## Key to Ability Levels

- **BL**: Below Level
- **OL**: On Level
- **AL**: Above Level
- **ELL**: English Language Learners

## Key to Teaching Resources

- Print Material
- CD-ROM or DVD
- Transparency

## Resources

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<tr>
<th>Levels</th>
<th>Resources</th>
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<th>Section 1</th>
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*Also available in Spanish

✓ Chapter- or unit-based activities applicable to all sections in this chapter.
### Teacher Resources

**TEACH (continued)**

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<thead>
<tr>
<th>Resources</th>
<th>Chapter Opener</th>
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<td>Graphic Organizer Transparencies, Strategies, and Activities</td>
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</tbody>
</table>

✓ Chapter- or unit-based activities applicable to all sections in this chapter.

*Also available in Spanish
## Teach With Technology

### What Glencoe products improve students’ vocabulary?

Vocabulary eFlashcards, ePuzzles and Games, and Vocabulary PuzzleMaker all build students’ vocabulary and help students understand key words and concepts from the textbook.

### How can these products help my students?

Vocabulary eFlashcards help students review and test their recall of content vocabulary, academic vocabulary, and people, places, and events for each chapter. ePuzzles and Games help students study the key facts, concepts, and vocabulary introduced in each chapter. The Vocabulary PuzzleMaker lets you create word searches, crosswords, and jumbles that students can use to practice vocabulary.

Visit glencoe.com and enter a student QuickPass™ code to go directly to student resources for the chapter. For Vocabulary PuzzleMaker, enter a teacher code to go to teacher resources.

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### Geography ONLINE

Visit glencoe.com and enter the QuickPass™ code WGC2630C2T for Chapter 2 resources.

You can easily launch a wide range of digital products from your computer’s desktop with the McGraw-Hill widget.

### World Geography and Cultures Online Learning Center (Web Site)

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Additional Resources

- **Timed Readings Plus in Social Studies** helps students increase their reading rate and fluency while maintaining comprehension. The 400-word passages are similar to those found on state and national assessments.

- **Reading in the Content Area: Social Studies** concentrates on six essential reading skills that help students better comprehend what they read. The book includes 75 high-interest nonfiction passages written at increasing levels of difficulty.

- **Reading Social Studies** includes strategic reading instruction and vocabulary support in Social Studies content for both ELLs and native speakers of English.

- **Content Vocabulary Workout** (Grades 6-8) accelerates reading comprehension through focused vocabulary development. Social Studies content vocabulary comes from the glossaries of Glencoe’s Middle School Social Studies texts. [www.jamestowneducation.com](http://www.jamestowneducation.com)

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**National Geographic**

**Index to National Geographic Magazine:**

The following articles relate to this chapter:

- “Gone With the Water,” by Joel K. Bourne, Jr., October 2004.

**National Geographic Society Products** To order the following, call National Geographic at 1-800-368-2728


Access National Geographic’s new dynamic MapMachine Web site and other geography resources at:

- [www.nationalgeographic.com](http://www.nationalgeographic.com)
- [www.nationalgeographic.com/maps](http://www.nationalgeographic.com/maps)

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**Biography**

The following videotape programs are available from Glencoe as supplements to Chapter 2:

- **Pompeii** (ISBN 0-76-700537-6)
- **The Tennessee Valley Authority** (ISBN 0-76-700031-5)

To order, call Glencoe at 1-800-334-7344. To find classroom resources to accompany many of these videos, check the following pages:

- A&E Television: [www.aetv.com](http://www.aetv.com)
- The History Channel: [www.historychannel.com](http://www.historychannel.com)

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**Reading List Generator CD-ROM**

Use this database to search more than 30,000 titles to create a customized reading list for your students.

- Reading lists can be organized by students’ reading level, author, genre, theme, or area of interest.
- The database provides Degrees of Reading Power™ (DRP) and Lexile™ readability scores for all selections.
- A brief summary of each selection is included.

**Leveled reading suggestions for this chapter:**

**For students at a Grade 7 reading level:**

- *Black Holes and Supernovae*, by David E. Newton

**For students at a Grade 8 reading level:**

- *Living In Space*, by Larry Kettelkamp

**For students at a Grade 9 reading level:**

- *Undersea Frontiers: An Introduction to Oceanography*, by C.B Colby

**For students at a Grade 10 reading level:**

- *Rain of Troubles: The Science and Politics of Acid Rain*, by Laurence Pringle
Focus
More About the Photo

Visual Literacy  Kilauea, on the island of Hawaii, is one of Earth's most active volcanoes. The volcano's Pu'u O'o vent has been erupting continuously since 1983. In its early years, Pu'u O'o produced spectacular lava fountains that rose hundreds of feet over the vent. Today, most eruptions from Pu'u O'o are relatively quiet, producing steady, slowly moving lava streams.

Teach

As you begin teaching this chapter, read the Big Idea out loud to students. Explain that the Big Idea is a broad, or high-level, concept that will help them understand what they are about to learn. Use the Essential Question for each section to help students focus on the Big Idea.

Physical processes shape Earth's surface. Understanding that Earth is part of a larger physical system called the solar system helps us understand how life on our planet is possible. Earth's physical systems are affected by natural forces such as earthquakes and volcanoes that can influence human activities on the planet.

Essential Questions

Section 1: Planet Earth
As a physical system, what makes Earth suitable for plant and animal life?

Section 2: Forces of Change
How have internal and external forces shaped Earth's surface?

Section 3: Earth's Water
What physical process keeps Earth's water constant?

Section 1
Planet Earth

Essential Question  As a physical system, what makes Earth suitable for plant and animal life? (Earth has water, land, and air that can support life.) Point out that in Section 1, students will learn more about the features of Earth that permit people and other organisms to thrive.  OL

Section 2
Forces of Change

Essential Question  How have internal and external forces shaped Earth's surface? (The internal forces of tectonic activity have created mountains, ridges, and islands. The external forces of wind and water have created caves, valleys, and soils.) Point out that in Section 2, students will learn about Earth's layers and the ways Earth's surface changes.  OL
Section 3

Earth’s Water

Essential Question What physical process keeps Earth's water constant? (The water cycle keeps the water on our planet—both freshwater and salt water—fairly constant over time.) Point out to students that in Section 3, they will learn about the different kinds of water on Earth and the water cycle that maintains our supply of freshwater.  

Reading and Writing As you read this chapter, write information on note cards about the structure of planet Earth and its place in the solar system, the natural forces that affect Earth’s physical systems, and Earth’s water. Place the cards in the correct pocket of your Foldable.

Organizing Information Make a Three-Pocket Book to help you organize information about the physical systems and processes that affect life on Earth.

Purpose This Foldable helps students organize information about the systems and processes that shape the physical Earth. The completed Foldable will help them review the chapter as they prepare for assessment.

Visit glencoe.com and enter code WGC2630C2T for Chapter 2 resources.
An astronaut, seeing Earth from the blackness of space, described it as “piercingly beautiful.” From the vantage point of space, the Earth’s great beauty resembles a blue and white marble, with contrasts of water and land beneath huge swirls of white clouds.

"To the ancient Egyptians the heavens were almost close enough to touch—a benign canopy of light and dark held up by mountain peaks. But modern science has exploded that ancient, peaceful mirage, replacing it with . . . change, and processes that sometimes defy human understanding. Guided by leaps of imagination and armed with potent new technologies . . . scientists have . . . claimed the universe itself as a titanic laboratory."

—Kathy Sawyer, "Unveiling the Universe," National Geographic, October 1999

Guide to Reading

Answers to Graphic:

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
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<tbody>
<tr>
<td>Hydrosphere</td>
<td>All liquid water, ice, groundwater, and water vapor on Earth</td>
</tr>
<tr>
<td>Lithosphere</td>
<td>Earth’s crust, 60–120 miles (100–200 km) deep</td>
</tr>
<tr>
<td>Atmosphere</td>
<td>Gas layer above Earth’s surface</td>
</tr>
<tr>
<td>Biosphere</td>
<td>The part of Earth that supports life.</td>
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</table>

Reading Strategy

Categorizing: As you read about Earth, complete a graphic organizer similar to the one below by describing the four components of Earth.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
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<tbody>
<tr>
<td>Hydrosphere</td>
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<td>Biosphere</td>
<td>The part of Earth that supports life.</td>
</tr>
</tbody>
</table>
Our Solar System

**MAIN Idea** Earth is part of a larger physical system that contains other planets, moons, and stars.

**GEOGRAPHY AND YOU** Have you ever seen a movie or read a book about outer space? Read to learn how Earth fits into the ever-changing solar system.

Earth is part of our solar system, which includes the sun and the objects that revolve around it. At the center of the solar system is the sun—a star, or ball of burning gases. The sun’s enormous mass, or the amount of matter it contains, creates a strong pull of gravity. This basic physical force keeps the Earth and the other objects revolving around the sun.

**The Planets**

Except for the sun, spheres called planets are the largest objects in the solar system. At least eight planets exist, and each is in its own orbit around the sun. Mercury, Venus, Earth, and Mars are the inner planets, or those nearest the sun. Earth, the third planet from the sun, is about 150 million miles (about 150 million km) away. Farthest from the sun are the outer planets—Jupiter, Saturn, Uranus, and Neptune.

The planets vary in size. Jupiter is the largest. Earth ranks fifth in size, and Mercury is the smallest. All of the planets except Mercury and Venus have moons, smaller spheres or satellites that orbit them. Earth has 1 moon, and Saturn has at least 18 moons. Ceres and Pluto are dwarf planets. Dwarf planets are small round bodies that orbit the sun, but have not cleared the area around their orbits of other orbiting bodies.

All of the planets are grouped into two types—terrestrial planets and gas giant planets. Mercury, Venus, Earth, and Mars are called terrestrial planets because they have solid, rocky crusts. Mercury and Venus are scalding hot, and Mars is a cold, barren desert. Only Earth has liquid water at the surface and can support varieties of life.

Farther from the sun are the gas giant planets—Jupiter, Saturn, Uranus, and Neptune. They are more gaseous and less dense than the terrestrial planets, even though they are larger in diameter. Each gas giant planet is like a miniature solar system, with orbiting moons and thin, encircling rings. Only Saturn’s rings, however, are easily seen from Earth by telescope.

**Asteroids, Comets, and Meteoroids**

Thousands of smaller objects—including asteroids, comets, and meteoroids—revolve around the sun. Asteroids are small, irregularly shaped, planet-like objects. They are found mainly between Mars and Jupiter in the asteroid belt. A few asteroids follow paths that cross Earth’s orbit.

Comets, made of icy dust particles and frozen gases, look like bright balls with long, feathery tails. Their orbits are inclined at every possible angle to Earth’s orbit. They may approach from any direction.

**Conservation Campaign**

**Step 1: Researching a Body of Water**

Pairs of students plan an advertising campaign to help preserve Earth’s water.

**Essential Question** What features of planet Earth support the presence of living things?

**Directions** Have each student pair research a body of freshwater. Suggest that they focus their research around questions such as “How big is it?” “What organisms live in it?” “Where does the water come from?” Where does it go?” “How is the body of water used?” “What threatens it today?”

**Putting It Together** Allow time for student pairs to share their findings with the class. Pairs should make an illustrated poster displaying their findings. (Chapter Project continues on page 35.)
Meteoroids are pieces of space debris—chunks of rock and iron. When they occasionally enter Earth’s atmosphere, friction usually burns them up before they reach the Earth’s surface. Those that collide with Earth are called meteorites. Meteorite strikes, though rare, can significantly affect the landscape, leaving craters and causing other devastation. In 1908 a huge area of forest in the remote Russian region of Siberia was flattened and burned by a “mysterious fireball.” Scientists theorize it was a meteorite or comet. A writer describes the effects:

“The heat incinerated herds of reindeer and charred tens of thousands of evergreens across hundreds of square miles. For days, and for thousands of miles around, the sky remained bright with an eerie orange glow—as far away as western Europe people were able to read newspapers at night without a lamp.” —Richard Stone, “The Last Great Impact on Earth,” Discover, September 1996

Getting to Know Earth

**MAIN Idea** Earth’s surface is a complex mix of landforms and water systems.

**GEOGRAPHY AND YOU** What do you know about Earth’s water, land, and air? Read to learn how these features support life on Earth.

The Earth is a rounded object wider around the center than from top to bottom. Earth has a larger diameter at the Equator—about 7,930 miles (12,760 km)—than from Pole to Pole, but the difference is less than 1 percent. With a circumference of about 24,900 miles (40,060 km), Earth is the largest of the inner planets.

**Water, Land, and Air**

The surface of the Earth is made up of water and land. About 70 percent of our planet’s surface is water. Oceans, lakes, rivers, and other bodies of water make up a part of the Earth called the **hydrosphere**.

About 30 percent of the Earth’s surface is land, including continents and islands. Land makes up a part of the Earth called the **lithosphere**, the Earth’s crust. The lithosphere also includes the ocean basins, or the land beneath the oceans.

The air we breathe is part of Earth’s **atmosphere**, a layer of gases extending above the planet’s surface. The atmosphere is composed of 78 percent nitrogen, 21 percent oxygen, and small amounts of argon and other gases.

All people, animals, and plants live on or close to the Earth’s surface or in the atmosphere. The part of the Earth that supports life is the **biosphere**. Life outside the biosphere, such as on a space station orbiting Earth, exists only with the assistance of mechanical life-support systems.

**Differentiated Instruction Strategies**

- **BL** Students will identify one extreme landform or natural feature and write a short overview on it.
- **AL** Have students identify extremes in the United States for each category used for the main activity.
- **ELL** Review the words extreme, landform, feature, and category with students.
Differentiated Instruction

Visual/Spatial Have students use a map to identify each continent, an isthmus, and a peninsula.

Reading Check Answer: cycling of water, oxygen, carbon dioxide, and soil, plus tolerable temperatures

Assess

Geography ONLINE Study Central™ provides summaries, interactive games, and online graphic organizers to help students review content.

Close

Summarizing Ask: What parts make up the biosphere? (atmosphere, lithosphere, hydrosphere)

Answers

1. Definitions for the vocabulary terms are found in the section and the Glossary.
2. Answers will vary. Students can list specific or general features but should reflect an understanding of what is needed to support life on Earth.
3. They all orbit the sun. Excluding dwarf planets, they have all cleared the areas around their orbits of other orbiting bodies. Terrestrial planets have solid rocky crusts.
4. Solar system: planets, moons, asteroids, comets
5. The biosphere is made up of the atmosphere, the lithosphere, and the hydrosphere. Together, these provide the elements of air, land, and water to support life on Earth.
6. Landforms both on land and under water are diverse. They include mountains, plains, cliffs, and valleys. Landforms on dry land may contain rivers, lakes, and streams.
7. The further away from the sun a planet is, the wider its orbit.
8. Answers will vary but should reflect an understanding of the existing ratio of land to water, about 1:4.
Forces of Change

The center of Earth is filled with intense heat and pressure. These natural forces drive numerous changes such as volcanoes and earthquakes that renew and enrich Earth’s surface. These physical processes can also disrupt, and often destroy, human life. As a result, scientists are working to learn how to predict them.

Voices Around the World

“[S]cientists are doing everything they can to solve the mysteries of earthquakes. They break rocks in laboratories, studying how stone behaves under stress. They hike through ghost forests where dead trees tell of long-ago tsunamis. They make maps of precarious, balanced rocks to see where the ground has shaken in the past, and how hard. They dig trenches across faults, searching for the active trace. They have wired up fault zones with so many sensors it’s as though the Earth is a patient in intensive care.”

—Joel Achenbach, “The Next Big One,” National Geographic, April 2006
Earth’s Structure

**MAIN IDEA** The Earth’s internal and external structure, including the tectonic plates, is responsible for the creation of the continents, oceans, and mountain ranges.

**GEOGRAPHY AND YOU** Are there mountains near where you live? Read to learn how Earth’s mountains are formed.

For hundreds of millions of years, the surface of the Earth has been in slow but constant motion. Some forces that change the Earth, such as wind and water, occur on the surface. Others, such as volcanic eruptions and earthquakes, originate deep in the Earth’s interior.

**A Layered Planet**

The diagram at the right shows that Earth is composed of three main layers—the core, the mantle, and the crust. At the very center of the planet is a super-hot but solid inner core. Scientists believe that the inner core is made up of iron and nickel under enormous pressure. Surrounding the inner core is a band of melted iron and nickel called the liquid outer core.

Next to the outer core is a thick layer of hot, dense rock called the mantle. The mantle consists of silicon, aluminum, iron, magnesium, oxygen, and other elements. This mixture continually rises, cools, sinks, warms up, and rises again, releasing 80 percent of the heat generated from the Earth’s interior.

The outer layer is the crust, a rocky shell forming the Earth’s surface. This relatively thin layer of rock ranges from about 2 miles (3.2 km) thick under oceans to about 75 miles (121 km) thick under mountains. The crust is broken into more than a dozen great slabs of rock called plates that rest—or more accurately, float—on a partially melted layer in the upper portion of the mantle. The plates carry the Earth’s oceans and continents.

**Plate Movement**

If you had seen the Earth from space 500 million years ago, the planet probably would not have looked at all like it does today. Many scientists believe that most of the landmasses forming our present-day continents were once part of one gigantic supercontinent called Pangea (pán•JEE•uh). The maps on the next page show that over millions of years, this supercontinent has broken apart into smaller continents. These continents in turn have drifted and, in some places, recombined. The theory that the continents were once joined and then slowly drifted apart is called continental drift.

The term plate tectonics refers to all of the physical processes that create many of the Earth’s physical features. Many scientists theorize that plates moving slowly around the globe have produced Earth’s largest features—not only continents, but also oceans and mountain ranges. Most of the time, plate movement is so gradual—only about 1 inch (2 to 3 cm) a year—that it cannot be felt. As they move, the plates may crash into each other, pull apart, or grind and slide past each other. Whatever their actions, plates are constantly changing the face of the planet. They push up mountains, create volcanoes, and produce earthquakes. When the plates spread apart, magma, or molten rock, is pushed up from the mantle, and ridges are formed. When plates bump together, one may slide under another, forming a trench.

**Conservation Campaign**

**Step 2: Where Do You Get Your Water?** Have student pairs research and prepare a poster or computer presentation illustrating where your school gets its water.

**Directions** Have pairs of students research which local agency controls water quality in your area. Have students answer questions such as: “How is water quality determined?” “What is done to purify the water?” “How clean is the drinking water?” “What threatens the quality of the school’s water?” “How is the water delivered to customers?”

**Putting It Together** Allow time for the pairs to share what they have learned. Pairs may wish to make a computer-generated presentation showing the path of water to their school.

(Chapter Project continues on page 42.)
Differentiated Instruction

English Learners Explain that molten rock is liquid. It is melted under great pressure and heat. Solid plates float on the liquid rock below. When the liquid rock moves, the plates move too. ELL

Skill Practice

Using Geography Skills Point out the small, green landmass east of Africa. Have students compare the maps here with a modern world map. Ask: What is this landmass? (Indian subcontinent) What features can help identify it? (general shape and size; its path, which appears to be moving toward its current position) AL

READING Check Answer: the theory that the continents were once joined and then drifted apart

MAP STUDY

Answers
1. Pangaea is one mass. The last map shows many landmasses (continents).
2. Africa is moving toward Asia. South America is moving away from Africa.

Internal Forces of Change

MAIN Idea Plate tectonics is responsible for folding, lifting, bending, and breaking parts of the Earth's surface.

GEOGRAPHY AND YOU Have you seen news coverage about earthquakes or volcanoes in different parts of the world? Read to learn how the internal forces of plate tectonics can cause such natural disasters.

Earth's surface has changed greatly over time. Scientists believe that some of these changes come from forces associated with plate tectonics. One of these forces relates to the movement of magma within the Earth. Others involve movements that can fold, lift, bend, or break the solid rock at the Earth's crust.

Differentiated Instruction

Leveled Activities

BL Authentic Assessment, p. 32
OL Differentiated Instruction, p. 6
AL Differentiated Instruction, p. 5
ELL Vocabulary Activity, URB, p. 24
Colliding and Spreading Plates

Mountains are formed in areas where giant continental plates collide. For example, the 
Himalaya mountain ranges in South Asia were thrust upward when the Indian landmass drifted against Eurasia. Himalayan peaks are getting higher as the Indian landmass continues to move northward.

Mountains are also created when a sea plate collides with a continental plate. The diagram on page 38 shows how in a process called subduction (suhb•DUHK•shuhn) the heavier sea plate dives beneath the lighter continental plate. Plunging into the Earth's interior, the sea plate becomes molten material. Then, as magma it bursts through the crust to form volcanic mountains. The Andes, a mountain system in South America, was formed over millions of years as a result of subduction. The Nazca Plate slid beneath the South American Plate.

In other cases where continental and sea plates meet, a different process, known as accretion, occurs. During accretion (uh•KREE•shuhn), pieces of the Earth's crust come together slowly as the sea plate slides under the continental plate. This movement levels off seamounts, underwater mountains with steep sides and sharp peaks, and piles up the resulting debris in trenches. This buildup can cause continents to grow outward. Most scientists believe that much of western North America expanded outward into the Pacific Ocean over more than 200 million years as a result of accretion.

New land can also form when two sea plates converge. In this process, one plate moves under the other, often forming an island chain at the boundary. Sea plates also can pull apart in a process known as spreading. The resulting rift, or deep crack, allows magma from within the Earth to well up between the plates. The magma hardens to build undersea volcanic mountains or ridges and some islands. This spreading activity occurs down the middle of the Atlantic Ocean's floor, pushing Europe and North America away from each other.

Folds and Faults

Moving plates sometimes squeeze the Earth's surface until it buckles. This activity forms folds, or bends, in layers of rock. In other cases, plates may grind or slide past each other, creating cracks in the Earth's crust called faults. One famous fault is the San Andreas Fault in California.

Activity: Collaborative Learning

Illustrating Ask: What happens when plates meet? Divide students into groups of four, and give each group four large pieces of foam rubber measuring roughly 3 feet (1 m) square and 4 inches (10 cm) thick. Have each group label two pieces as sea plates and two as continental plates. One student will hold one plate so that it touches the other plates. Have students demonstrate what happens when two continental plates collide. (plates grind past each other or push up against each other) Ask: What does this form? (faults or mountains, respectively)

Next, have a sea plate slide under a continental plate. Ask: What two processes occur this way? (subduction and accretion)

Ask: Why does the sea plate slide under the continental plate? (sea plate is heavier)

Have students demonstrate two sea plates colliding (One slides under the other.) Ask: What can this produce? (new landforms such as island chains) Make sure students move very slowly, to demonstrate that these processes happen in small increments over long periods of time.

Reading Strategy

Previewing Have students quickly glance at the passage to identify the three highlighted terms: subduction, accretion, and spreading. Then have students read the first sentence of each paragraph, and write out the five kinds of interactions discussed in the passage. (continental plates colliding, sea plate and continental plate colliding, sea plate sliding under continental plate, sea plates converging, sea plates pulling away from each other)

Finally, have students read the whole passage for meaning.
The process of faulting occurs when the folded land cannot be bent any further. Then the Earth’s crust cracks and breaks into huge blocks. The blocks move along the faults in different directions, grinding against each other. The resulting tension may release a series of small jumps, felt as minor tremors on the Earth’s surface.

**Earthquakes**

Sudden, violent movements of tectonic plates along a fault line are known as earthquakes. These shaking activities dramatically change the surface of the land and the floor of the ocean. During a severe earthquake in Alaska in 1964, a portion of the ground lurched upward 38 feet (11.6 m).

Earthquakes often occur where plates meet. Tension builds up along fault lines as the plates stick. The strain eventually becomes so intense that the rocks suddenly snap and shift. This movement releases stored-up energy along the fault. The ground then trembles and shakes as shock waves surge through it moving away from the area where the rocks first snapped apart.

In recent years disastrous earthquakes have occurred in Kobe, Japan, and in Los Angeles and San Francisco. These cities are located along the Ring of Fire, one of the most earthquake-prone areas on the planet. The Ring of Fire is a zone of earthquake and volcanic activity around the perimeter of the Pacific Ocean. Here the plates that cradle the Pacific meet the plates that hold the continents surrounding the Pacific. North America, South America, Asia, and Australia are affected by their location on the Ring of Fire.

**Volcanic Eruptions**

Volcanoes are mountains formed by lava or by magma that breaks through the Earth’s crust. Volcanoes often rise along plate boundaries where one plate plunges beneath another, as along the Ring of Fire. In such a process, the rocky plate melts as it dives downward into the hot mantle. If the molten rock is too thick, its flow is blocked and pressure builds. A cloud of ash and gas may then spew forth, creating a funnel through which the red-hot magma rushes to the surface. There the lava flow may eventually form a large volcanic cone topped by a crater, a bowl-shaped depression at a volcano’s mouth.

Volcanoes also arise in areas away from plate boundaries. Some areas deep in the Earth are hotter than others, and magma often blasts through the surface as volcanoes. As a moving plate passes over these hot spots, molten rock flowing out of the Earth may create volcanic island chains, such as the Hawaiian Islands. At some hot spots, molten rock may also heat underground water, causing hot springs or geysers like Old Faithful in Yellowstone National Park.

**Sociology**

Have students use the Internet to research the effect of a major earthquake (magnitude 7.0 or greater) on public health. In their research, students should note the magnitude of the earthquake, the size and density of the area population, and the physical characteristics of the location. Have students identify problems arising in the aftermath of a major seismic event as these relate to public health. For example, damage to infrastructure can lead to problems with sanitation; blocked roads and damaged communications lines can impede relief efforts.

Ask: What are some challenges to public health following a major earthquake? (Sample answers: lack of clean water, increased infectious disease outbreaks, damaged infrastructure impedes relief efforts, mental health issues such as depression, suicide) Point out that despite differences in physical surroundings, people in crowded urban areas and in isolated mountainous regions face many of the same basic challenges. Schedule a time for an extended discussion in which students can share their findings with the class.
**Wind Erosion**

Wind erosion involves the movement of dust, sand, and soil from one place to another. Plants help protect the land from wind erosion; however, in dry places where people have cut down trees and plants, winds pick up large amounts of soil and blow it away. Wind erosion can provide some benefits. The dust carried by wind often forms large deposits of mineral-rich soil.

**Glacial Erosion**

Another cause of erosion is glaciers, or large bodies of ice that move across the Earth’s surface. Glaciers form over time as layers of snow press together and turn to ice. Their great weight causes them to move slowly downhill or spread outward. As they move, glaciers pick up rocks and soil in their paths, changing the landscape. They can destroy forests, carve out valleys, alter the courses of rivers, and wear down mountaintops.

When glaciers melt and recede, in some places they leave behind large piles of rocks and debris called moraines. Some moraines form long ridges of land, while others form dams that hold water back and create glacial lakes.

**Additional Support**

**Writing Support**

**Descriptive Writing** Point out that burning fossil fuels such as gasoline contributes to acid rain formation. Have students research and write a one-page description of this process. (Essays will vary, but should note that fossil fuel combustion creates carbon dioxide, which forms an acidic solution when dissolved in water.)

**Answers**

1. As mountains are leveled, the buildup of debris makes trenches.
2. Earthquakes have leveled towns and cities.

**Activity: Technology Connection**

**Making Connections** Ask: How do physical processes inside the Earth affect the inhabitants on its surface? Students will work in teams to research a volcanic eruption or earthquake. Each team will present a newscast-style report to the class that incorporates the scientific background, as well as the social and economic impact of the event. Ask students to gather information from at least three reliable sources, such as newspaper archives, scientific journals, and agencies such as the U.S. Geological Survey. The report should include the date and location of the event, and should trace the processes beneath the Earth’s crust that caused the event. The event’s social and economic consequences should be reported in terms of immediate and long-term effects. Students can create a computer simulation or use presentation software to illustrate their findings.
Water Erosion

Water erosion begins when springwater and rainwater flow downhill in streams, cutting into the land, and wearing away the soil and rock. The resulting sediment grinds away the surface of rocks along the stream’s path. Over time, the eroding action of water forms first a gully and then a V-shaped valley. Sometimes valleys are eroded even further to form canyons. The Grand Canyon is an example of the eroding power of water.

Oceans also play an important role in water erosion. Pounding waves continually erode coastal cliffs, wear rocks into sandy beaches, and move sand away to other coastal areas.

Soil Building

Soil is the product of thousands of years of weathering and biological activity. The process of soil development begins when weathering breaks down solid rock into smaller pieces. Worms and other organisms help break down organic matter (dead plant and animal material) that comes to rest on these particles. Living organisms also add nutrients to the soil and create passages for air and water.

Five factors influence soil formation, with climate being the most significant. Wind, temperature, and rainfall determine the type of soil that can develop. Topography—the shape and position of Earth’s physical features—affects surface runoff of water, drainage, and rate of erosion. Geology determines the parent material (original rock), which influences depth, texture, drainage, and nutrient content of soil. Biology, living and dead plants and animals, adds organic matter to the soil. The length of time the other four factors have been interacting also affects soil formation. These factors combine to produce different types of soils from region to region.

Critical Thinking

5. Answering the Essential Question Based on your understanding of plate tectonics, what changes would you predict to the Earth’s appearance millions of years from now?

6. Drawing Conclusions In what ways can erosion be both beneficial and harmful to agricultural communities?

7. Analyzing Visuals Study the map of plate movement on page 37. Which plates are responsible for the earthquakes that have occurred in California?

Writing About Geography

8. Descriptive Writing Review how internal forces shape the surface of the Earth. Now imagine that the mantle ceased to circulate molten rock. Write a description of how land formation on the surface of the Earth would be different.

Answers

1. Definitions for the vocabulary terms are found in the section and the Glossary.

2. Plates float on liquid mantle. Mantle moves, warming, cooling, rising, sinking. Plates move together and apart; land is pushed upwards or volcanic rifts are formed.

3. Physical weathering breaks rocks into smaller pieces. Chemical weathering changes the chemical makeup of rocks. Erosion is caused by wind, glaciers, or moving water. Weathering breaks down rocks into soil. Erosion wears down and moves soil.

4. Subduction: sea plate dives beneath continental plate and melts into magma, then bursts through crust forming volcanic mountains; example: the Andes. Accretion: sea plate slides under continental plate piling up debris, causing continents to grow outward; example: western North America. Spreading: two sea plates pull apart, magma wells up between the plates forming volcanic mountains and islands; example: Atlantic Ocean, pushing North America and Europe apart. Faulting: folded land cannot bend further, breaking crust; example: San Andreas Fault.

5. Answers will vary but students should understand that some landforms will be pushed further apart while others collide.

6. Erosion brings rich soil into the area, helping crops, but it can also strip the land of good soil.

7. Pacific Plate and North American Plate

8. Answers should discuss the importance of internal forces in the formation of landforms and how external forces would continue to shape Earth.
Earth’s Water

A submarine crew investigating the Arctic Ocean can still experience the thrill of exploring uncharted territory—one of Earth’s last frontiers. Although humans live mostly on land, water is important to our lives, and all living things need water to survive.

Voices Around the World

“In a world that’s been almost completely mapped, it’s easy to forget why cartographers used to put monsters in the blank spots. Today we got a reminder. The submarine captain had warned us that we were in uncharted waters... Yet the first days of our cruise through this ice-covered ocean, Earth’s least explored frontier, were... smooth... Even when we passed over a mile-high mountain that no one on the planet knew existed, the reaction was one of quiet enthusiasm—’Neat.’”


Guide to Reading
Essential Question
What physical process keeps Earth’s water constant?

Content Vocabulary
• water cycle (p. 42)
• evaporation (p. 42)
• condensation (p. 42)
• precipitation (p. 42)
• desalination (p. 43)
• groundwater (p. 44)
• aquifer (p. 44)

Academic Vocabulary
• area (p. 43)
• focus (p. 43)
• source (p. 44)

Places to Locate
• Pacific Ocean (p. 43)
• Atlantic Ocean (p. 43)
• Indian Ocean (p. 43)
• Arctic Ocean (p. 43)
• Mediterranean Sea (p. 43)
• Gulf of Mexico (p. 43)

Reading Strategy
Organizing As you read, complete a graphic organizer similar to the one below by listing the processes that contribute to the water cycle.

Water Cycle

- precipitation
- evaporation
- condensation

A pilot aboard a submarine research vessel

To generate student interest and provide a springboard for class discussion, access the Chapter 2, Section 3 video at glencoe.com.

Resource Manager

R Reading Strategies
Teacher Edition
• Academic Vocab., p. 43

Additional Resources
• Guided Reading 2-3, URB, p. 33
• RENTG, pp. 13–15

C Critical Thinking
Teacher Edition
• Making Inferences, p. 44

Additional Resources
• GeoLab, URB, p. 5
• Quizzes and Tests, p. 15

D Differentiated Instruction
Teacher Edition
• English Learners, p. 42

Additional Resources
• Graphic Organizer Trans., pp. 19–20

W Writing Support
Teacher Edition
• Expository Writing, p. 43

Additional Resources
• Authentic Assess., p. 32

S Skill Practice
Teacher Edition
• Visual Literacy, p. 43

Additional Resources
• Daily Focus Skills Trans. 2-3
The Water Cycle

MAIN Idea  The amount of water on Earth remains fairly constant and moves in the water cycle.

GEOGRAPHY AND YOU Have you ever experienced a day when the air just felt heavy and wet? Read to learn what causes such conditions and how they are related to the water cycle.

As you recall, oceans, lakes, rivers, and other bodies of water make up the Earth's hydrosphere. Almost all of the hydrosphere is salt water found in the oceans, seas, and a few large saltwater lakes. The remainder is freshwater found in lakes, rivers, and groundwater.

The total amount of water on Earth does not change, but the Earth's water is constantly moving—from the oceans to the air to the land and finally back to the oceans. The water cycle is the name given to this regular movement of water. The diagram below shows how the water cycle works.

The sun drives the cycle by evaporating water from the surfaces of oceans, lakes, and streams. Evaporation is the changing of liquid water into vapor, or gas. The sun's energy causes evaporation.

Water vapor rising from the oceans, other bodies of water, and plants is gathered in the air. The amount of water vapor the air holds depends on its temperature. Warm, less dense air holds more water vapor than does cool air.

When warm air cools, it cannot retain all of its water vapor, so the excess water vapor changes into liquid water—a process called condensation. Tiny droplets of water come together to form clouds. When clouds gather more water than they can hold, they release moisture, which falls to the Earth as precipitation—rain, snow, or sleet, depending on the air temperature and wind conditions. This precipitation sinks into the ground and collects in streams and lakes to return to the oceans. Soon most of it evaporates, and the cycle begins again.

The amount of water that evaporates is approximately the same amount that falls back to the Earth. This amount varies little from year to year. Thus, the total volume of water in the water cycle is more or less constant.

Regions What drives the Earth's water cycle?

Answers
1. evaporation
2. Organisms would have no water, and they need water to live.

Answer: the sun

Conservation Campaign

Step 3: Calculating Water Usage

Ask: How much water do you use? Pairs of students will monitor daily water usage in their homes, and propose ways to conserve water.

Directions Have students determine daily water usage for their home. Some students will find this information on utility bills. The amount of water used by appliances may be found in owner manuals. To calculate water usage for other sources (sinks, showers, sprinklers, toilets), students should measure the volume of water flow per minute, and multiply this rate by total minutes of use per day. The sum of these amounts equals the household's daily usage. After daily usage is determined, have students brainstorm ways to reduce water usage at home, and calculate how much water their families would save by following the plan.

Summarizing Have students use a computer to create graphs and charts comparing their water usage and potential water savings. Allow class time for students to share their findings with the class.

(Chapter Project continues on Visual Summary page.)
Salt Water to Freshwater

Although 97 percent of the world’s water is found in oceans, the water is too salty for drinking, farming, or manufacturing. Today efforts focus on ways to meet the world’s increasing need for freshwater, such as turning ocean water into freshwater by removing the salt in a process known as desalination. The diagram above shows one way that salt water can be turned into freshwater.

Because desalination is expensive, only a small amount of freshwater is obtained this way. Even so, certain countries in Southwest Asia and North Africa use desalination because other freshwater sources are scarce. Many of these countries also have the energy supplies to run the desalination plants cheaply.

—that the planet’s fresh water is consumed profligately is beyond doubt, particularly in agriculture, which accounts for 70 percent of all water use. Getting more out of each drop of water is imperative, for as the world’s population increases and the demand for food soars, unchecked irrigation poses a serious threat to rivers, wetlands, and lakes.”


Geography ONLINE
Student Web Activity Visit glencoe.com, select the World Geography and Cultures Web site, and click on Student Web Activities—Chapter 2 for an activity about the Earth’s oceans.

Differentiated Instruction

Leveled Activities

BL Reading Essentials/Note-Taking Guide, p. 14

OL Reinforcing Skills Activity, URB, p. 27

AL Differentiated Instruction, p. 6

ELL Vocabulary Activity, URB, p. 24
Critical Thinking

Making Inferences Ask: How could a toxic chemical spill affect the water supply of a nearby community? (If chemicals seep into the groundwater, they will contaminate the community’s source of drinking water.)

For additional practice on this skill, see the Skills Handbook.

READING Check Answer: aquifers, groundwater, springs, lakes, rivers, meltwater

Assess

Geography ONLINE

Study Central™ provides summaries, interactive games, and online graphic organizers to help students review content.

Close

Summarizing Ask: What are the main parts of the water cycle? (evaporation, condensation, precipitation)

SECTION 3 REVIEW

Vocabulary
1. Explain the significance of: water cycle, evaporation, condensation, precipitation, desalination, groundwater, aquifer.

Main Ideas
2. How does the water cycle function to maintain a fairly constant amount of water on the Earth?
3. Describe the bodies of salt water that cover much of the Earth's surface.
4. Use a web diagram like the one below to identify the bodies of freshwater that are necessary to sustain life on Earth.

Earth's Freshwater Features

Critical Thinking
5. Answering the Essential Question Use your knowledge of the water cycle to explain how droughts might occur.
6. Making Inferences Why might salt water someday provide water for drinking, farming, and manufacturing?
7. Identifying Cause and Effect When drinking water is contaminated by hazardous substances, how is it released on land or into rivers and lakes?
8. Analyzing Visuals Look at the diagram of the water cycle on page 42. What source of water supplies wells and springs?

Writing About Geography
9. Expository Writing Many large urban areas developed in river basins. Write a description of how a river or rivers contributed to the development of your community.

Answers

1. Definitions for the vocabulary terms are found in the section and the Glossary.
2. Water evaporates from large bodies of water, condenses into clouds, falls back to the Earth as precipitation, runs off into groundwater that goes into rivers and oceans, where it evaporates once more.
3. Oceans make up a huge body of salt water that circles the planet. It is divided into 5 oceans that make up 97% of the Earth's water.
4. lakes, groundwater, streams, rivers, aquifers
5. Answers will vary but may include that it is too cold for the sun to cause evaporation to occur or that the air is too warm for condensation to happen.
6. because desalination technology will have become cheap enough for common use
7. through runoff or being leached into the soil
8. groundwater
9. Answers will vary based on the community. Students should be graded on their ability to show the relationship of the community to a river.
Earth is the third planet from the sun in our solar system. It is one of four planets with a solid, rocky crust, and the only planet with liquid water on its surface.

Earth’s proximity to the sun allows for liquid water on the surface needed to sustain life.

Earth also has an atmosphere that protects life from the harmful effects of the sun and keeps the Earth at a temperature suitable for a variety of life-forms.

The Earth is shaped by internal and external forces.

Inside the Earth is a superheated, solid inner core. A liquid outer core is covered by the hot rock of the mantle.

The Earth’s crust, made up of more than a dozen slabs, rests on a melted layer of mantle. These slabs move around the globe, creating physical features.

Wind and water erosion shape the surface of the Earth.

The water cycle keeps Earth’s water constantly moving—water evaporates from oceans, lakes, and streams. Then it cools, becomes condensation, and falls to Earth as precipitation.

Most of Earth’s water is found in the oceans. The rest is frozen in glaciers, found underground, or is in lakes, rivers, and streams.

Because most of Earth’s water is salty ocean water, people have found a way to remove the salt from water. Desalination is expensive, but useful in places where freshwater is scarce.

Conservation Campaign

Step 4: Create the Campaign Students will synthesize what they have learned in Steps 1, 2, and 3.

Directions Have students brainstorm all the ways human actions negatively modify the environment. Have students suggest three ways to help minimize or fix each of the negative effects listed. Next, have groups of students select one part of the biosphere: the land, the air, or water. Have each group organize an advertising campaign designed to help people conserve resources and decrease pollutant production. Student campaigns can be in any medium: examples include print campaigns using posters and brochures, video campaigns using television and the Internet, or audio campaigns designed for podcast or radio.

Putting It Together Have each group present their campaign to the class. Following the presentations, lead a discussion on the ideas presented.

Illustrating Have students work together to create a natural history museum exhibit about Earth’s features and processes. Displays might include a mobile of the solar system, a model of Earth’s structure, an illustration of Earth’s internal and external forces of change, or a diagram of the water cycle. Students may work in small groups to develop displays. Encourage students to be accurate and creative and to use a variety of media.

Did You Know?

World Water Day To address the lack of clean water for many of the world’s people, the United Nations designated the decade 2005–2015 as the International Decade for Action “Water for Life.” During this period, the United Nations’s 192 member countries hope to reduce by half the proportion of people without access to clean drinking water. March 22 has been designated as World Water Day. Like Earth Day, World Water Day is an annual opportunity to raise awareness of the Earth’s water crisis and to participate in community and global efforts to conserve this very precious resource.
Answers, Analyses, and Tips

Reviewing Vocabulary

1. D This question may be difficult for students since all of the answer choices are similar words. Students may associate the choices with similar words. Hydrosphere is associated with water, and has the same root as hydrant. Biosphere is associated with life, and has the same root as biology. Students should know that atmosphere is the layer of gases surrounding Earth.

2. C After reading the question, students will know that the answer containing the word continent is correct. Answers A, B, and D are distracters, since those theories are not discussed in the chapter.

3. C Students struggling with this question will probably decide between erosion and weathering. The two terms are very similar. Wind and water both contribute to erosion and weathering. Glacial activity is not part of weathering but it does contribute to erosion.

4. B This is a straightforward vocabulary question. Students struggling with the answer need to review the terms in the chapter. Springs and pools are types of groundwater supplied by an aquifer. Desalination (not desalination) is a process by which salt is removed from ocean water.

Reviewing Main Ideas

5. D Examining incorrect answers may help students find the best answer. Students can eliminate A, because gravity is a force that keeps objects such as the asteroid belt in orbit around the sun, but it does not create asteroids. They can eliminate B, because the section explicitly states that the sun’s enormous mass creates a strong pull of gravity. Answer C can be eliminated; while gravity maintains the order of the planets it did not establish the order.

6. C Wind causes erosion but does not wear away Earth’s surface. Sand is formed as the process of weathering wears rocks away. Heat is a distracter since it is not mentioned in the section. The correct answer is C, since water in the form of rain, glaciers, springwater, and oceans, works to wear down the Earth.

7. C Students may confuse hydrosphere with atmosphere. The humidity of the atmosphere varies, but the hydrosphere includes all the water on Earth. Water changes location and form, but the amount of water on Earth generally stays the same.
Critical Thinking

8. How are the hydrosphere, the lithosphere, and the atmosphere related?
   A. All are circular regions.
   B. They are all elements that make up the biosphere.
   C. People have no control over the hydrosphere, the lithosphere, or the atmosphere.
   D. All three revolve around the sun.

   Base your answer to question 9 on the map and on your knowledge of Chapter 2.

9. Which plates collided to help form the Andes?
   A. South American and Nazca
   B. Caribbean and Cocos
   C. North American and Nazca
   D. South American and Caribbean

Document-Based Questions

Directions: Analyze the document and answer the short-answer questions that follow the document.

10. What human activity has made the effect of a strong earthquake worse?

11. What does the writer mean by "ecological land mines"?

Extended Response

12. What are the different types of erosion? How does each affect the land?

13. Exploring the Big Idea
   Recall what you have learned about the lithosphere, hydrosphere, and atmosphere. How do physical processes in each shape Earth’s surface? Provide examples to support your answer.

Earthquake Dramatizes Human Ecological Assault on the Himalayas

This month’s massive earthquake did not destroy Mohammad Shafi Mir’s house and bury his mother, but what followed seconds later did: a torrent of boulders thundering down a mountainside . . .

The landslides that tumbled across the zone of the Oct. 8 earthquake dramatized not only the power of nature but how humans have brought tragedy upon themselves through massive deforestation and other ecological assaults on the Himalayas.

In this once-remote region, loss of green cover from commercial logging, local cutting and overgrazing has weakened the land’s ability to retain water, which now rushes easily down mountainsides to set off slides that some call “ecological land mines.”

—“Earthquake Dramatizes Human Ecological Assault on the Himalayas,” October 22, 2005, Associated Press Archive

11. A land mine can be triggered by a slight disturbance of the land above it. Landslides can be caused by a disturbance such as an earthquake. The writer is referring to the danger a landslide poses to human life, and the potential for it to kill many people at any time. Students should be able to infer the meaning of the phrase through their prior knowledge of what a land mine is and how it works.

Extended Response

12. wind: moves dust, sand, and soil elsewhere; glacial: the weight of the glaciers causes them to move downhill or outward, picking up rocks and soil and changing the landscape as they pass; water: cuts into the land and wears down soil and rock, with the sediment grinding other rocks along the stream's path and forming gullies, valleys, and canyons; The process of erosion is covered extensively in the chapter.

13. Answers may vary. Possible answers include the following:
   Tectonic activity in the lithosphere has shaped the Earth’s surface through earthquakes and volcanic activity. Rain, snow, and wind from the atmosphere have been involved in the processes of weathering and erosion. For example, glacial erosion has created lakes and wind erosion can result in large areas of mineral-rich soil. Water from the hydrosphere can erode land. For example, ocean waves can erode coastal rocks into sandy beaches.