



Energy Transfer and Weather

Lesson 1

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Lesson I

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How Does Radiation Affect Earth's
Processes?2

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VOCABULARY

- solar radiation
- ultraviolet radiation
- climate
- water cycle

How Does Radiation Affect Earth's Processes?



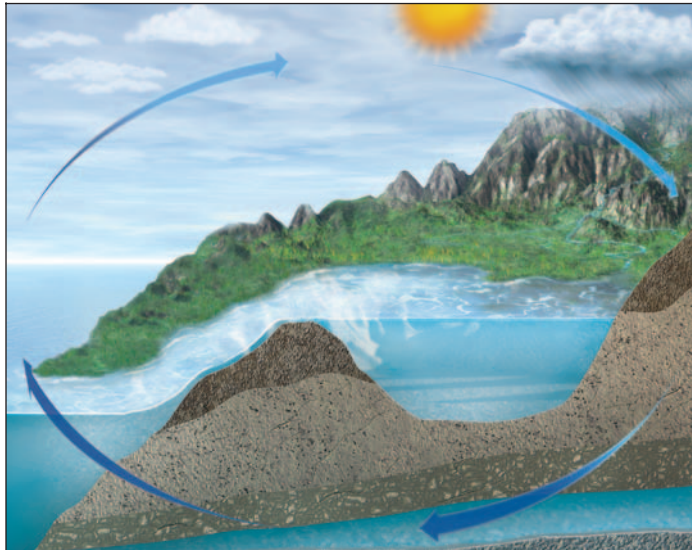
■ I can feel **solar radiation** when I walk outside on a sunny day.



■ White will glow brightly in **ultraviolet radiation**.



■ You need to wear a warm coat in a very cold **climate**.



■ Because of the **water cycle**, none of Earth's water is lost.



READING FOCUS SKILL

CAUSE AND EFFECT

A **cause** is something that makes another thing happen. An **effect** is the thing that happens.

While you read, learn how solar radiation can **cause** changes in Earth's processes.



Energy from the Sun

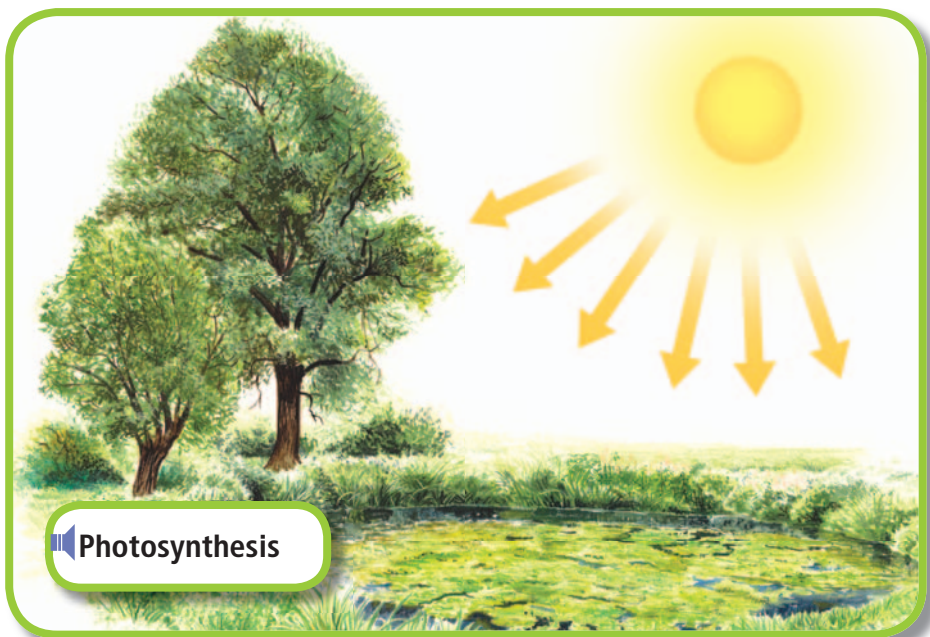
The sun is our energy source. Nearly all living things on Earth depend on the sun. **Solar radiation** is energy from the sun. Solar radiation reaches Earth by waves through space. There are many types of solar radiation.



Longer wavelengths are infrared radiation. They warm the Earth. Visible-light waves provide our light. Shorter wavelengths are called **ultraviolet radiation**. You cannot see these waves, but they can cause you to get a sunburn. Most incoming solar radiation is in the visible and ultraviolet range.



The sun supplies the energy that makes it possible for Earth to support life.



What happens to energy when it reaches Earth? Earth's oceans and land absorb some energy. This causes their temperature to rise.

Plants use the sun's energy. During photosynthesis, plants change the sun's energy into chemical energy. This is the plants' food. At the same time, plants produce oxygen. Animals need oxygen to live.

Many animals eat plants to get energy to move and grow. Animals then become food for other animals. In this way, the sun provides energy for all living things.

A fuel can release energy when it is burned. Humans use fuels to run machines. Some fuels are fossil fuels. These fuels got energy from the sun millions of years ago.

The supply of energy from the sun is important for the survival of all living things.



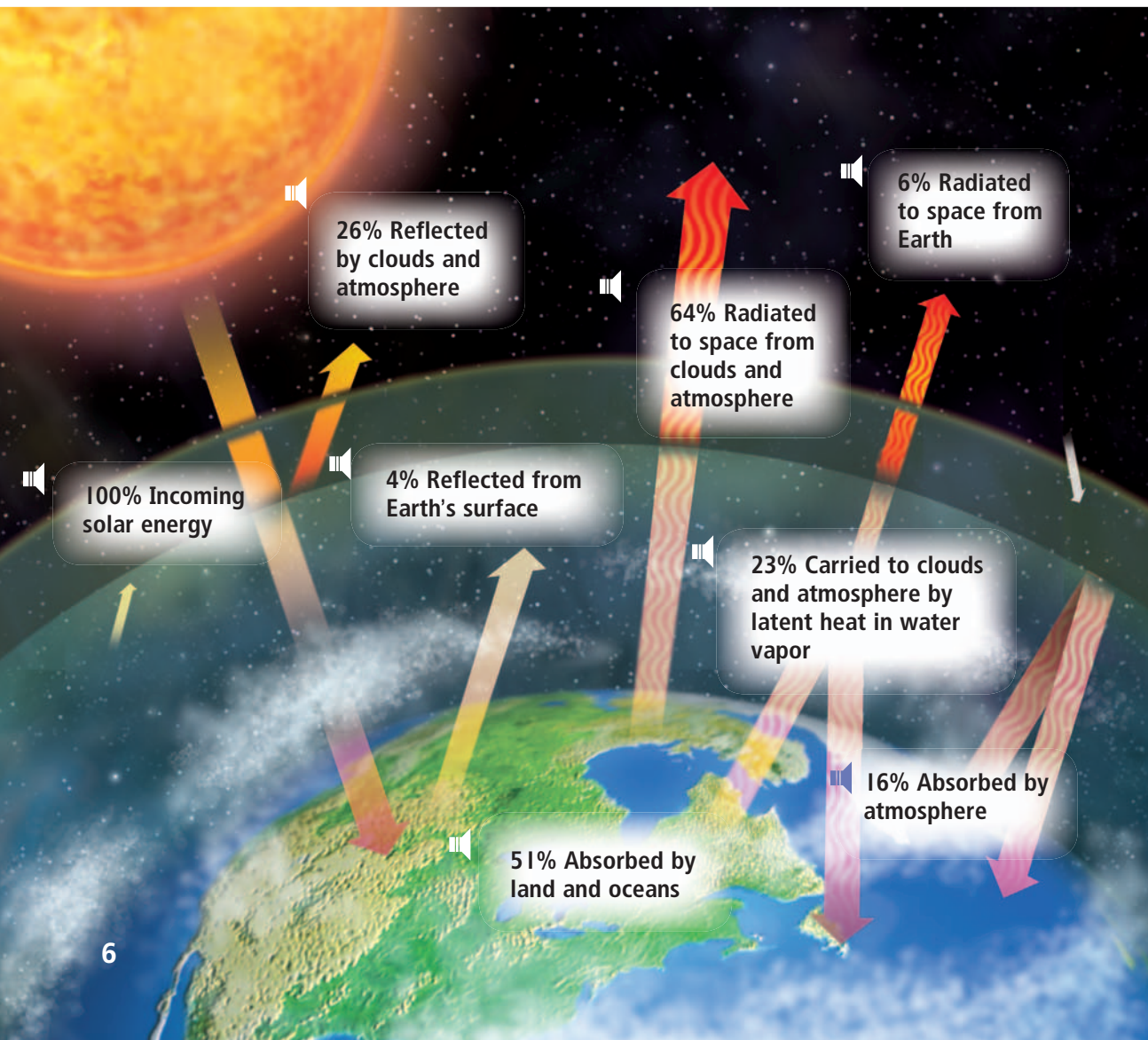
What kind of energy comes from the sun by waves through space?

The Sun's Energy Affects the Atmosphere

The atmosphere absorbs some solar radiation. Some solar radiation is reflected back by the atmosphere. Oceans and Earth's surface also reflect solar radiation.

 Land and ocean water absorb about 51 percent of the solar radiation. As Earth's temperature rises, Earth gives off infrared radiation.

 Clouds and water vapor absorb heat from Earth's surface. This absorbed energy is then given off in all directions.

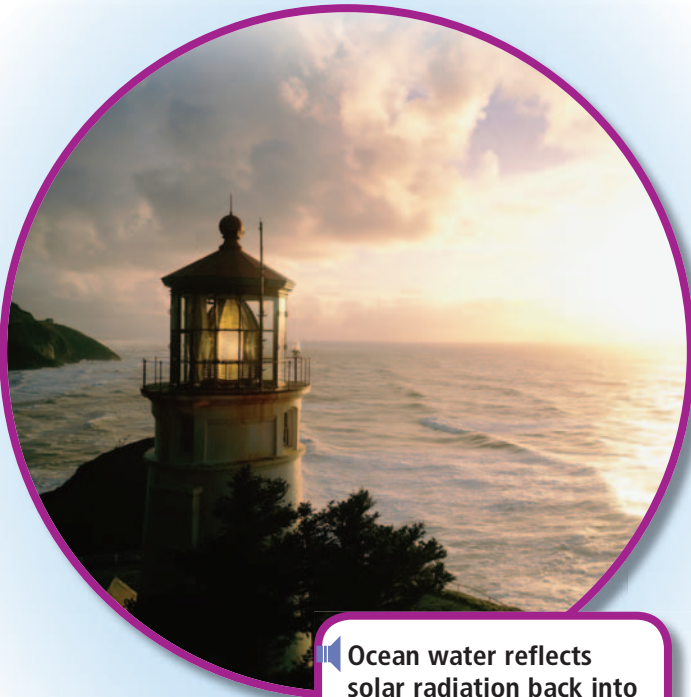


Earth's atmosphere absorbs and stores energy near Earth's surface. This is called the *greenhouse effect*.

Earth absorbs and gives off solar energy. The amount of energy received balances the amount of energy that is given off. This balance gives Earth a stable average temperature.



How much solar radiation is absorbed by the land and oceans on Earth?

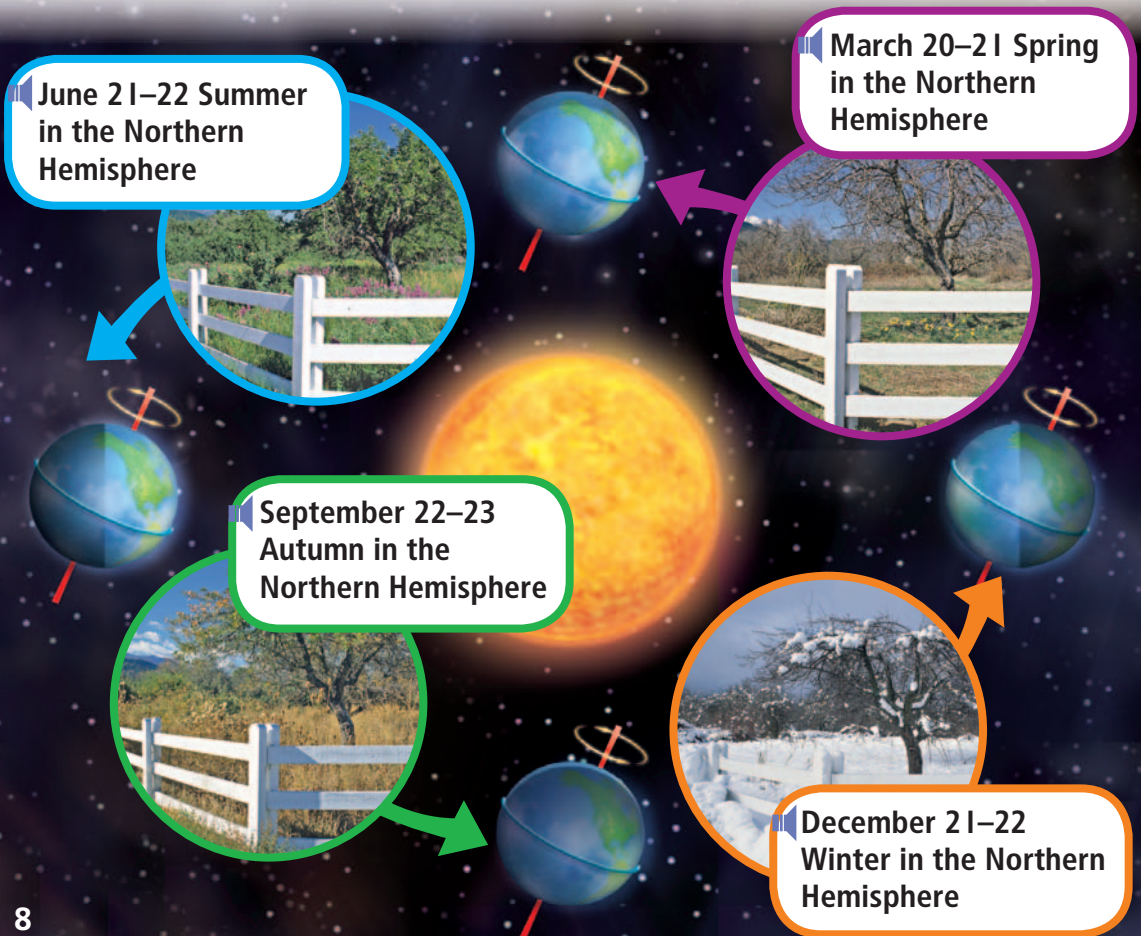


Ocean water reflects solar radiation back into the atmosphere.

Seasons and Climate

The Earth revolves around the sun. The way it revolves affects our seasons and climate. Earth is tilted at an angle. The tilt helps to cause seasons on Earth. During some months, the Northern Hemisphere is tilted toward the sun. Other months, the Northern Hemisphere is tilted away from the sun.

When the Northern Hemisphere is tilted toward the sun, solar radiation is more direct. The energy is focused. There are more hours of daylight. At the same time, the Southern Hemisphere is tilted away from the sun. The sun's radiation is less direct. The energy spreads out. There are more hours of darkness than daylight.



||| The equator gets the same amount of solar radiation all year. When a pole is tilted away from the sun, it experiences winter. This difference in temperature causes a strong flow of energy. The energy flows from the equator to the pole. This circulation produces strong winter storms.

||| In many places on Earth, there are four seasons. However, some places have only two seasons—wet and dry. Seasons differ in different climates.

||| **Climate** is the average of all weather conditions in an area over a long period of time. There are several climate zones between the equator and the poles. Earth's climates have not changed very much for thousands of years.



What causes warm weather in the Northern Hemisphere?

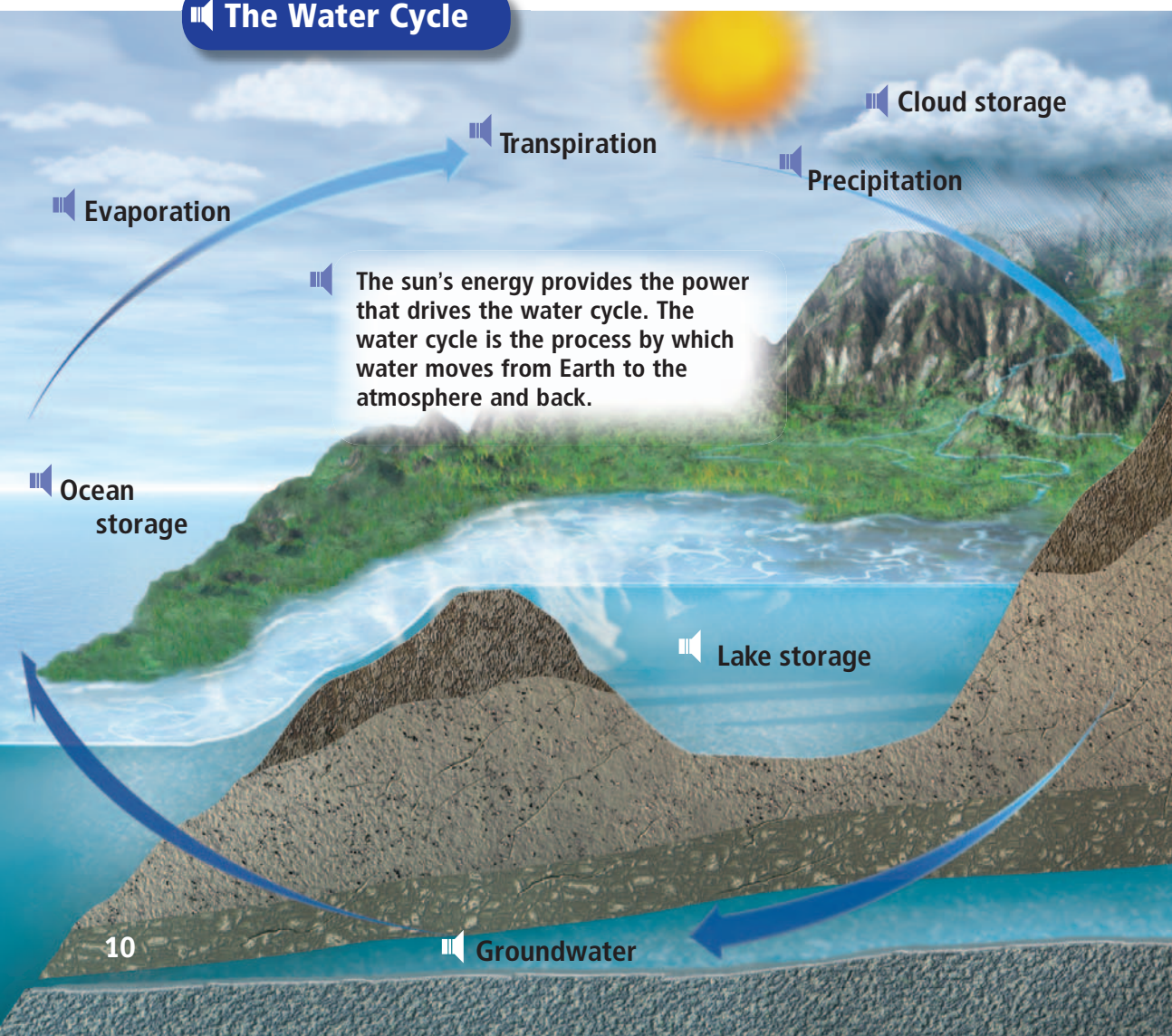


The Water Cycle

The **water cycle** is the process by which water moves from Earth to the atmosphere and back. The sun's energy drives the water cycle. Earth's oceans, lakes, rivers, and ponds absorb solar radiation. Water evaporates and becomes water vapor.

 Water vapor is less dense than liquid water. The water vapor rises and cools. The vapor condenses around dust particles in the air. The condensed droplets form clouds. When the drops collect together they grow larger. Soon they fall as rain or snow.

The Water Cycle



Some water enters plant roots and travels through the plants. The water goes into the plant's green leaves. The water inside the leaves absorb solar energy. Heat is produced. This causes the water to evaporate. The cycle of evaporation, condensation, and precipitation never ends.



How does solar energy cause water to change from a liquid to a gas?



Review



Complete these **cause** and **effect** statements.

1. All living things on Earth survive because of the steady supply of energy from the ____ .
2. The Earth's ____ causes seasons as the Earth revolves around the sun.
3. When a pole tilts away from the sun, the pole's hemisphere experiences ____ .
4. After water reaches the green leaves of the plant, the water absorbs ____ energy.

GLOSSARY

-  **climate** [KLY•mit] The average weather in an area over a long period of time.
-  **solar radiation** [SOH•ler ray•dee•AY•shuhn] The electromagnetic radiation emitted by the sun.
-  **ultraviolet radiation** [uhl•truh•vy•uh•lit ray•dee•AY•shuhn]
Waves with shorter wavelengths than those of visible light.
-  **water cycle** [WAW•ter sy•kuhl] The process by which water moves above, across, and through Earth's crust and ecosystems.

Think About the Reading

-  **1.** How does the illustration on page 8 help you understand the changing seasons?
-  **2.** Which section should you read again to learn more about the sun's effect on the atmosphere?

Hands-On Activity

Plants use the sun's energy. What happens if a plant does not receive sunlight? Get two small potted plants that are the same kind and about the same size. Water both according to the directions on the plant.

-  **1.** Place one in a sunny window. Wait 2 weeks. Does it survive?
-  **2.** Place the second plant on a dark bookshelf. Wait 2 weeks. Compare the two plants.

School-Home Connection

With a family member, use a flashlight and a ball to show how the sun's radiation shines onto Earth differently during each season. Tilt the ball, and rotate it around the flashlight. Tape a spot on the "Earth" to show your home. What season do you experience when your home is tilted toward the sun? What season do you experience when your home is tilted away from the sun?