil over the organic material. Make sure that the container is fil to maximum capacity.
4. Adjust the moisture so that the material is damp to the touch but not soggy.
5. Allow the compost to heat up.
6. Mix up the compost every few days for several weeks and add water as neede
7. Compost is ready for use when it looks like dark, crumbly soil. Some small pi of organic material might still be present. It should smell earthy and sweet.

Some members of the BEST organization would like to see if the process could b simplified. They would like to find out if any of these steps could be eliminated: adding soil, adding water, or mixing. They also want to know if a single type of organic material could be used instead of a mixture. But the members do not wan quality of the compost to decrease or the time to make it increase.

BEST has contracted your solid waste research company to test and compile d on the effects of changing the composting procedure. Your job is to work with a t of other scientists to test the suggested changes in the composting procedure. The criteria the organization wants you to use for determining the success of a compos pile are compost temperature and settling over time, known as settle depth. Highe temperatures and more settling indicate that better composting is occurring.

OBJECTIVES

Design an experiment to test the effects of different variables on composting.

Graph indicators of composting activity over time.

Compare the original BEST compost procedure with test procedures.

MATERIALS

- buckets, large (6)
- grass clippings
- leaves
- ruler
- soil

Editable!

Inquiry Labs are student-developed labs that encourage students to perform their own procedure to solve a problem, often using a real-life example.

Name _____ Class _____ Date _____

BEST Composting *continued*

- spade, hand
- spray bottle
- thermometer
- vegetable waste, variety
- water

Procedure

PART I—FORMING A HYPOTHESIS

1. Review the steps in the current composting procedure. What step(s) do you think could be eliminated without affecting the quality of the compost? Based on your thinking, write a hypothesis that you would like to test.

PART II—DESIGNING THE EXPERIMENT

2. With your team, design an experiment to test your hypothesis. Write your procedure on a separate sheet of paper. Be sure to include a control and to identify the criteria you will use to compare the results.
3. Select the materials you will use, and identify any safety cautions. Add these to your procedure.
4. Decide where you will place the test materials as they form compost. Keep in mind that compost gets hot as it forms, and that it also gives off an unpleasant odor.
5. Construct tables to record your data.
6. Have your teacher approve your plan.

PART III—TEST YOUR HYPOTHESIS

7. Perform your experiment. Record your observations and data in the data table you made. When you finish your experiment, clean up and dispose of materials properly. Then use the following questions to help you analyze the data and draw conclusions on the effects of the variables on composting.

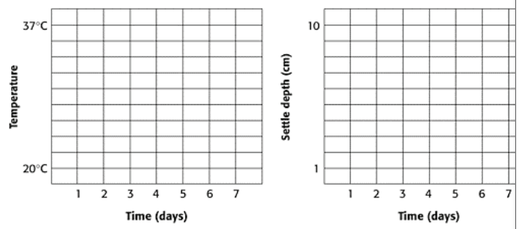
Name _____ Class _____ Date _____

BEST Composting *continued*

Analysis

1. **Explaining Events** Describe the control you used in your experiment. What was its purpose?

2. **Organizing Data** Use the data you collected to make line graphs on the gri below. One graph should show the recorded temperatures of the compost pil The other should show the settle depth.



3. **Identifying/Recognizing Patterns** Compare your data and graphs with t of other teams. Do your data and graphs indicate the same trends? Explain.

4. **Analyzing Graphs** Which compost pile appears to be the most successful?

5. **Analyzing Results** Do your test results support your hypothesis? Explain.

Name _____ Class _____ Date _____

BEST Composting *continued*

Conclusions

6. **Drawing Conclusions** What conclusion can you draw from the class results?

7. **Evaluating Methods** Do you think the procedure you used gives reliable information? Explain.

8. **Defending Conclusions** On a separate sheet of paper, write a draft letter to the BEST organization, in which you report your test results and recommendations.

Extension

1. **Design Experiments** Design an experiment to test the quality of the different composts you made during this experiment. In your experiment, evaluate which compost supports the best growth in plants.

Notes

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PROGRAM COMPONENTS	PRINT	INTERACTIVE ONLINE	TEACHER ONE STOP	STUDENT ONE STOP	LAB GENERATOR DVD
Active Reading Worksheets		●	●	●	
Audio Files in English		●	●	●	
Chapter Test A		●	●		
Chapter Test A (Spanish)		●	●		
Chapter Test B		●	●		
Classroom Catalysts		●	●		
Classroom Management Resources		●	●		
Critical Thinking Worksheets		●	●	●	
EcoZine Online Magazine		●			
*eTextbooks					
ExamView Test Banks		●	●		
FoldNotes		●	●	●	
Interactive Concept Maps		●	●	●	
Laboratory Manager's Professional Reference for Teachers		●	●		●
Lab Generator DVD (with Environmental and Earth Science Labs)					●
Lab Materials QuickList			●		●
Labs: QuickLabs, Field Studies, Inquiry, STEM, Exploration		●	●	●	●
Lab Safety		●	●		●
Lesson Planner		●	●		
Map Skills Worksheets		●	●	●	
Materials List		●	●		●
Online Assessment		●			
Power Presentations		●	●		
Professional Reference for Teachers		●	●		
Project Resources		●		●	
PuzzlePro		●	●		
Scientific Reasoning Skill Builder		●	●	●	
Section Quizzes		●	●		
Section Quizzes (Spanish)		●	●		
Section Self-Check Quizzes		●	●	●	
Smart Grapher		●		●	
Student Edition	●	●		●	
Student One Stop DVD				●	
Study Guide	●	●	●	●	
Study Guide (Spanish)		●	●	●	
Teacher Edition	●	●	●		
Teacher One Stop DVD			●		
Teaching Visuals		●	●		
Virtual Investigations		●		●	

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