

60 Changing States of Water



Water is one of the most important natural resources. People need it for survival. Although the earth has a lot of water, it is not always in the right place or of the right quality for human use. Seawater, for example, has too much salt in it for people to drink. Hydrologists study how water moves around the earth so that they can help address people's need for water.

CHALLENGE

How does water change?

MATERIALS



For each group of four students

- 1 Student Sheet 60.1, "Instructions for Concept Map About Water"
- 1 sheet of chart paper
- markers



READING

Work with your group to create a concept map that will help prepare you for this activity.

Water: Solid, Liquid, and Gas

Water can be found on the earth as a liquid, a solid, and a gas. Liquid water falls as rain or flows as a river. Sometimes water is frozen solid and falls to earth as snow, ice, or hail. When water is a gas, you cannot usually see it, but you can sometimes feel it.

When water is a gas, it is called **water vapor** (VAY-pur). If there is a lot of water vapor in the air, you may feel the air is damp or wet. **Humidity** (hew-MID-ih-tee) is the word meteorologists use to describe the amount of water vapor in the air. When it is very humid, there is a lot of water vapor in the air. It may take a long time for wet things to dry, and your skin may feel sticky and wet. Winds move water vapor from place to place.

Clouds and Climate

Sometimes, water moves in a form you see every day—clouds. The **clouds** that you see in the sky are large collections of water, usually in the form of tiny droplets of liquid and solid water. When these droplets

Like clouds, fog is also made up of tiny drops of water. If you have ever been in fog, you know what the inside of a cloud is like!



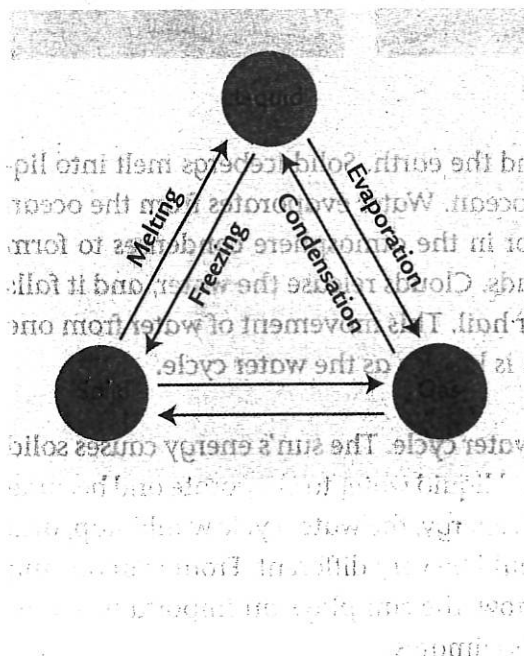
become too heavy for air currents to hold them up, they fall down to earth as rain, snow, or hail.

Clouds both cool and warm the earth. Clouds can reflect the sun's rays back into space, causing temperatures to be cooler. Sometimes they act as a blanket over the earth's atmosphere, keeping it warmer. Depending on the time of day and the type of clouds, the result can be either a warmer or cooler surface. Areas with heavy cloud cover tend to be cooler during the day and warmer at night than they would otherwise be.

Changing States of Water

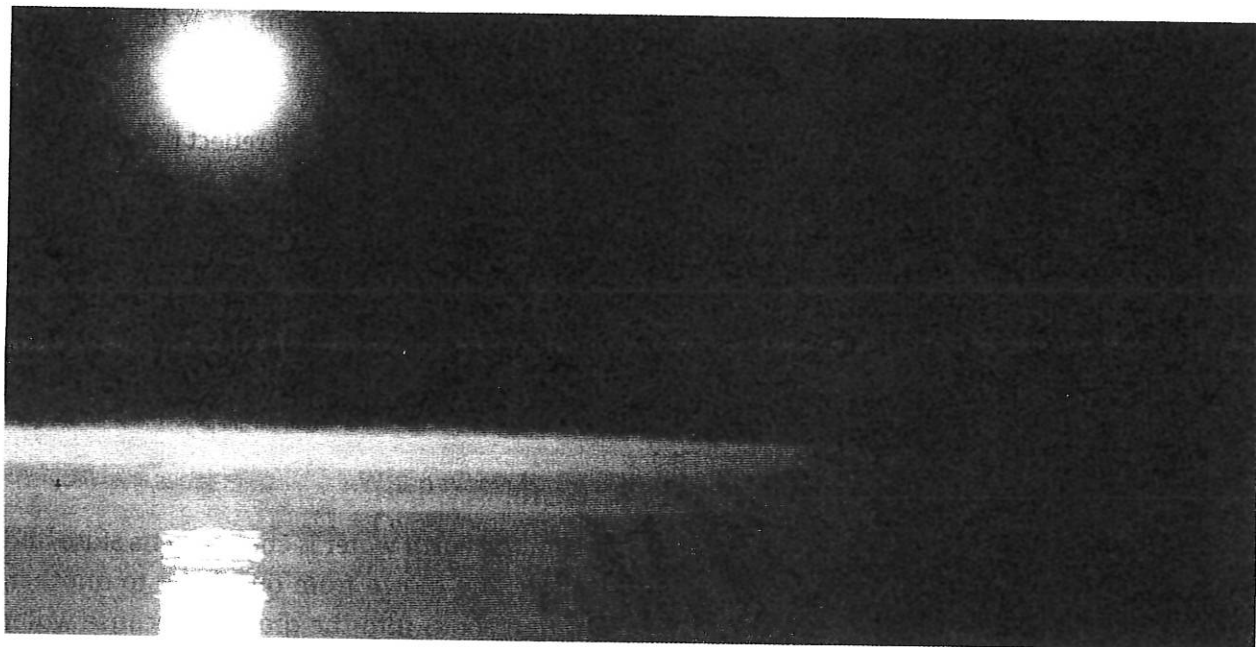
Every second, somewhere on the earth water is changing its state and moving. Clouds, for example, are blown from one place to another, sometimes releasing rain that soaks into the ground. Because water changes state and moves around so much, it can sometimes seem like the earth has more or less water on it. This is not true. The amount of water on the earth stays the same.

Scientists have words to describe the different ways in which water can change from one state to another. Two familiar words used to describe water changing from one state to another are **melting** and **freezing**. Water melts when it goes from solid to liquid, and water freezes when it goes from liquid to solid.



Liquid water becomes water vapor through a process called **evaporation** (ee-VAP-oh-RAY-shun). If you have ever left a glass of water on a counter and come back to find that some of the water has "disappeared," you have seen evidence of evaporation. The water hasn't disappeared; it has changed state.

Water vapor can also turn back into a liquid through a process called **condensation** (CON-den-SAY-shun). If you have ever seen drops of water appear on the inside of a car window or the outside of a glass, you have seen condensation take place. Condensation often occurs high in the sky, when water vapor condenses into tiny water droplets and forms clouds.



The Water Cycle

Imagine water moving around the earth. Solid icebergs melt into liquid water that flows into the ocean. Water evaporates from the ocean into water vapor. Water vapor in the atmosphere condenses to form the tiny water droplets in clouds. Clouds release the water, and it falls back to earth as rain, snow, or hail. This movement of water from one state to another around earth is known as the water cycle.

Heat from the sun drives the water cycle. The sun's energy causes solid ice to melt into liquid water and liquid water to evaporate and become water vapor. Without the sun's energy, the water cycle would stop, and climates around the world would be very different. From evaporating the ocean water to melting snow, the sun plays an important role in the water cycle and the world's climates.

ANALYSIS



1. Copy the three lists of words below.

List 1

vapor

liquid

solid

melting

water

List 2

water

solid

condensation

vapor

liquid

List 3

evaporation

solid

liquid

vapor

water

- a. Look for a relationship among the words in each list. Cross out the word in each list that does not belong.
- b. Circle the word in each list that includes the others.
- c. Explain how the word you circled relates to the other words in the list.



2. The amount of water on the earth today is the same as it was 100 years ago. Use your knowledge from this activity to explain how this could be true.

