

Chapter 2 – Planet Earth GRA

SECTION 1

MAIN IDEAS

1. Earth's movement affects the amount of energy we receive from the sun.
2. Earth's seasons are caused by the planet's tilt.

Key Terms

solar energy energy from the sun

rotation one complete spin of Earth on its axis

revolution one trip of Earth around the sun

latitude the distance north or south of Earth's equator

tropics regions close to the equator

Section Summary

EARTH'S MOVEMENT

Energy from the sun, or **solar energy**, is necessary for life on Earth. It helps plants grow and provides light and heat. Several factors affect the amount of solar energy Earth receives. These are rotation, revolution, tilt, and latitude.

Earth's axis is an imaginary rod running from the North Pole to the South Pole. Earth spins around on its axis. One complete **rotation** takes 24 hours, or one day. Solar energy reaches only half of the planet at a time. As Earth rotates, levels of solar energy change. The half that faces the sun receives light and heat and is warmer. The half that faces away from the sun is darker and cooler.

As Earth rotates, it also moves around the sun. Earth completes one **revolution** around the sun every year, in 365 1/4 days. Every four years an extra day is added to February. This makes up for the extra quarter of a day.

Earth's axis is tilted, not straight up and down. At different times of year, some locations tilt toward the sun. They get more solar energy than locations tilted away from the sun.

Latitude refers to imaginary lines that run east and west around the planet, north and south of the Earth's equator. Areas near the equator receive direct rays from the sun all year and have warm temperatures. Higher latitudes receive fewer direct rays and are cooler.

THE SEASONS

Many locations on Earth have four seasons: winter, spring, summer, and fall. These are based on temperature and how long the days are.

The seasons change because of the tilt of Earth's axis. In summer the Northern Hemisphere is tilted toward the sun. It receives more solar energy than during the winter, when it is tilted away from the sun.

List the four factors that affect the amount of solar energy Earth receives.

What would happen if Earth did not rotate?

Underline the sentence that describes Earth's revolution around the sun.

Where you live, does more solar energy reach Earth in winter or in summer?

Because Earth's axis is tilted, the hemispheres have opposite seasons. Winter in the Northern Hemisphere is summer in the Southern Hemisphere. During the fall and spring, the poles point neither toward nor away from the sun. In spring, temperatures rise and days become longer as summer approaches. In fall the opposite occurs.

In some regions, the seasons are tied to rainfall instead of temperature. One of these regions, close to the equator, is the **tropics**. There, winds bring heavy rains from June to October. The weather turns dry in the tropics from November to January.

CHALLENGE ACTIVITY

Critical Thinking: Drawing Conclusions Imagine that you are a travel agent. One of your clients is planning a trip to Argentina in June, and another is planning a trip to Chicago in August. What kinds of clothing would you suggest they pack for their trips and why?

What would the seasons be like in the Northern and Southern hemispheres if Earth's axis weren't tilted?

latitude	revolution	rotation
solar energy	tropics	

DIRECTIONS: On the line provided before each statement, write **T** if a statement is true and **F** if a statement is false. If the statement is false, write the term from the word bank that would make the statement correct on the line after each sentence.

- _____ 1. The hemisphere of Earth that is tilted away from the sun receives less direct rainfall than the other hemisphere receives.

- _____ 2. An umbrella might be more useful to a person in the tropics than a winter coat.

- _____ 3. Earth's path, or orbit, around the sun is its rotation.

- _____ 4. One revolution of Earth takes 24 hours.

- _____ 5. Plants in a high latitude receive less direct solar energy during the year than plants at a lower latitude because they are farther from the equator.

SECTION 2

MAIN IDEAS

1. Salt water and freshwater make up Earth's water supply.
2. In the water cycle, water circulates from Earth's surface to the atmosphere and back again.
3. Water plays an important role in people's lives.

Key Terms

freshwater water without salt

glacier large area of slow-moving ice

surface water water that is stored in Earth's streams, rivers, and lakes

precipitation water that falls to Earth's surface as rain, snow, sleet, or hail

groundwater water found below Earth's surface

water vapor water that occurs in the air as an invisible gas

water cycle the circulation of water from Earth's surface to the atmosphere and back

drought a long period of lower-than-normal precipitation

Section Summary

EARTH'S WATER SUPPLY

Approximately three-quarters of Earth's surface is covered with water. There are two kinds of water—salt water and **freshwater**. About 97 percent of Earth's water is salt water. Most of it is in the oceans, seas, gulfs, bays, and straits. Some lakes, such as the Great Salt Lake in Utah, also contain salt water.

Salt water cannot be used for drinking. Only freshwater is safe to drink. Freshwater is found in lakes and rivers and stored underground. Much is frozen in **glaciers**. Freshwater is also found in the ice of the Arctic and Antarctic regions.

One form of freshwater is **surface water**. This is stored in streams, lakes, and rivers. Streams form when **precipitation** falls to Earth as rain, snow, sleet, or hail. These streams then flow into larger streams and rivers.

Most freshwater is stored underground. **Groundwater** bubbles to the surface in springs or can be reached by digging deep holes, or wells.

THE WATER CYCLE

Water can take the form of a liquid, gas, or solid. In its solid form, water is snow and ice. Liquid water is rain or water found in lakes and rivers. **Water vapor** is an invisible form of water in the air.

Water is always moving. When water on Earth's surface heats up, it evaporates and turns into water vapor. It then rises from Earth into the atmosphere. When it cools down, it changes from water vapor to liquid. Droplets of water

Circle the places where we find salt water.

Underline the places where we find freshwater.

Underline the words that define water vapor.

What are the two main processes of the water cycle?

form clouds. When they get heavier, these droplets fall to Earth as precipitation. This process of evaporation and precipitation is called the **water cycle**.

Some precipitation is absorbed into the soil as groundwater. The rest flows into streams, rivers, and oceans.

WATER AND PEOPLE

Problems with water include shortages, pollution, and flooding. Shortages are caused by overuse and by **drought**, when there is little or no precipitation for a long time. Chemicals and waste can pollute water. Heavy rains can cause flooding.

Water quenches our thirst and allows us to have food to eat. Flowing water is an important source of energy. Water also provides recreation, making our lives richer and more enjoyable. Water is essential for life on Earth.

CHALLENGE ACTIVITY

Critical Thinking: Solving Problems: You are campaigning for public office. Write a speech describing three actions you plan to take to protect supplies of freshwater. (write speech on back of page)

Drought	freshwater	glacier	groundwater
precipitation	surface water	water cycle	water vapor

DIRECTIONS: Read each sentence and fill in the blank with the word in the word pair that best completes the sentence.

1. Some _____ is locked in Earth's glaciers. (drought/freshwater)
2. Less than one percent of Earth's water supply comes from _____ stored in streams, rivers, and lakes.
(surface water/water vapor)
3. Water can be a solid (ice), a liquid, or a gas called _____.
(precipitation/water vapor)
4. The water brought to the surface from deep holes dug in the ground is _____.
(freshwater/groundwater)
5. _____ is water that falls from clouds as rain, snow, sleet, or hail.
(Precipitation/Water cycle)

DIRECTIONS: Use the terms from the word bank to write a summary of what you learned in the section.

SECTION 3

MAIN IDEAS

1. Earth's surface is covered by many different landforms.
2. Forces below Earth's surface build up our landforms.
3. Forces on the planet's surface shape Earth's landforms.
4. Landforms influence people's lives and culture.

Key Terms

landforms shapes on Earth's surface, such as hills or mountains

continents large landmasses

plate tectonics a theory suggesting that Earth's surface is divided into more than 12 slow-moving plates, or pieces of Earth's crust

lava magma, or liquid rock, that reaches Earth's surface

earthquake sudden, violent movement of Earth's crust

weathering the process of breaking rock into smaller pieces

erosion the movement of sediment from one location to another

Section Summary

LANDFORMS

Geographers study **landforms** such as mountains, valleys, plains, islands, and peninsulas. They study how landforms are made and how they influence people.

FORCES BELOW EARTH'S SURFACE

Below Earth's surface, or crust, is a layer of liquid and a solid core. The planet has seven **continents**, large landmasses made of Earth's crust. All of Earth's crust rests on 12 plates. These plates are constantly in motion. Geographers call the study of these moving pieces of crust **plate tectonics**.

All of these plates move at different speeds and in different directions. As they move, they shape Earth's landforms. Plates move in three ways: They collide, they separate, and they slide past each other.

The energy of colliding plates creates new landforms. When two ocean plates collide, they may form deep valleys on the ocean's floor. When ocean plates collide with continental plates, mountain ranges are formed. Mountains are also created when two continental plates collide.

When plates separate, usually on the ocean floor, they cause gaps in the planet's crust. Magma, or liquid rock, rises through the cracks as **lava**. As it cools, it forms underwater mountains or ridges. Sometimes these mountains rise above the surface of the

Give two examples of landforms.

Underline the sentence that lists the three different ways in which Earth's plates move.

Write what happens when two ocean plates collide with one another.

What causes earthquakes?

water and form islands. Plates can also slide past each other. They grind along faults, causing **earthquakes**.

FORCES ON EARTH'S SURFACE

As landforms are created, other forces work to wear them away.

Weathering breaks larger rocks into smaller rocks. Changes in temperature can cause cracks in rocks. Water then gets into the cracks, expands as it freezes, and breaks the rocks. Rocks eventually break down into smaller pieces called sediment.

Flowing water moves sediment to form new landforms, such as river deltas.

Another force that wears down landforms is **erosion**. Erosion takes place when sediment is moved by ice, water, and wind.

Name the three forces that can cause erosion.

LANDFORMS INFLUENCE LIFE

Landforms influence where people live. For example, people might want to settle in an area with good soil and water. People change landforms in many ways. For example, engineers build tunnels through mountains to make roads. Farmers build terraces on steep hillsides.

continents	earthquake	erosion	landforms
lava	plate tectonics	weathering	

DIRECTIONS: Look at each set of four vocabulary terms. On the line provided, write the letter of the term that does not relate to the others.

_____ 1. a. erosion b. weathering c. landform d. continent

_____ 2. a. lava b. erosion c. earthquake d. plate tectonics

DIRECTIONS: Answer each question by writing a sentence that contains at least one word from the word bank.

3. What are two ways that the movement of tectonic plates affects the Earth?

4. What is the most common cause of erosion?

DIRECTIONS: Choose four of the terms from the word bank. Look them up in the chapter, define.

Survivors of Krakatau



ABOUT THE READINGS Krakatau, a small volcanic island, lies between Sumatra and Java in Indonesia. Its volcano erupted on August 26, 1883, triggering tidal waves. The eruption became more powerful on August 27. Below are two eyewitness accounts.

VOCABULARY

pumice light volcanic rock



As you read, note how the two accounts are similar and different.

An Account from Sumatra by Mrs. Beyerinck

On the night of August 26, waves threatened the home of colonist Mrs. Beyerinck. She fled with her husband and children to a mountain hut. At about 10:00 a.m. on August 27, they heard loud explosions from Krakatau.

Indonesia was a colony of the Netherlands in 1883. It was known at that time as the Dutch East Indies.

“Suddenly, it became pitch dark. The last thing I saw was the ash being pushed up through the cracks in the floorboards, like a fountain. I . . . heard [my husband] say in despair ‘Where is the knife? . . . I will cut all our wrists and then we shall be released from our suffering sooner.’ The knife could not be found. I felt a heavy pressure, throwing me to the ground. Then it seemed as if all the air was being sucked away and I could not breathe . . . I forced myself through the [door] . . . The ash was hot and I tried to protect my face with my hands. The hot bite of the **pumice** pricked like needles . . . I noticed for the first time that [my] skin was hanging off everywhere, thick and moist from the ash stuck to it. Thinking it must be dirty, I wanted to pull bits of skin off, but that was still more painful . . . I did not know I had been burnt . . .”

Quotes by two survivors of Krakatau from *Vulcan's Fury* by Alwyn Scarth. Copyright © 1999 by Alwyn Scarth. Reproduced by permission of Yale University Press.

Robert D. Ballard

1942–



HOW HE AFFECTED THE WORLD In addition to discovering deep-sea creatures, undersea volcanoes, and famous lost ships, Robert Ballard has helped thousands of students become interested in science.



As you read the biography below, think about personal qualities such as perseverance that a successful explorer needs.



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Oceans cover more than seventy percent of the Earth. As an explorer, naval officer, scientist, author, and educator, Robert Ballard has spent his life uncovering secrets that lie deep beneath the surface.

Ballard was born in Wichita, Kansas, but his family soon moved to San Diego, California. There he spent much of his time playing on the beach and exploring **tidal pools**. “The ocean was my friend—my best friend,” Ballard remembers. He also remembers being fascinated by Jules Verne’s science-fiction tale *20,000 Leagues Under the Sea*. He dreamed of sailing with the book’s hero, Captain Nemo, in his fantastic submarine.

Ballard studied marine geology and **geophysics** in college. In 1967 he joined the U.S. Navy and helped make maps of the ocean floor. He also made his first dive in a submarine. Later he explored undersea mountains in a **submersible**. In 1977 Ballard used a submersible to explore an area near the Galápagos Islands. There he discovered giant worms and other creatures that live in places much deeper than people had thought possible. He later discovered underwater volcanoes off the coast of Baja California in Mexico.

VOCABULARY

tidal pools low, rocky areas that remain full of water at low tide

geophysics the study of the effects that physical forces (wind, earthquakes, tides, etc.) have on the earth

submersible an underwater vehicle that can travel deeper than a submarine

archaeology the study of life in past cultures and civilizations