

# Weather

## Describing Weather

### ..... Before You Read .....

**What do you think?** Read the two statements below and decide whether you agree or disagree with them. Place an A in the Before column if you agree with the statement or a D if you disagree. After you've read this lesson, reread the statements to see if you have changed your mind.


Before	Statement	After
	1. Weather is the long-term average of atmospheric patterns of an area.	
	2. All clouds are at the same altitude within the atmosphere.	

### ..... Read to Learn .....

## What is weather?

**Weather** is the atmospheric conditions, along with short-term changes, of a certain place at a certain time. Have you ever been caught in a rainstorm on what began as a sunny day? If so, you know that weather can change quickly. It can also stay the same for days.

## Weather Variables

Variables are things that can change. Temperature and rainfall are two of the variables used to describe weather. Meteorologists are scientists who study and predict weather. They use several variables that describe a variety of atmospheric conditions. These variables include air temperature, air pressure, wind speed and direction, humidity, cloud coverage, and precipitation. 

## Air Temperature

Air temperature is a measure of the average kinetic energy of molecules in the air. Kinetic energy is the energy an object has because it is moving. When the temperature is high, molecules have a high kinetic energy. Therefore, molecules in warm air move faster than molecules in cold air. Air temperatures vary with the time of day, season, location, and altitude.

### Key Concepts

- What is weather?
- What variables are used to describe weather?
- How is weather related to the water cycle?

### Study Coach

#### Summarize What You Read

After you read each paragraph, write a sentence or two in your own words describing what you read. Use your sentences to review the lesson.

### Key Concept Check

**1. Define** What is weather?

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## Visual Check

**2. Apply** What happens to air pressure as altitude decreases?

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## Reading Check

**3. Name** What instrument measures air pressure?

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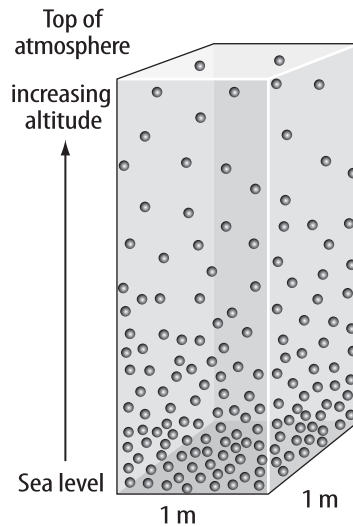
## Reading Check

**4. Compare** humidity and relative humidity.

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## Air Pressure

**Air pressure** is the pressure that a column of air exerts on the air, or surface, below it. Look at the figure. Air pressure decreases as altitude increases. Therefore, air pressure is greater at low altitudes than it is at high altitudes.

Air pressure is measured with an instrument called a barometer. Air pressure is measured in millibars (mb). The term *barometric pressure* means "air pressure." Knowing the barometric

pressure of different areas helps meteorologists predict the weather. ✓

## Wind

Wind is created as air moves from areas of high pressure to areas of low pressure. Wind direction is given as the direction from which the wind is blowing. For example, winds that blow from west to east are called westerlies. Meteorologists measure wind speed using an instrument called an anemometer (a nuh MAH muh tur).

## Humidity

The amount of water vapor in the air is called **humidity** (hyew MIH duh tee). Humidity can be measured in grams per cubic meter of air ( $\text{g}/\text{m}^3$ ). When the humidity is high, there is more water vapor in the air. On a day with high humidity, your skin might feel sticky because sweat might not evaporate quickly from your skin.

## Relative Humidity

A sponge can absorb water. When it becomes full, it cannot absorb any more water. In the same way, air can hold only a certain amount of gaseous water vapor. When air is saturated, it holds as much water vapor as possible. Temperature determines how much water vapor air can contain. Warm air can contain more water vapor than cold air can. **Relative humidity** is the amount of water vapor present in the air compared to the maximum amount of water vapor the air could contain at that temperature. Relative humidity is measured using a psychrometer. It is stated as a percent. A relative humidity of 50 percent means that the amount of water vapor in the air is one-half of the maximum the air can hold at that temperature. ✓

## Dew Point

When a sponge becomes saturated with water, the water starts to drip from the sponge. Likewise, when air becomes saturated with water vapor, the water vapor condenses and forms water droplets. When air near the ground is saturated, water vapor condenses into a liquid. If the temperature is above 0°C, dew forms. If the temperature is below 0°C, ice crystals, or frost, form. Higher in the atmosphere, saturated air forms clouds.

When the temperature decreases, air can hold less moisture. Eventually, the air becomes saturated, condensation occurs, and dew forms. *The dew point is the temperature at which air is saturated and condensation can occur.*

## Clouds and Fog

Think about what happens when you exhale warm air on a cold day. The warm air you exhale cools. If it reaches its dew point, you can see the water vapor condense into a foggy cloud in front of your face. This also happens when warm air containing water vapor cools as it rises in the atmosphere. When the cooling air reaches its dew point, water vapor condenses on small particles in the air and forms droplets. The droplets block and reflect light. This makes them visible as clouds.

Clouds are water droplets or ice crystals suspended in the atmosphere. Clouds can have different shapes. Clouds can form at different altitudes within the atmosphere. Read the table below that describes different types of clouds. As clouds move, water and thermal energy are transported from one location to another. Recall that clouds reflect some of the Sun's incoming radiation.

A cloud that forms near Earth's surface is called fog. Fog is a suspension of water droplets or ice crystals close to or at Earth's surface. Fog reduces visibility. Visibility is the distance a person can see into the atmosphere. ✓

Types of Clouds		
Stratus Clouds	Cumulus Clouds	Cirrus Clouds
<ul style="list-style-type: none"><li>• flat, white, and layered</li><li>• altitude up to 2000 m</li></ul>	<ul style="list-style-type: none"><li>• fluffy, heaped, or piled up</li><li>• 2,000 to 6,000 m altitude</li></ul>	<ul style="list-style-type: none"><li>• wispy</li><li>• above 6,000 m</li></ul>



Make a two-tab book and use it to collect information about the similarities and differences between clouds and fog.



### Visual Check

**5. Illustrate** Look out the window and find a cloud. Sketch the shape of the cloud in the space above. Then highlight in the table the type of cloud you drew.

### Reading Check

**6. Describe** What is fog?

### Visual Check

**7. Compare** What is the difference between snow and sleet?

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### Key Concept Check

**8. Identify** What variables are used to describe weather?

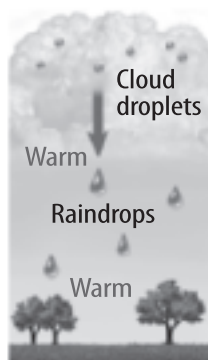
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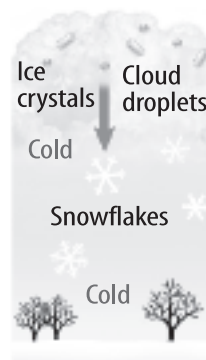
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## Types of Precipitation

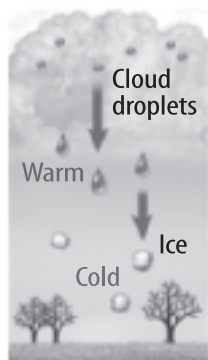
**Rain**



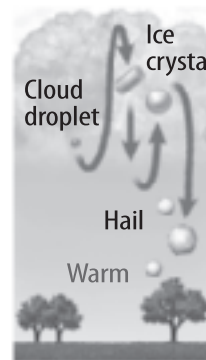
**Snow**




**Sleet**



**Hail**



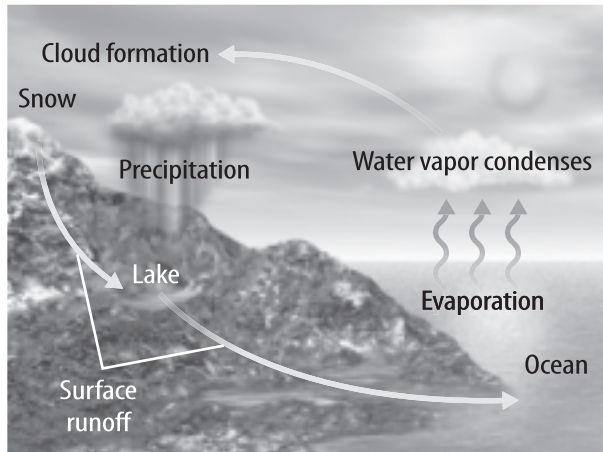
## Precipitation

Droplets in clouds form around small solid particles in the atmosphere. These particles might be dust, salt, or smoke. Precipitation occurs when cloud droplets combine and become large enough to fall to Earth's surface. **Precipitation** is water in liquid or solid form that falls from the atmosphere. Types of precipitation—rain, snow, sleet, and hail—are shown in the figure above. Rain is precipitation that reaches Earth's surface as droplets of water. Snow is precipitation that reaches Earth's surface as solid, frozen crystals of water. Sleet may start out as snow. The snow melts into rain as it passes through a layer of warm air and refreezes when it passes through a layer of below-freezing air. Other times, sleet is just freezing rain. Hail reaches Earth's surface as large ice pellets. Hail starts as a small piece of ice that is repeatedly caught in an updraft within a cloud. A layer of ice is added with each lifting. When it becomes too heavy, it falls to Earth. 

## The Water Cycle

Precipitation is an important process in the water cycle, shown at the top of next page. Evaporation and condensation are also important processes in the water cycle. *The **water cycle** is the series of natural processes in which water continually moves among oceans, land, and the atmosphere.*

## The Water Cycle



Most water vapor enters the atmosphere through evaporation. Water vapor forms as water is heated at the ocean's surface. Water vapor cools as it rises in the atmosphere. The cooled water vapor condenses back into liquid. Clouds form from droplets of liquid and solid water. Clouds produce precipitation. The precipitation falls to Earth's surface and later evaporates, continuing the cycle.



### Visual Check

**9. Identify** Circle the name of the process in which liquid water changes into water vapor.



### Key Concept Check

**10. Describe** How is weather related to the water cycle?

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## Mini Glossary

**air pressure:** the pressure that a column of air exerts on the air, or surface, below it

**dew point:** the temperature at which air is fully saturated because of decreasing temperatures while holding the amount of moisture constant

**humidity (hyew MIH duh tee):** the amount of water vapor in the air

**precipitation:** water, in liquid or solid form, that falls from the atmosphere

**relative humidity:** the amount of water vapor present in the air compared to the maximum amount of water vapor the air could contain at that temperature

**water cycle:** the series of natural processes in which water continually moves among oceans, land, and the atmosphere

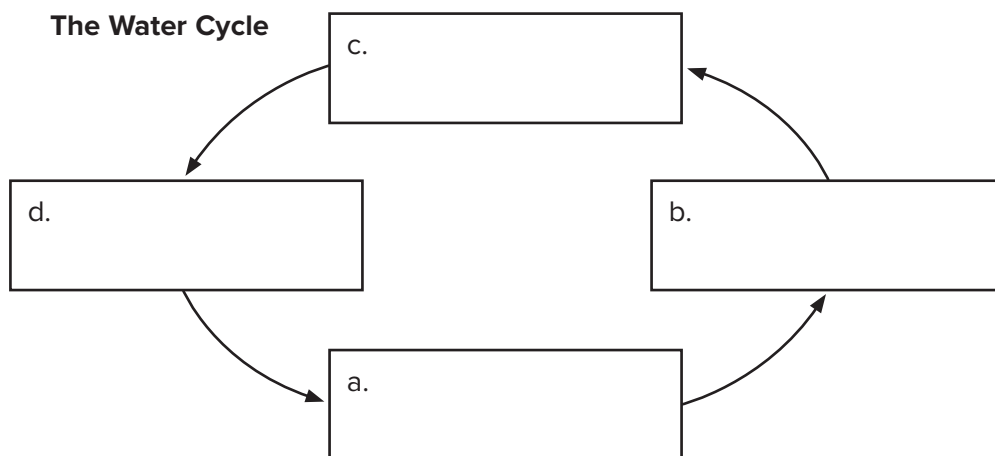
**weather:** the atmospheric conditions, along with short-term changes, of a certain place at a certain time

1. Review the terms and their definitions in the Mini Glossary. Write a sentence that explains how relative humidity and dew point are related.

2. Complete the graphic of the water cycle by writing the terms below in the correct order. You may begin with any process.

cloud formation  
condensation

evaporation  
precipitation



### What do you think

**NOW?**

Reread the statements at the beginning of the lesson. Fill in the After column with an A if you agree with the statement or a D if you disagree. Did you change your mind?



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**END OF  
LESSON**