

Water in the Atmosphere (pp. 432–438)

This section explains what humidity is and how it is measured. The section also explains how clouds form and describes different types of clouds.

Use Target Reading Skills

As you preview the red headings, write questions on the left side of the graphic organizer. As you read, fill in the answers on the right side. Accept all logical answers.

The Water Cycle

Question	Answer
How does the water cycle work?	a. Water evaporates from the surface, condenses to form clouds, and falls to Earth as rain or snow.
b. What is relative humidity?	c. The percentage of water vapor in the air compared to the maximum amount air can hold at that temperature
d. How do clouds form?	e. Water vapor in the air condenses to form liquid water or crystals.
f. Can you tell about weather conditions by looking at clouds?	g. Yes; each type of cloud is associated with a particular type of weather.

Introduction (p. 432)

- The process by which water molecules in liquid water escape into the air as water vapor is called _____ evaporation _____.
- What is the water cycle?
The water cycle is the movement of water between the atmosphere and Earth's surface.

3 types of clouds:
 1. cirrus - feathery
 2. cumulus - piles of cotton balls
 3. stratus - layers

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Water in the Atmosphere (continued)

Humidity (pp. 433-434)

3. A measure of the amount of water vapor in the air is _____ humidity _____.

4. What is relative humidity?

It is the percentage of water vapor that is actually in the air compared to the amount of water vapor the air can hold at a particular temperature.

5. Circle the letter of each sentence that is true about relative humidity.

- (a) It is a percentage.
- b. It is all the water vapor that the air can hold.
- (c) It depends on air temperature.
- d. It measures how hot it feels.

6. Relative humidity can be measured with a(n) _____ psychrometer _____.

7. Circle the letter of each sentence that is true about how a psychrometer works.

- a. The dry-bulb thermometer is cooled by evaporation when the wind blows.
- b. The higher the humidity, the faster water evaporates from the bulb.
- c. The wet-bulb thermometer reading is always higher than the dry-bulb reading.
- (d) When relative humidity is high, there is not much difference between thermometer readings.

2 parts:
wet bulb
+
dry bulb
thermometers

How Clouds Form (p. 435)

8. Is the following sentence true or false? Clouds form when water vapor in the air condenses to form liquid water or ice crystals. _____ true _____

Match the term with its definition.

Term	Definition
<u>d</u> 9. condensation	a. Ice that has been deposited on a surface with a temperature that is below freezing
<u>c</u> 10. dew point	b. Water that condenses from the air onto a cooler surface
<u>b</u> 11. dew	c. Temperature at which ^{gas to liquid} condensation begins
<u>a</u> 12. frost	d. Process by which molecules of water vapor become liquid water

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13. Circle the letter of each sentence that is true about condensation of water vapor.

- a. It occurs when air gets ~~warmer~~ ^{cooler}.
- b. It can occur on cold surfaces.
- c. It explains why clouds form.
- d. It can form on dust particles.

Types of Clouds (pp. 436–438)

Match the type of cloud with the type of weather.

	Type of Cloud	Type of Weather
<u>a</u>	14. cumulus	a. Fair
<u>d</u>	15. nimbostratus	b. Storm on the way
<u>b</u>	16. cirrocumulus	c. Thunderstorms
<u>c</u>	17. cumulonimbus	d. Drizzle, rain, or snow

18. Circle the letter of each sentence that is true about cloud types.
- a. Cumulus clouds are usually a sign that a storm is approaching.
 - b. Cumulonimbus and nimbostratus clouds produce rain or snow.
 - c. Altostratus clouds are lower than regular stratus clouds.
 - d. Cirrus clouds are made up of ice crystals.

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Precipitation (pp. 439-441)

This section explains how rain, snow, and other common types of precipitation occur and how they are measured. The section also describes how scientists try to produce rain from clouds.

Use Target Reading Skills

As you preview the section headings, write what you know about precipitation in the box What You Know. As you read the section, complete the What You Learned box. Accept all logical answers.

no
no!

What You Know
1. Precipitation can be rain or snow.
2. Precipitation comes from clouds.
3. Snowflakes come in many different shapes.

What You Learned
1. Sleet, freezing rain, and hail are forms of precipitation.
2. Droplets or ice crystals in clouds must grow heavy enough to fall through the air before precipitation occurs.
3. Hail forms inside cumulonimbus clouds.

Introduction (p. 439)

1. What is precipitation?
Precipitation is any form of water that falls from clouds and reaches Earth's surface.

2. Is the following sentence true or false? ~~all~~ ^{Not all} clouds produce precipitation.
false

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Types of Precipitation (pp. 440–441)

3. Complete the table that compares three types of precipitation.

Type of Precipitation	Description and Size
Rain	a. Drops of water at least 0.5mm in diameter
Sleet	b. Ice particles smaller than 5mm in diameter
Hail	c. Ice pellets larger than 5mm in diameter

d. How are rain, hail, and sleet similar and how are they different?

They are similar in that they are all composed of water. They are different in that they are different sizes; rain is water in liquid form, but sleet and hail are in solid form as ice.

e. How does the humidity of air affect the type of snow that falls?

When the air is dry, powdery snow falls. When the air is humid, snowflakes join together into larger clumps.

4. Is the following sentence true or false? The most common kind of precipitation is

~~snow.~~ rain.

~~false~~ true

5. How do mist and drizzle differ from rain?

Mist and drizzle are made up of smaller drops of water than is rain.

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Precipitation *(continued)*

6. How can freezing rain cause power failures?
Freezing rain freezes and builds up as ice on tree branches, which can then break onto power lines, causing power failures.

Match the type of precipitation with how it forms.

Precipitation	How It Forms
<u>d</u> 7. sleet	a. Water vapor in a cloud is converted directly into ice crystals.
<u>c</u> 8. freezing rain	b. Ice pellets add layers of ice as they are carried up and down in a cumulonimbus cloud.
<u>b</u> 9. hail	c. Raindrops freeze after they hit the ground or other cold surfaces.
<u>a</u> 10. snow	d. Raindrops freeze into tiny particles of ice as they fall through the air.

11. What damage can large hailstones do?
Large hailstones can cause tremendous damage to crops, buildings, and vehicles.

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Air Masses and Fronts (pp. 442–449)

This section describes huge bodies of air, called air masses, and explains how they move. The section also explains how the meeting of different air masses affects weather.

Use Target Reading Skills

As you read about the four types of fronts, complete the compare-and-contrast table below. Accept all logical answers.

Types of Fronts

Front	How It Forms	Type of Weather
Cold front	A cold air mass overtakes a warm air mass.	a. Clouds, possibly storms with heavy precipitation
Warm front	b. A warm air mass overtakes a cold air mass.	c. Clouds, light precipitation
Occluded front	d. A warm air mass is caught between two cold air masses.	e. Clouds, precipitation
Stationary front	f. Cold and warm air masses meet, but neither can move the other.	g. Clouds, precipitation

Introduction (p. 442)

1. What is an air mass?

An air mass is a huge body of air that has similar temperature, humidity, and air pressure at any given height.

Types of Air Masses (pp. 443–444)

2. Scientists classify air masses according to _____ temperature and _____ humidity.
3. Is the following sentence true or false? Polar air masses have ^{high}~~low~~ air pressure. ~~false~~ true

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Air Masses and Fronts (continued)

4. Complete the compare/contrast table that shows the types of air masses and their characteristics.

Types of Air Masses and Their Characteristics

Type or Air Mass	Characteristics
a. Maritime tropical	Warm and humid
b. Maritime polar	Cool and humid
c. Continental tropical	Warm and dry
d. Continental polar	Cool and dry

5. e. How are maritime tropical and marine polar air masses alike, and how are they different? They are alike in that they are both humid. They are different in that the tropical air mass is warm and the polar air mass is cool.
- f. How are continental tropical and continental polar air masses alike, and how are they different? They are alike in that they are both dry. They are different in that the tropical air mass is warm and the polar air mass is cool.

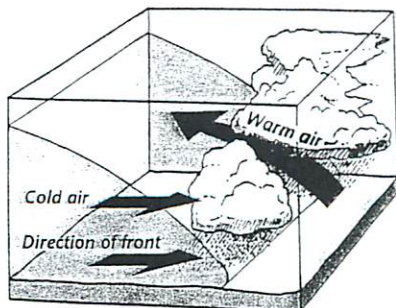
How Air Masses Move (p. 445)

6. In the continental United States, major wind belts generally push air masses from _____ west _____ to _____ east _____.
7. How do jet streams affect air masses?
As the jet streams blow from west to east, air masses are carried along their track.

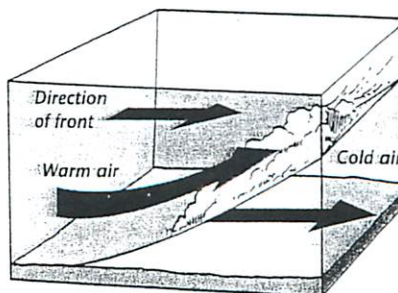
Types of Fronts (pp. 446-447)

front - where two unlike

8. Label the drawings to indicate a cold front and a warm front. air masses meet.



a. _____ cold front



b. _____ warm front

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Match the type of front with how it forms.

Type of Front

- c ⁹ 8. cold front
 a ¹⁰ 9. warm front
 d ¹¹ 10. stationary front
 b ¹² 11. occluded front

How It Forms

- a. A moving warm air mass overtakes a slowly moving cold air mass.
 b. A warm air mass is caught between two cooler air masses.
 c. A rapidly moving cold air mass runs into a slowly moving warm air mass.
 d. A cold air mass and a warm air mass meet and remain stalled over an area.

¹³ 12. Circle the letter of each sentence that is true about fronts.

- (a.) Cold fronts can bring violent thunderstorms.
 (b.) Warm fronts are associated with clouds and rain.
 (c.) Stationary fronts may bring many days of clouds and precipitation.
 d. Occluded fronts always bring fair weather.

Cyclones and Anticyclones (pp. 448-449)

¹⁴ 13. A swirling center of low air pressure is called a(n) _____ cyclone, or low air pressure ^{rain or snow}

¹⁵ 14. Is the following sentence true or false? Winds spiral inward toward the center of a cyclone. _____ true

¹⁶ 15. What type of weather is associated with cyclones?

Storms and precipitation are associated with cyclones.

¹⁷ 16. Is the following sentence true or false? Winds in an anticyclone spin clockwise in the Northern Hemisphere. _____ true

¹⁸ 17. What type of weather is generally associated with anticyclones?

Dry, clear weather is generally associated with anticyclones.

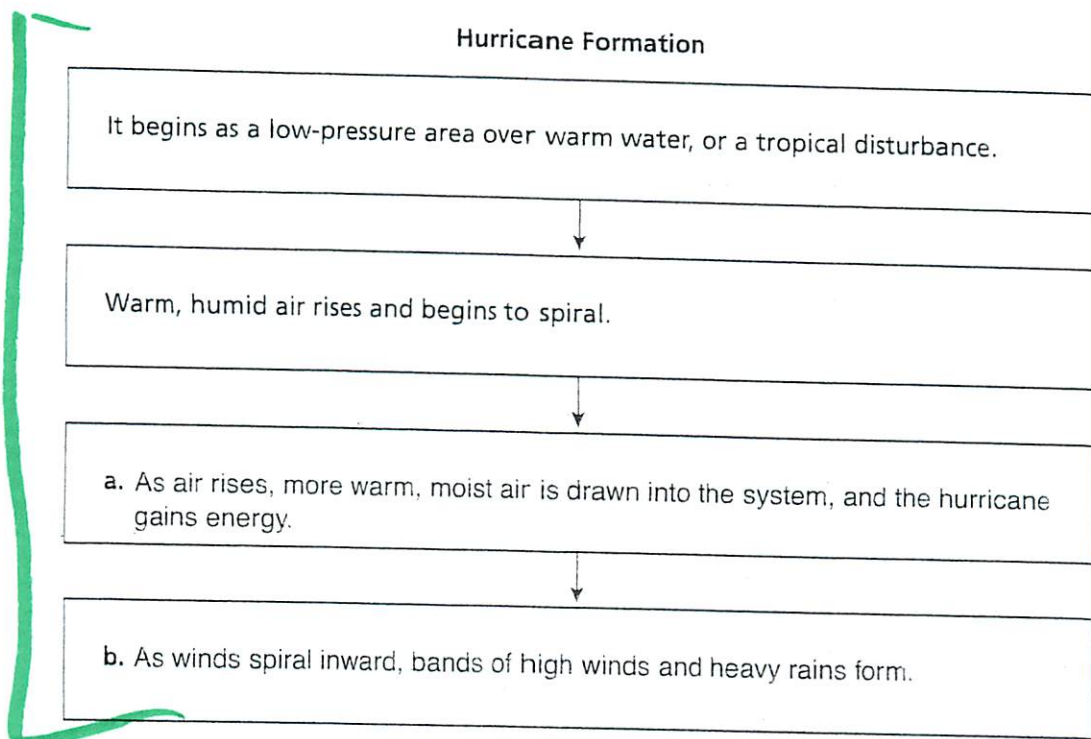
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Storms (pp. 450–457)

This section explains how thunderstorms, tornadoes, snowstorms, and hurricanes form. The section also describes how people can stay safe in the different types of storms.

Use Target Reading Skills

As you read about how hurricanes form, fill in the flowchart to show the sequence of events. Accept all logical answers.



Introduction (p. 450)

1. What is a storm?

A storm is a violent disturbance in the atmosphere.

Thunderstorms (pp. 451–452)

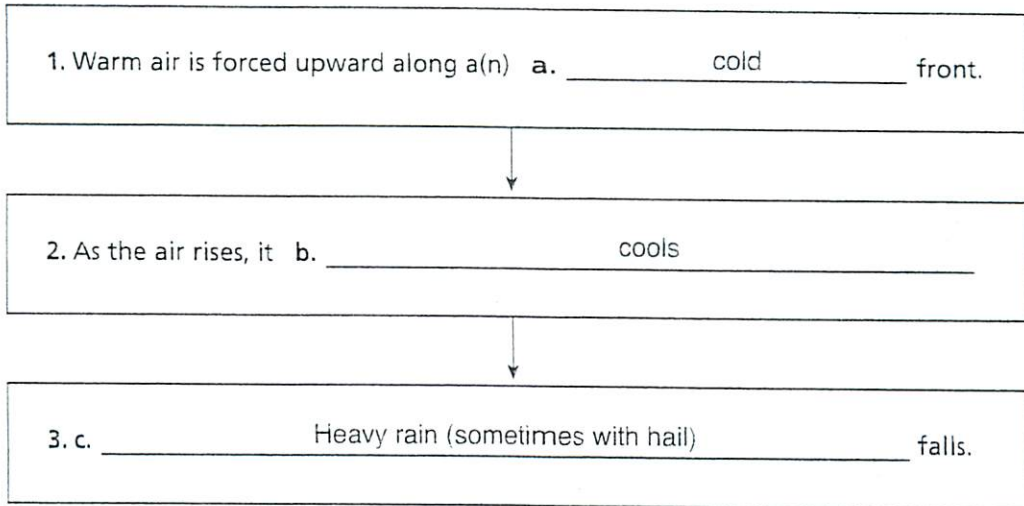
2. Circle the letter of the type of clouds in which thunderstorms form.

- a. cumulus
- c. nimbostratus
- b. nimbus
- Ⓓ. cumulonimbus *large*

3. A sudden electric discharge between parts of a cloud, between nearby clouds, or between a cloud and the ground is called _____
lightning

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4. Circle the letter of each sentence that is true about thunder.
- a. It causes lighting to occur.
 - b. You hear it after you see the lightning that caused it.
 - c. It occurs because lightning heats the air.
 - d. It occurs because light travels faster than sound.
5. Complete the flowchart to show the sequence of events describing how a thunderstorm can form.



6. Name a benefit that river floods can provide.
River floods can provide rich new soil for agriculture.
-
-

7. Circle the letter of each sentence that is a way to stay safe in a thunderstorm.
- a. Avoid touching electrical appliances.
 - b. Get out of the water if you are swimming.
 - c. Don't use the telephone.
 - d. Get out of your car and go under a tree.

Tornadoes (pp. 452–453)

8. What is a tornado?
A tornado is a rapidly whirling, funnel-shaped cloud that reaches down from a storm cloud to touch Earth's surface.
-
-

9. Is the following sentence true or false? Tornadoes develop in the same type of clouds that bring thunderstorms.
true
-

AV

Storms (continued)

10. Circle the letter of each sentence that is true about where and when tornadoes occur.

- a. Tornadoes are most likely in late summer and early fall.
- b. Tornadoes occur often in the Great Plains. *Texas + Kansas*
- ~~c.~~ Tornadoes occur infrequently in California.
- d. Tornadoes occur in just a few parts of the United States.

11. Where is the safest place to be during a tornado?

The safest place to be is in the basement of a well-built building.

Snowstorms (pp. 454-455)

12. Under what conditions can snow fall?

Snow falls during a storm when the whole atmosphere is colder than 0°C.

13. What should you do if you are caught in a snowstorm?

You should try to find shelter from the wind, cover exposed parts of your body, and stay dry.

If you are in a car, the driver should keep the engine running only if the exhaust pipe is clear of snow.

most dangerous aspect of a snowstorm

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Hurricanes (pp. 456-457)

AN

14. Circle the letter of each sentence that is true about a hurricane.
- a. It is a tropical storm.
 - b. It has winds of at least 320 kilometers per hour.
 - c. It is typically about 60 kilometers across.
 - d. It forms over water.
- winds of 119 Km/hr or more

15. The center of a hurricane is called the _____ eye. It is calm.

16. Is the following sentence true or false? Hurricanes ~~do not~~ last ~~as long as~~ ^{er} than other storms.
_____ ~~false~~ true

17. A "dome" of water that sweeps across the coast where the hurricane lands is called a(n) _____ storm surge.

18. Is the following sentence true or false? If you hear a hurricane warning and are told to evacuate, you should leave the area immediately.
_____ true

Weather • *Guided Reading and Study***Predicting the Weather** (pp. 460–464)

This section explains how scientists predict the weather in the future and why it is difficult to predict the weather accurately. The section also explains how to read weather maps.

Use Target Reading Skills

As you look at the weather map, write questions in the appropriate spaces in the graphic organizer. As you read the information about weather maps, fill in the answers under the questions. Accept all logical answers.

Weather Map

Q. What type of front is located west of Oklahoma City?
A. A cold front
Q. What do the stick symbols indicate?
A. Amount of cloud cover, atmospheric pressure, wind direction and speed, and temperature
Q. What are the slender, curvy lines?
A. Isobars, which join places with the same air pressure

Weather Forecasting (p. 461)

1. Scientists who study the causes of weather and try to predict it are called _____ meteorologists.
2. Circle the letter of each choice that is a source of weather information for meteorologists.
 - a. radar
 - b. seismographs
 - c. instruments carried by balloons
 - d. satellites

Math in Science:

Ch. 13 p. 445

Rate = $\frac{\text{Distance}}{\text{Time}}$ or $R = \frac{D}{T}$

Name Key
Date _____ Science _____

When traveling by airplane – Flying from West to East
W->E
Flying with the Jet Stream
----->
Can fly faster – carried by
the Jet Stream

Flying from East to West
W<-E
Flying against the Jet Stream
<-----
Must fly slower – fighting
the Jet Stream

1. Colorado to New York City
Distance = 2618 miles
Time of flight = 3.5 hours
How fast are you flying?

$$R = \frac{D}{T}$$

$$R = \frac{2618}{3.5}$$

$$R = 748 \text{ mph}$$

2. New York City to Colorado
Distance = 2618 miles
Time of flight = 4 hours
How fast are you flying?

$$R = \frac{D}{T}$$

$$R = \frac{2618}{4}$$

$$R = 654.5 \text{ mph}$$

Why does it take longer to return? You are flying against the Jet Stream
What is the speed difference? 93.5 mph

3. New York City to London
Distance = 3460 miles
Time of flight = 7.5 hours
How fast are you flying?

$$R = \frac{D}{T}$$

$$R = \frac{3460}{7.5}$$

$$R = 461.\bar{3} \text{ mph}$$

4. London to New York City
Distance = 3460 miles
Time of Flight = 8.5 hours
How fast are you flying?

$$R = \frac{D}{T}$$

$$R = \frac{3460}{8.5}$$

$$R = 407.1 \text{ mph}$$

Why does it take longer to return? You are flying against the Jet Stream
What is the speed difference? 54.2 mph

Types of Weather Fronts



When large masses of warm air and cold air meet, they do not mix. Instead, they form a front, usually hundreds of miles long. When a front passes, the weather changes. The chart describes the four main types of fronts and the weather changes each type brings.

Type of Front	How It Forms	Weather It Brings
<p>Cold front</p>	Forms when a cold air mass pushes under a warm air mass, forcing the warm air to rise.	Thunderheads can form as the moisture in the warm air mass rises, cools, and condenses. As the front moves through, cool, fair weather is likely to follow.
<p>Warm front</p>	Forms when a moist, warm air mass slides up and over a cold air mass.	As the warm air mass rises, it condenses into a broad area of clouds. A warm front brings gentle rain or light snow, followed by warmer, milder weather.
<p>Stationary front</p>	Forms when warm and cold air meet and neither air mass has the force to move the other. They remain <i>stationary</i> , or "standing still."	Where the warm and cold air meet, clouds and fog form, and it may rain or snow. Can bring many days of clouds and precipitation.
<p>Occluded Front</p>	Forms when a warm air mass gets caught between two cold air masses. The warm air mass rises as the cool air masses push and meet in the middle.	The temperature drops as the warm air mass is <i>occluded</i> , or "cut off," from the ground and pushed upward. Can bring strong winds and heavy precipitation.

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Storm Information Chart

Storms	Created How?	Occurs When?	Amount Damage	What to Do
Thunderstorm	Cold front moves in as warm moist air rises	Spring & summer in cumulonimbus clouds	Lightning strike objects; Flooding; Wind damage	Stay inside; no electrical outlets; stay away from windows; basement, shelter; very low!
Tornado	In cumulonimbus clouds after thunderstorms; cold air sinking and warm air rising rapidly	In cumulonimbus clouds when warm moist air rises rapidly; Spring and summer	Fujita scale- F0-F5 Mild damage (roofs) to extreme damage (level houses)	Basement, Ditch (outside), Bath tub, Cover with mattresses/blankets, Stay low (away from glass)
Snowstorm	High precipitation (snow) when air is colder than 0°C	Winter in Northern U.S./Arctic region	Block roads, trap people in home, keep emergency crews from helping, crop damage, roads to become cracked/split apart	Find shelter from wind, cover exposed body, cars should stay running (prevent freezing)
Hurricane	Over warm ocean water in low-pressure area as tropical storm, tornadoes often follow them	Late summer to early fall; in cumulonimbus clouds,	Flooding, Wind damage (roofs, side house damage, level houses), range from Levels/Categories 1-5, Winds 85-300 mph	Get low (unless flooding occurs), Get away from the area (evacuate)