FOCUS ON SCIENCE

Earth Science

Water

On Level

Water Is in the Air

LOOK INSIDE FOR:

- Core Curriculum Covered
- Student Book
- Assessments and Reading Activities

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Water Is in the Air

What makes water so special?

CORE CURRICULUM STATEMENTS

Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land.

Water is recycled by natural processes on Earth.

- evaporation: changing of water (liquid) into water vapor (gas)
- condensation: changing of water vapor (gas) into water (liquid)
- precipitation: rain, sleet, snow, hail
- runoff: water flowing on Earth's surface
- groundwater: water that moves downward into the ground

Plants and animals depend on each other and their physical environment.

Heat energy from the Sun powers the water cycle.

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Water Is in the Air

by Caitlin Scott

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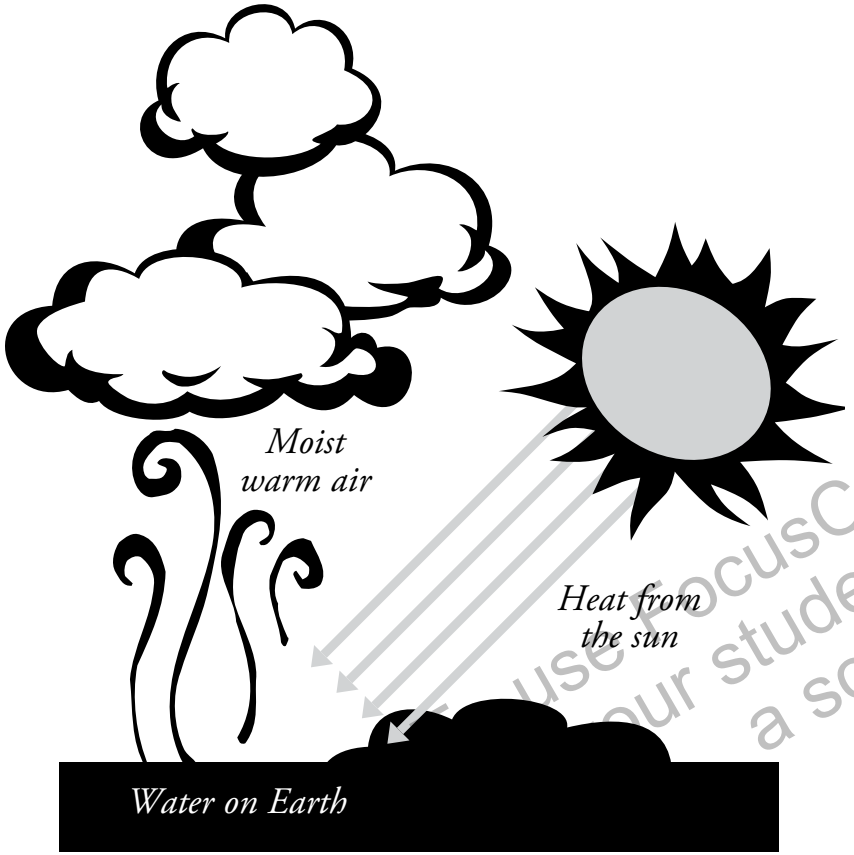
Curriculum materials for **your** content standards

Table of Contents

– Predict –
What do you think you will learn from reading this book?



Clouds form when warm, moist air rises off Earth's surface.

Clouds Are Water

Air is all around us. We can't see air, but we know it is there. We breathe it every day. Air is made of **gases**. It also contains water **vapor**. How do we know? Look at a cloud. Did you know a cloud is just water in the air?

When water is warmed by the sun, it evaporates and rises. As water vapor rises, it cools and tiny water drops form. When these drops are packed close together, we can see them. They form a cloud. When too much water collects in a cloud, the water falls.

Water goes up into the air and falls back to Earth all the time. This is called the water cycle. It all starts with the sun.

gases: matter that has no shape; gases spread out to fill the space around them; most cannot be seen
vapor: a gas formed from something that is usually a liquid

CHAPTER 1

The Water Cycle

The water cycle has five parts.

Evaporation—The sun warms water on Earth. The water changes to a gas and rises.

Transportation—Clouds are transported, or moved, by wind over land.

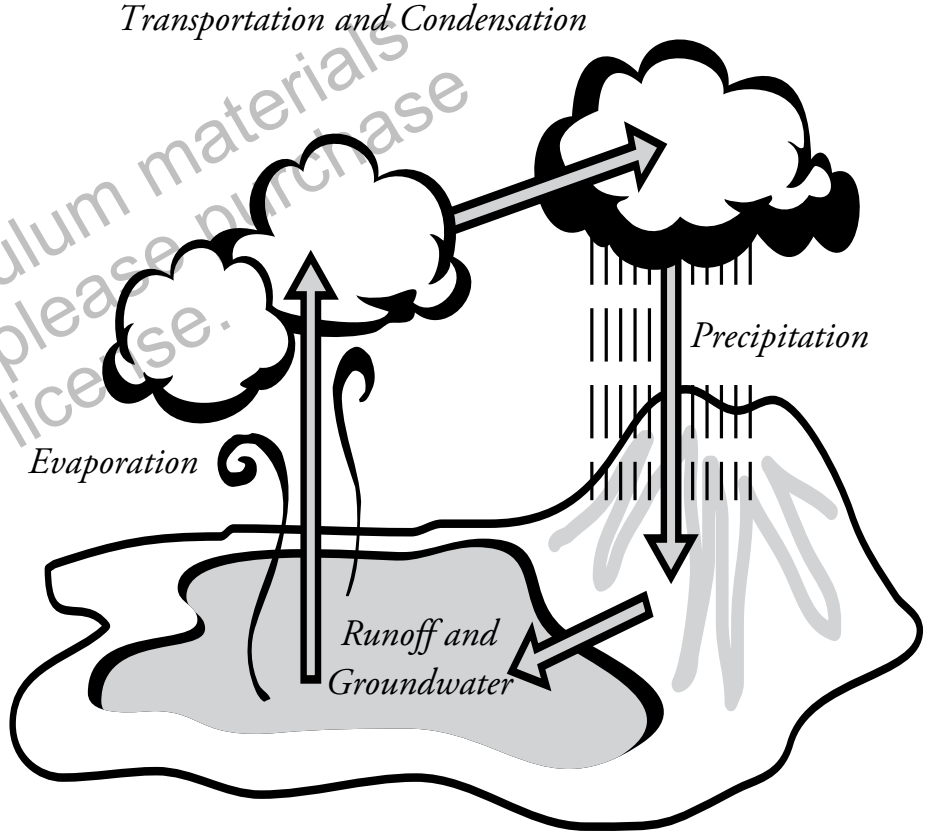
Condensation—The warm gas rises and moves over land. The air cools and the gas begins to change back to a liquid. Tiny water droplets form clouds.

Precipitation—More and more water collects in the cloud. When there is too much water, it falls back to Earth as rain, snow, sleet, or hail.

Runoff and Groundwater—The water that falls collects on Earth. Some is absorbed into the ground.

liquid: a state in which matter flows freely when poured; liquids take the shape of whatever holds them

Water Cycle



– Recall –
Name the five parts of the water cycle.

Evaporation

Evaporation occurs when water is warmed by the sun. The water changes from a liquid to a gas. As a gas, water moves up into the air.

Have you ever spilled water on your clothes? Did the water spot go away? Yes. Your clothes dried out. The water changed from a liquid to a gas. It evaporated. But you didn't see the water going into the air.

If it doesn't rain for a while, the ground gets dry. Why? Because the water evaporates. Even though you can't see it, water evaporates all the time.

Have you seen a pot of boiling water? You see steam rising out of the pot. First, water changes from a liquid to a gas. Then, a cloud forms. This is called condensation. Read on to learn more.

– Explain –
What causes water to evaporate?

When water boils, it turns from a liquid to a gas. You can see the gas as steam.

– Apply –
Describe evidence of the water cycle that you have seen.

Transportation

Most water vapor comes from the ocean or lakes. Wind transports the water vapor toward land which is higher than the water.

Condensation

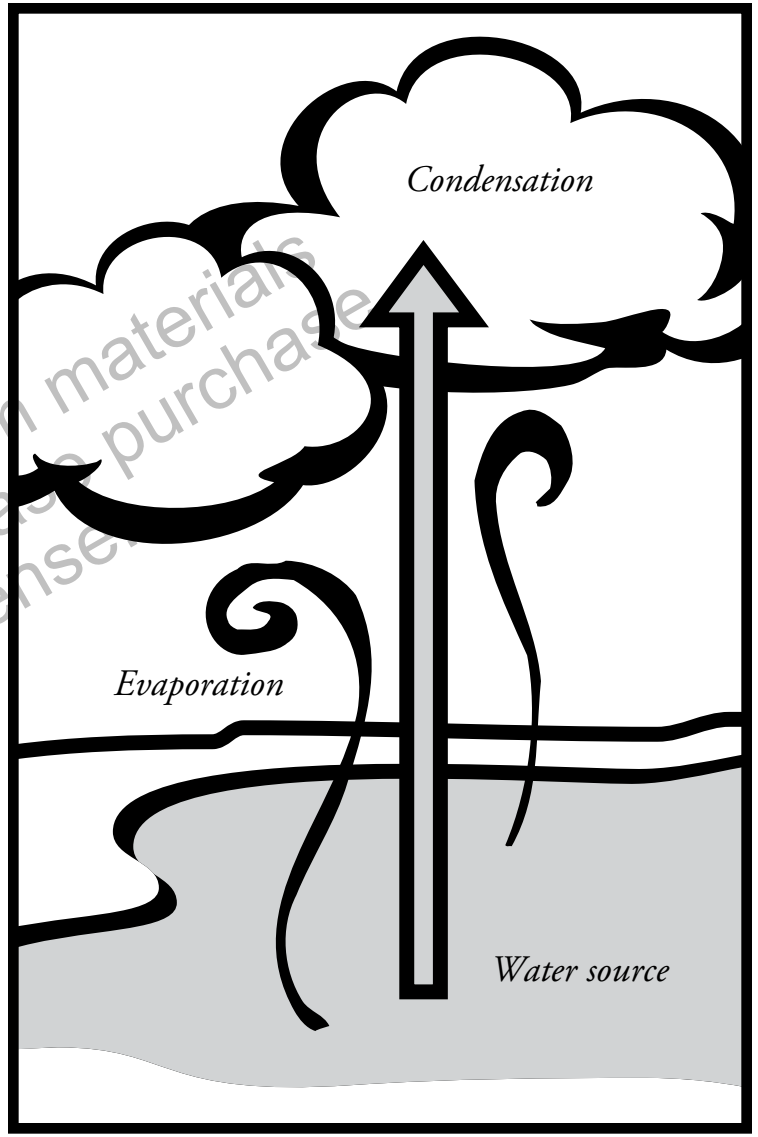
Have you ever breathed on a cold window? Your breath made fog on the window. This is condensation.

Have you noticed what happens when someone with glasses goes from the cold outside to the warm inside? Their glasses fog up. This is also condensation.

Condensation occurs when water vapor is pushed higher and begins to cool. The vapor changes back to liquid water, forming a cloud. First, water evaporates; then it condenses. The condensation forms clouds.

What happens next in the water cycle? Water falls back to Earth.

– Explain –
What happens when water condenses?



Precipitation

As the clouds move higher, they get colder and more gas becomes liquid. The liquid water is heavier than water vapor. It falls back to Earth.

Rain

If it is warm outside, the water that falls is rain. Rain occurs at temperatures that are above freezing. This means greater than 32 degrees Fahrenheit or 0 degrees Celsius.

In some parts of the United States, it rains a lot. In other parts, it is very dry.

Average Rainfall in U.S. Cities	
City	**Average Annual Rainfall in Inches**
Astoria, Oregon	70
El Paso, Texas	8
Las Vegas, Nevada	4
Miami, Florida	60
New Orleans, Louisiana	60
Phoenix, Arizona	7

Snow

Snow is water that freezes in a cloud. As it falls to the ground, it stays frozen. Because water freezes in a cloud and stays frozen as it falls, each flake has a beautiful pattern. The patterns are created by the air that mixes with the cloud when the water freezes.

It snows a lot in the northern parts of the United States. It also snows a lot high up in the mountains.

Snowiest U.S. Cities	
City	**Average Annual Snowfall in Inches**
Blue Canyon, California	241
Marquette, Michigan	129
Sault Ste. Marie, Michigan	117
Syracuse, New York	112
Caribou, Maine	110

– Infer –
Why do scientists keep records of precipitation?

Sleet

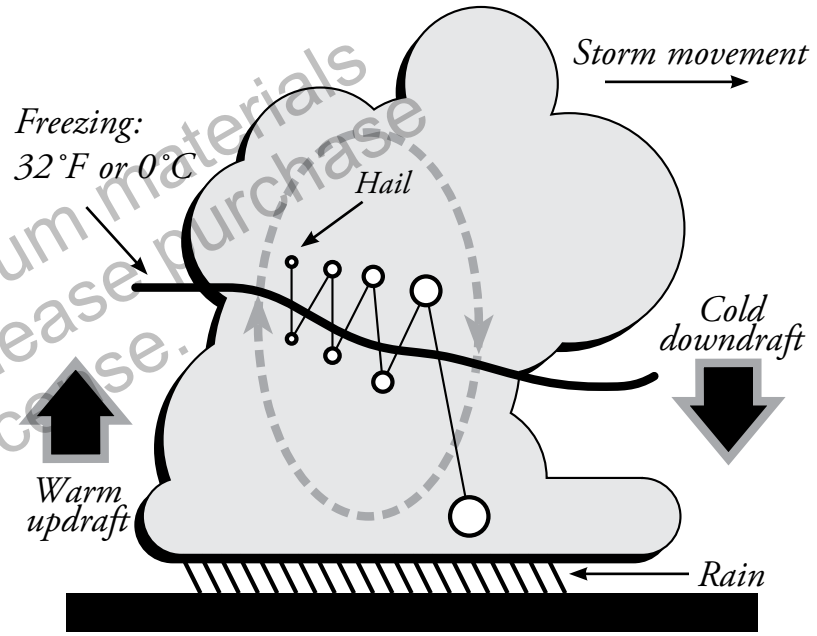
Sleet is also water that freezes in a cloud. But, sleet doesn't stay frozen. It passes through warmer air and melts as it falls. Then it goes through colder air again. It refreezes just before it hits the ground.

Hail

Hail is a little like sleet. Water drops freeze in a cloud and fall through warmer air. The water starts to melt. But then, strong winds from a **thunderstorm** blow it back up to the colder air. It collects dust and ice from the cloud and freezes again. The frozen water falls again and the wind may blow it up again. This can happen many times. Each time, the frozen water gets larger. Finally, it gets too heavy to stay up and falls to the ground as hail.

thunderstorm: a rainstorm that has thunder and lightning

How Hail Forms



Hail moves up and down in a storm cloud. It grows larger and larger each time it passes through air that is above and below freezing.

– Summarize –
Describe how water changes from one state to another.

Runoff and Groundwater

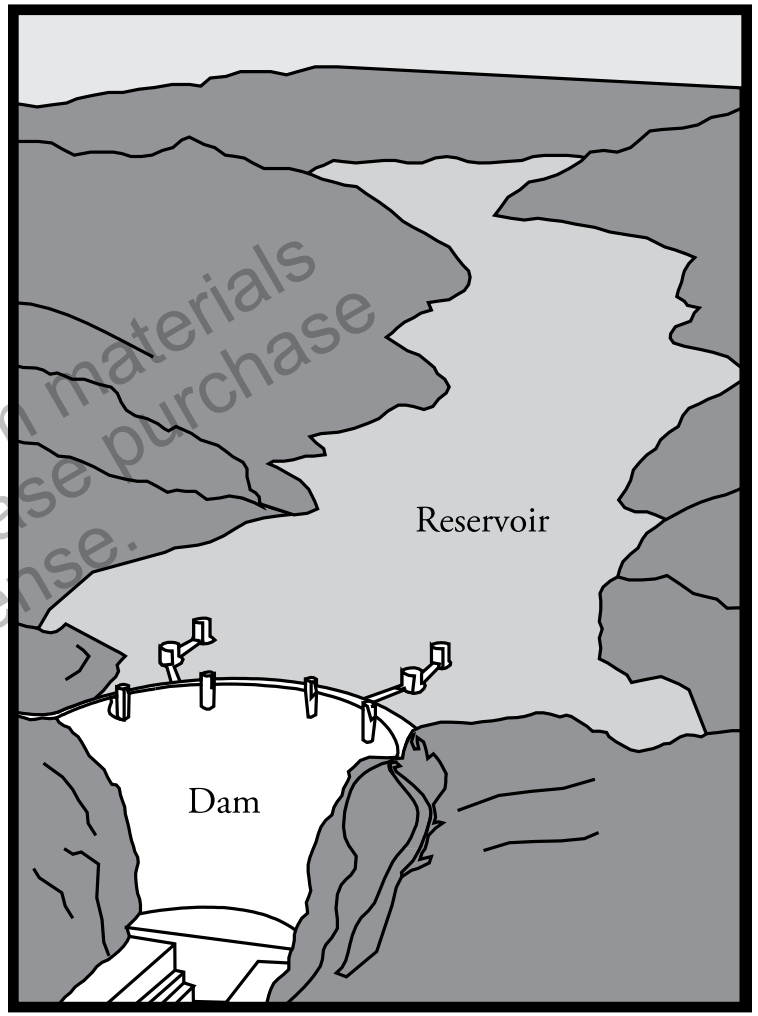
The last step of the water cycle is runoff and groundwater. When water falls to the ground, it is absorbed, collected, and stored until it evaporates again.

Where can you see water stored on Earth? The first place you think of might be a lake, a river, a sea, or the oceans.

Water is also stored underground. After a hard rain, the ground is damp and muddy. The ground is storing water. Water can even form underground lakes or streams.

Sometimes people build **reservoirs** to collect and store water. Then they clean the water and use it for drinking, cooking, and cleaning. Lake Mead in Arizona and Nevada is the biggest man-made reservoir in the United States. It is about 110 miles long.

reservoirs: places where water is stored



Lake Mead in Arizona and Nevada is a reservoir created by the Hoover Dam.

CHAPTER 2

The Water Cycle Never Stops

If you put evaporation, transportation, condensation, precipitation, and runoff and absorption together, you have the water cycle.

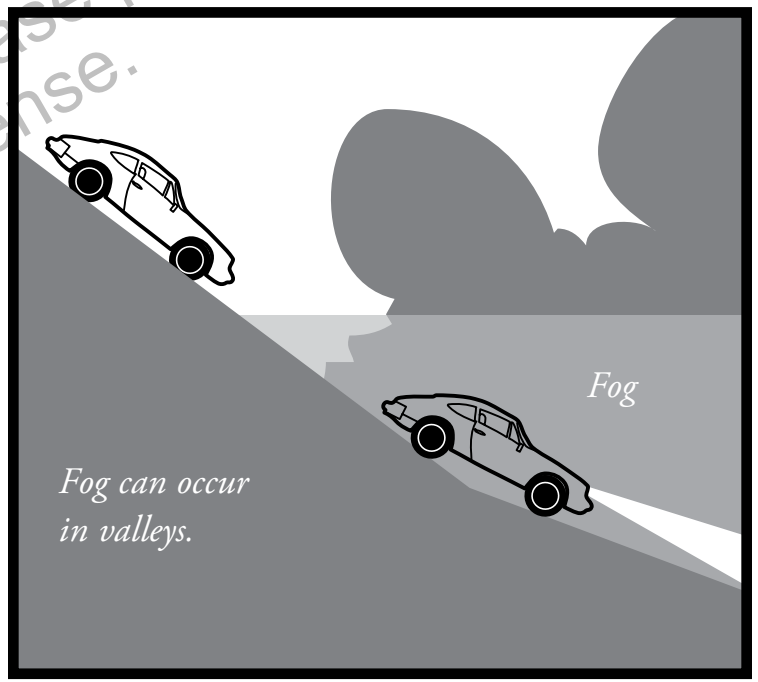
The water cycle has been going on as long as Earth has been around. The water in your glass once fell as rain. The rain that falls today has been around since the time of the dinosaurs.

The water cycle is going on right this very minute. Just like air, we can't always see water. But, we know it's there.

We can't live without the water cycle. In fact, all living things depend on it. Plants need water to grow. Many animals, such as you, eat plants to survive. Like plants, animals need water to drink. Without the water cycle, the food chain would not exist.

Did You Know?

Clouds don't have to be high up in the sky. Sometimes clouds can touch the ground. We call these clouds fog. Fog often occurs in the morning in places near a large body of water—such as a bay or lake. Fog can also occur when heavy cold air sinks into a valley and warmer air passes over top.



CHAPTER 3

Try This

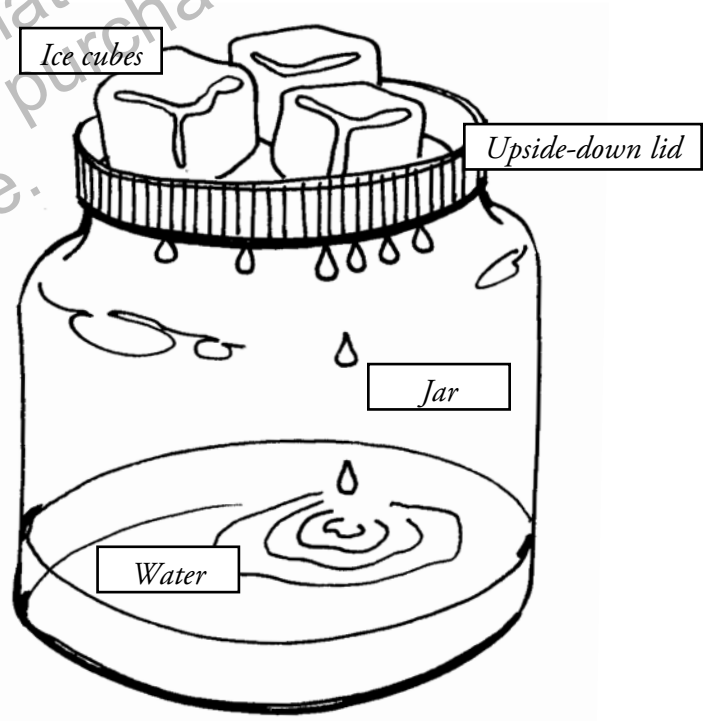
In this experiment, you can see the water cycle in a short period of time. You will be able to observe evaporation, condensation, and precipitation in just 10 minutes.

Materials

- 1 glass jar with a lid (metal lid preferred)
- 3 ice cubes
- hot water
- paper and pencil to record observations

What To Do

1. Pour hot water into the jar to a depth of one-half to one inch.
2. Turn the lid upside down and place it on top of the jar.
3. Place the three ice cubes on top of the lid.
4. Record what you see for the next 10 minutes.
5. After 10 minutes, take the lid off and observe the underside of the lid.
6. Record your observations again.



– Interpret –
Explain the results of the data you collected.

Glossary

gases—matter that has no shape; gases spread out to fill the space around them; most cannot be seen

liquid—a state in which matter flows freely when poured; liquids take the shape of whatever holds them

reservoirs—places where water is stored

thunderstorm—a rainstorm that has thunder and lightning

vapor—a gas formed from something that is usually a liquid

To Find Out More . . .

Want to learn more about water?

Try these books

A Drop Around the World by Barbara McKinney Shaw. Dawn Publications, 1998.

The Magic School Bus Wet All Over by Pat Relf and Carolyn Bracken. Scholastic, 1996.

Access these Web sites

The National Weather Service
http://www.nws.noaa.gov/

The Environmental Protection Agency, Office of Water
http://www.epa.gov/water/

Write for more information

The National Weather Service
1325 East West Highway
Silver Spring, MD 20910

U.S. Environmental Protection Agency
Office of Water (4101M)
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

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Earth Science

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Assessments

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Check Understanding

Shade the circle next to the correct answer or write your answer on the lines provided.

1. The water cycle never stops. The same water that you drink has been around since the time of dinosaurs. Which statement describes the runoff and groundwater part of the water cycle?

   Ⓐ Water collects on Earth.

   Ⓑ Water falls back to Earth.

   Ⓒ Water changes to a liquid.

   Ⓓ Water changes to a gas and rises.

2. After several weeks, students observe that the water level in a fish bowl is lower. What process causes this to happen?

   Ⓐ condensation

   Ⓑ precipitation

   Ⓒ evaporation

   Ⓓ transportation

3. Clouds are part of the water cycle. They are formed by tiny water drops packed close together. Identify the part of the water cycle in which clouds develop. [1]

   _____

   Explain what happens when too much water collects. [1]

   _____

   _____

   _____

   _____

Water Is in the Air

Check Understanding

Shade the circle next to the correct answer or write your answer on the lines provided.

4. Water can exist as a solid, liquid, or gas. Identify two terms that can describe water in gas form. [1]

   1) _____

   2) _____

   Explain where each might occur. [2]

   _____

   _____

   _____

   _____

   _____

   _____

5. The illustration below shows how the water cycle works. The water in the bottom of the jar is hot.

Why does the water change from gas to liquid?

Ⓐ The air cools.

Ⓑ The air gets warmer.

Ⓒ There is too much water.

Ⓓ There is not enough water.

Water Is in the Air

Assessment Scoring Guidelines

1. Answer A is correct.
2. Answer C is correct.
3. Condensation
   When too much water collects, it falls to Earth as rain, snow, sleet, or hail.
4. Vapor
   Water vapor exists in the air around us after it has evaporated.

   Steam
   Steam exists when boiling water evaporates.
5. Answer A is correct.

Earth Science

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English Language Arts Activities

Water Is in the Air

Summarize

Summarizing means retelling what you have read. Summaries are often shorter than the text you read. Summarizing helps you understand what you read.

Read this paragraph from *Water Is in the Air* and try summarizing it.

Clouds don't have to be high up in the sky. Sometimes clouds can touch the ground. We call these clouds fog. Fog often occurs in the morning in places near a large body of water—such as a bay or lake. Fog can also occur when heavy cold air sinks into a valley and warmer air passes over top.

Is this a good summary?

Fog often occurs in the morning.

No! This statement is too specific and does not summarize the main idea. How about the one below? Is it a good summary?

Clouds that are close to the ground are called fog.

Yes! This is the main idea of the paragraph.

TRY THE SKILL

Read the paragraphs. Shade the circle next to the best summary.

1. Air rises and falls. As air rises, tiny water drops form. When these drops are close together, we can see them. They form a cloud. A cloud is really just water in the air.

   Ⓐ Air is made of oxygen and hydrogen.

   Ⓑ Water in the air forms clouds.

   Ⓒ Rain is important for plants.

2. Snow is water that freezes in a cloud. As it falls to the ground, it stays frozen. Because snow freezes in a cloud and stays frozen, each flake has beautiful patterns. The patterns are created by the air that mixes with the cloud when the snowflake froze.

   Ⓐ Each snowflake has a beautiful pattern.

   Ⓑ Snowflake patterns are created by the air in the clouds.

   Ⓒ Snow freezes in a cloud and stays frozen as it falls.

Draw Conclusions

Charts can give you information quickly. You can draw conclusions from charts. Read the chart from *Water Is in the Air*.

Snowiest U.S. Cities

City	Average Annual Snowfall in Inches
Blue Canyon, California	241
Marquette, Michigan	129
Sault Ste. Marie, Michigan	117
Syracuse, New York	112
Caribou, Maine	110

Here are some conclusions you can draw from the chart.

- The snowiest cities in the U.S. get more than 100 inches of snow. That's a lot of snow.
- Two of the snowiest cities are in Michigan, so Michigan probably gets a lot of snow.
- Not all the snowiest cities are in the same state, so there can be heavy snowfall in many different parts of the U.S.

TRY THE SKILL

Read the chart from *Water Is in the Air*. Think about the conclusions you can draw. Write them on the lines.

Average Rainfall in U.S. Cities

City	Average Annual Rainfall in Inches
Astoria, Oregon	70
El Paso, Texas	8
Las Vegas, Nevada	4
Miami, Florida	60
New Orleans, Louisiana	60
Phoenix , Arizona	7

Compare and Contrast

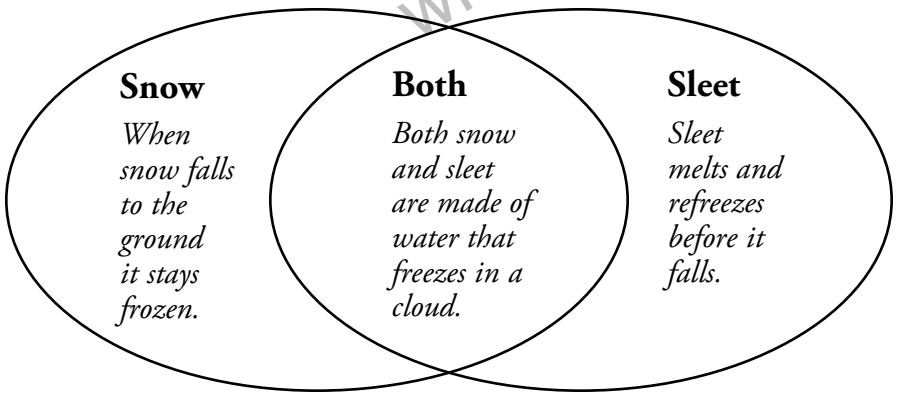
Comparing and contrasting can help you understand what you read.

- **Comparing tells how things are alike.**
- **Contrasting tells how things are different.**

Read these paragraphs from *Water Is in the Air*. Then, read the Venn diagram that compares and contrasts.

Snow is water that freezes in a cloud. As it falls to the ground, it stays frozen. Because snow freezes in a cloud and stays frozen as it falls, each flake has a beautiful pattern.

Sleet is also water that freezes in a cloud. But, sleet doesn't stay frozen. It passes through warmer air and melts as it falls. Then, it goes through colder air again. It refreezes just before it hits the ground.

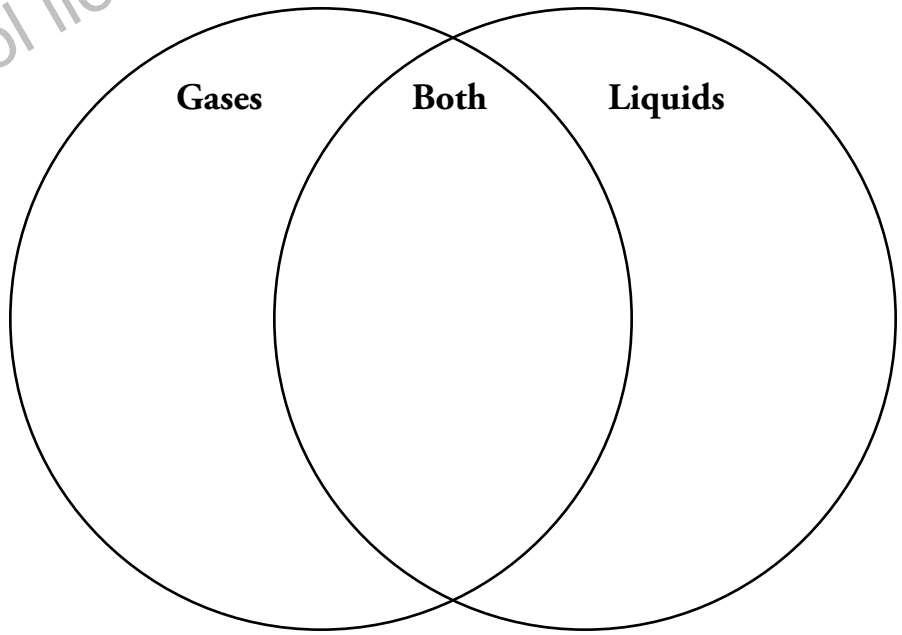


TRY THE SKILL

Read the paragraphs. Think about comparing and contrasting. Then complete the Venn diagram.

Gas is a state of matter. Most gases have no shape. They spread out to fill the space around them. Most cannot be seen.

Liquid is also a state of matter. Liquids flow freely when you pour them. They take the shape of whatever holds them.



Antonyms

Antonyms are words that have opposite meanings. Some examples of antonyms are:

night* and *day
up* and *down
inside* and *outside
left* and *right

Read the paragraph from *Water Is in the Air*. Look for the antonyms.

When air is warmed by the sun, it rises. As air rises, it cools and tiny water drops form. When these drops are packed close together, we can see them. They form a cloud. When too much water collects in a cloud, the water falls.

***Rises* and *falls* are antonyms. Here is another. Look for the antonyms.**

Rain, snow, sleet, and hail are all forms of precipitation. Remember, precipitation can occur in liquid or solid forms.

***Liquid* and *solid* are antonyms.**

TRY THE SKILL

1. Read the paragraph from ***Water Is in the Air***. Circle the antonyms.

Sleet is also water that freezes in a cloud. But sleet doesn't stay frozen. It passes through warmer air and melts as it falls. Then it goes through colder air again. It refreezes just before it hits the ground.

2. Read the paragraph from ***Water Is in the Air***. Circle the antonyms.

You know that water goes up into the air and forms clouds and fog. Water also falls down from the sky as rain, snow, sleet, or hail.

3. Think of as many antonyms that have to do with weather as you can. Write them on the lines.

_____

_____

_____

Answer Key

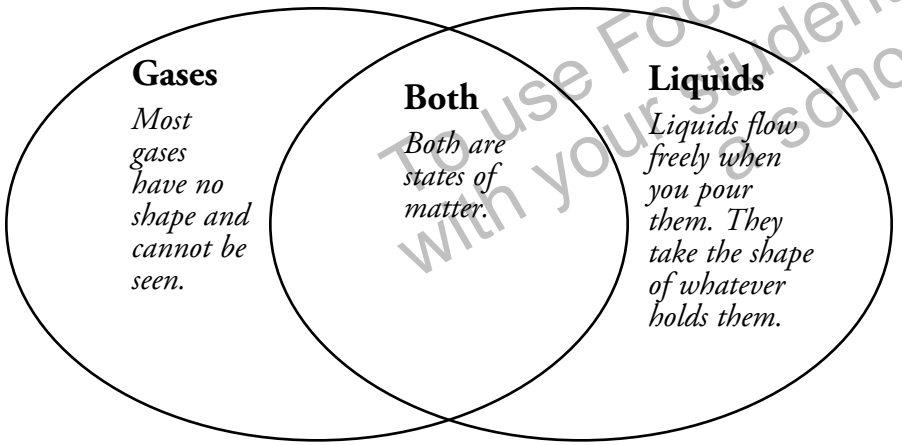
Summarize

1. B
2. C

Draw Conclusions

Conclusions will vary but should be based on information from the chart.

Compare and Contrast



Antonyms

1. warmer/colder, freezes/melts
2. goes up/falls down
3. Answers will vary.