

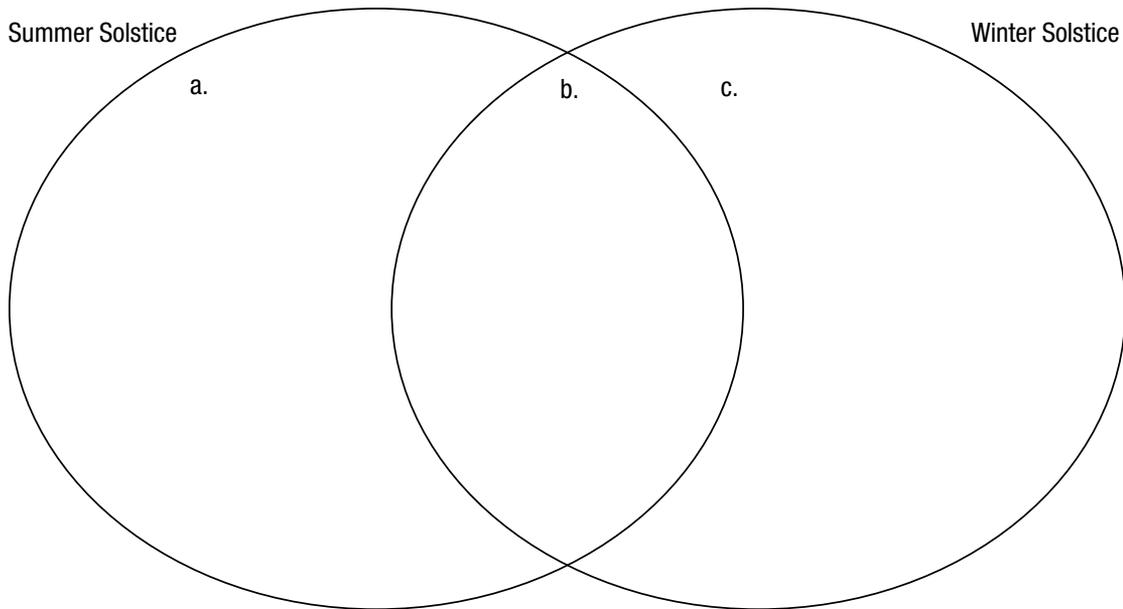
Chapter 17 The Atmosphere: Structure and Temperature

Section 17.1 Atmosphere Characteristics

This section describes the components and vertical structure of the atmosphere. It also explains how the relationship between Earth and the sun causes the seasons.

Reading Strategy

Comparing and Contrasting As you read, complete the Venn diagram by comparing and contrasting summer and winter solstices. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.



1. _____ is the state of the atmosphere at any given time and place.

Composition of the Atmosphere

2. Circle the letter of the gas that is the largest component of the atmosphere.

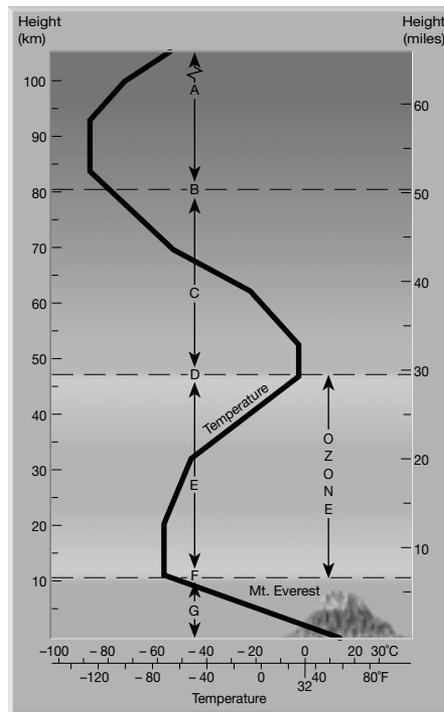
a. oxygen	b. nitrogen
c. water vapor	d. carbon dioxide
3. Is the following sentence true or false? The source of all clouds and precipitation is water vapor. _____
4. Why is the ozone layer crucial to life on Earth? _____

Height and Structure of the Atmosphere

5. Is the following sentence true or false? Atmospheric pressure increases with height.

Chapter 17 The Atmosphere: Structure and Temperature

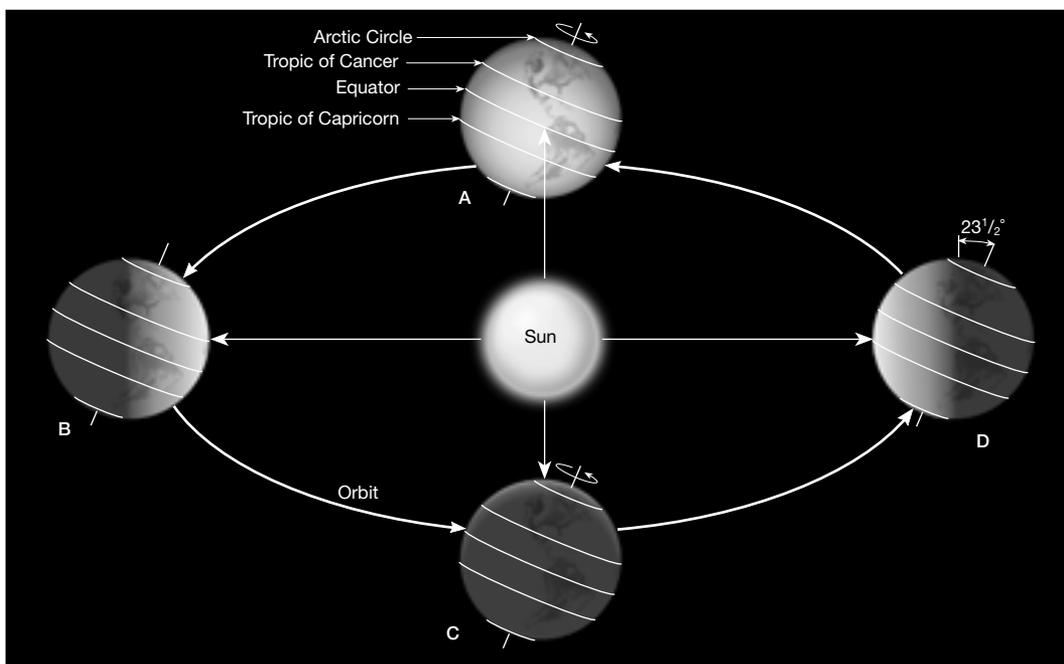
6. Select the appropriate letter in the figure that identifies each of the following layers of the atmosphere.
- _____ mesosphere _____ thermosphere
 _____ troposphere _____ stratosphere
7. 🌐 In the figure, the atmosphere is divided vertically into four layers based on _____.
8. Circle the letter of the layer of the atmosphere that contains the ozone layer.
- a. troposphere b. stratosphere
 c. mesosphere d. thermosphere



Earth-Sun Relationships

9. What are Earth's two principal motions?

10. Select the appropriate letter in the figure that identifies each of the following months.
- _____ March _____ December
 _____ June _____ September



11. Is the following sentence true or false? At position B in the figure, the Northern Hemisphere will have longer daylight than darkness. _____
12. 🌐 What causes seasonal changes? _____

© Pearson Education, Inc., publishing as Pearson Prentice Hall. All rights reserved.

Chapter 17 The Atmosphere: Structure and Temperature

Section 17.2 Heating the Atmosphere

This section describes the three ways in which heat can be transferred. It also explains what happens to solar radiation that hits Earth's atmosphere and surface.

Reading Strategy

Using Prior Knowledge Before you read, write your definition for each term. After you read, write the scientific definition of each term and compare it to your original definition. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Term	Your Definition	Scientific Definition
Heat		
Temperature		

Energy Transfer as Heat

Match each description with its mechanism of energy transfer.

- | Description | Mechanism of Energy Transfer |
|--|-------------------------------|
| _____ 1. transfer of heat by mass movement or circulation within a substance | a. radiation
b. convection |
| _____ 2. transfer of heat through matter by molecular activity | c. conduction |
| _____ 3. ☞ transfer of heat without requiring a medium to travel through | |
| 4. Circle the letter of the act of light bouncing off an object. | |
| a. absorption | |
| b. scattering | |
| c. reflection | |
| d. radiation | |

Chapter 17 The Atmosphere: Structure and Temperature

5. Complete the chart below.

Mechanism of Energy Transfer		
Mechanism	Requires direct contact?	Requires a medium?
Conduction	yes	
Convection		
Radiation		

6. ➡ Is the following sentence true or false? All objects at any temperature emit radiant energy. _____
7. ➡ Hotter objects emit _____ total energy per unit area than colder objects do.
8. ➡ Is the following sentence true or false? The hotter a radiating body is, the longer the wavelengths of maximum radiation it will produce. _____
9. ➡ Objects that are good absorbers of radiation are also good _____ of radiation.

What Happens to Solar Radiation?

10. ➡ List three things that can happen when radiation strikes an object. _____

11. Circle the letter of the process that produces rays that travel in all directions.
 - a. absorption
 - b. transmission
 - c. reflection
 - d. scattering
12. About _____ percent of the solar energy reaching the outer atmosphere is reflected or scattered back into space.
13. What is the greenhouse effect? _____

14. Is the following sentence true or false? Another term for the greenhouse effect is global warming. _____

Chapter 18 Moisture, Clouds, and Precipitation

Section 18.1 Water in the Atmosphere

This section describes how water changes from one state to another. It also explains humidity and relative humidity.

Reading Strategy

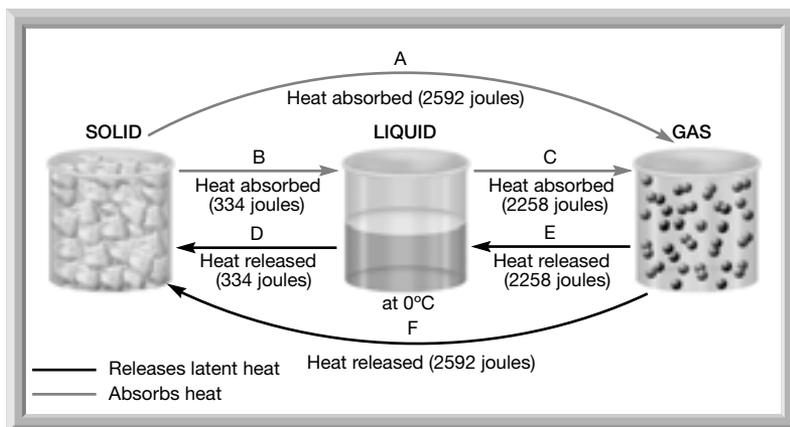
In the table below, list what you know about water in the atmosphere and what you would like to learn. After you read, list what you have learned. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

What I Know	What I Would Like to Learn	What I Have Learned
a.	b.	c.
d.	e.	f.

- Circle the letter of the most important gas in atmospheric processes.
 - a. oxygen
 - b. nitrogen
 - c. water vapor
 - d. carbon dioxide

Water's Changes of State

- Select the appropriate letter in the figure that identifies each of the following changes of state.
 - _____ sublimation
 - _____ deposition
 - _____ condensation
 - _____ freezing
 - _____ evaporation
 - _____ melting



© Pearson Education, Inc., publishing as Pearson Prentice Hall. All rights reserved.

Chapter 18 Moisture, Clouds, and Precipitation

3. For each change of state, write the opposite change of state.
 - a. condensation: _____
 - b. freezing: _____
 - c. deposition: _____
4. The heat absorbed or released during a change of state is called _____.

Humidity

5. Is the following sentence true or false? Saturated warm air contains more water vapor than saturated cold air.

6. What is the difference between humidity and relative humidity?

Match each situation to its change in relative humidity.

Situation	Change in Relative Humidity
_____ 7. Water vapor is added.	a. increases
_____ 8. Air temperature decreases.	b. no change
_____ 9. Water vapor is removed.	c. decreases
_____ 10. Air temperature increases.	
11. When a parcel of air is cooled to the temperature at which it is saturated, it has reached its _____.	
12. Circle the letter of the factor that a hygrometer is used to measure. <ol style="list-style-type: none"> a. humidity b. relative humidity c. temperature d. latent heat 	
13. A sling psychrometer works because the amount of cooling that occurs in the wet bulb is directly proportional to the _____ of the air.	
14. What happens when air that has reached its dew point is cooled further? _____ _____ _____	

© Pearson Education, Inc., publishing as Pearson Prentice Hall. All rights reserved.

Chapter 18 Moisture, Clouds, and Precipitation

Section 18.3 Cloud Types and Precipitation

This section describes different types of clouds, including fog. It also explains how precipitation forms and describes different types of precipitation.

Reading Strategy

As you read, add definitions for the vocabulary terms. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Vocabulary Term	Definition
Cirrus	a.
Cumulus	b.
Stratus	c.
Coalescence	d.

Types of Clouds

1.  Is the following sentence true or false? Clouds are classified based on form and height. _____
2. The three types of _____ clouds are cirrus, cirrostratus, and cirrocumulus.
3. Which photograph shows cumulus clouds? _____
4. Which photograph shows cirrus clouds? _____



A.



B.

Chapter 18 Moisture, Clouds, and Precipitation

5. How can you tell from the name of a cloud if it is a middle-range cloud?

6. Circle the letter of each cloud type that is a low cloud.

- a. stratus
- b. altostratus
- c. stratocumulus
- d. nimbostratus

Fog

7. 🗣️ Define *fog*. _____

8. Is the following sentence true or false? Fogs can be formed by cooling or by evaporation. _____

How Precipitation Forms

9. 🗣️ What must happen for precipitation to form? _____

10. Formation of precipitation in cold clouds is called the _____ process.

11. Is the following sentence true or false? In warm clouds, raindrops form by the Bergeron process. _____

12. Circle the letter of the word that describes water in the liquid state below 0°C.

- a. supersaturated
- b. coalesced
- c. saturated
- d. supercooled

Forms of Precipitation

Match each description with its form of precipitation.

Description	Form of Precipitation
_____ 13. small particles of ice	a. hail
_____ 14. drops of water that fall from a cloud and have a diameter of at least 0.5 mm	b. sleet
_____ 15. ice pellets with multiple layers	c. rain

Chapter 19 Air Pressure and Wind

Section 19.1 Atmosphere Characteristics

This section explains what air pressure is and how it is measured. It also describes the factors that cause and control wind.

Reading Strategy

As you read, write the main ideas for each topic in the table. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Topic	Main Ideas
Air Pressure Defined	Air pressure is the weight of air above. It is exerted in all directions.
Measuring Air Pressure	a.
Factors Affecting Wind	b.

Air Pressure Defined

- Air pressure is the pressure exerted by the _____ of air above a certain point.
-  Why doesn't the weight of air above a table crush it? _____

- Is the following sentence true or false? Average air pressure is about the same as that produced by a column of water 10 m high. _____

Measuring Air Pressure

- Circle the letter of the instrument used to measure air pressure.
 - thermometer
 - barometer
 - anemometer
 - aneroidometer

Chapter 19 Air Pressure and Wind

5. ➡ When air pressure increases, the mercury in the tube of a mercury barometer _____.
6. Is the following sentence true or false? The mercury barometer was invented by Galileo. _____
7. List two advantages of the aneroid barometer over the mercury barometer. _____

Factors Affecting Wind

8. ➡ Wind is caused by horizontal differences in _____.
9. ➡ Is the following sentence true or false? Pressure differences that cause wind are generated by unequal heating of Earth’s surface. _____
10. ➡ What three factors combine to control wind? _____

11. ➡ How are isobars related to pressure gradients? _____

12. ➡ Due to the Coriolis effect, winds in the Northern Hemisphere are deflected to the _____.
13. Is the following sentence true or false? The Coriolis effect occurs because Earth rotates underneath the path of moving objects. _____
14. How does friction affect wind? _____

15. _____ are high-altitude fast-moving rivers of air that travel from west to east.
16. Complete the table below.

Factors That Affect Wind		
Factor	Ultimate Cause	Effect on Wind
Pressure Differences	unequal heating of Earth's surface by the sun	
Coriolis Effect		
Friction		

Chapter 19 Air Pressure and Wind

Section 19.2 Pressure Centers and Winds

This section describes cyclones, anticyclones, and global wind patterns.

Reading Strategy

As you read about pressure centers and winds, complete the table indicating to which hemisphere the concept applies. Use *N* for Northern Hemisphere, *S* for Southern Hemisphere, or *B* for both. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Cyclones rotate counterclockwise.	a.
Net flow of air is inward around a cyclone.	b.
Anticyclones rotate counterclockwise.	c.
Coriolis effect deflects winds to the right.	d.

Highs and Lows

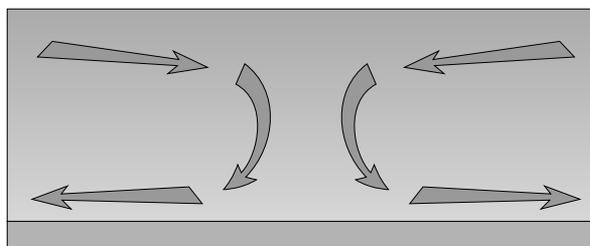
- Cyclones are centers of _____ pressure associated with clouds and precipitation.
- 👉 Is the following sentence true or false? In an anticyclone, the value of the isobars increases from the center to the outside.

- 👉 List the factors that cause winds in the Northern Hemisphere to blow inwards and counterclockwise around lows.

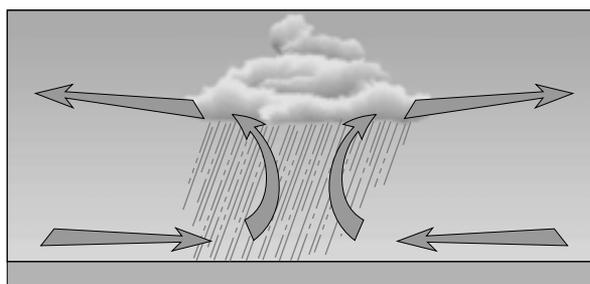
- 👉 Is the following sentence true or false? In the Southern Hemisphere, winds around a cyclone flow outward.

- These figures show side views of the air movement in a high and low. Select the letter of the figure that identifies each of the following air movements.

- _____ surface low
- _____ divergence aloft
- _____ surface high
- _____ surface divergence
- _____ calm, clear weather



A.



B.

Chapter 19 Air Pressure and Wind

6. Why do weather reports always emphasize cyclones and anticyclones? _____

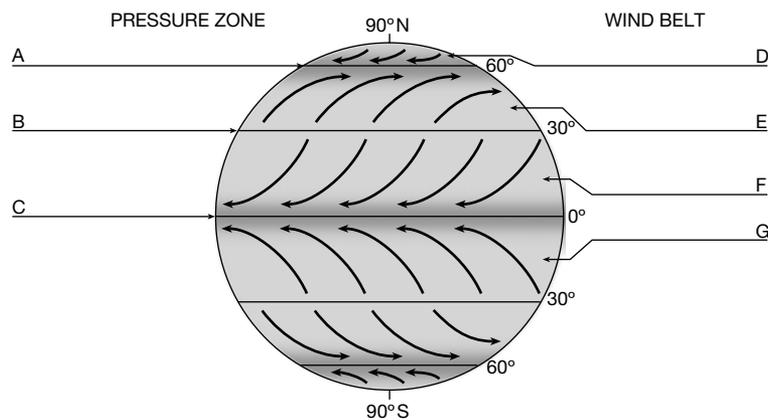
Global Winds

7. 🔄 How does the atmosphere balance the amounts of energy received at different parts of Earth’s surface?

8. Is the following sentence true or false? Earth’s rotation causes the two-cell convection system to break down into smaller cells.

9. Select the appropriate letter in the figure that identifies each part of the global circulation model.

- _____ NE trade winds
- _____ polar easterlies
- _____ equatorial low
- _____ westerlies
- _____ subtropical high
- _____ SE trade winds
- _____ subpolar low



10. In which zone in the figure does sinking dry air produce deserts in some areas? _____
11. Circle the letter of the winds near the equator that blow from easterly directions.
- | | |
|----------------|---------------------|
| a. jet streams | b. westerlies |
| c. trade winds | d. polar easterlies |
12. The interaction of westerlies and polar easterlies produces the _____.
13. Is the following sentence true or false? Inward and upward airflow at the equatorial zone is associated with clouds and precipitation.

14. In North America, seasonal temperature differences over _____ disrupt the global pressure pattern.
15. What causes monsoons? _____

Chapter 20 Weather Patterns and Severe Storms

Section 20.1 Air Masses

This section describes air masses and explains how they affect weather.

Reading Strategy

As you read, write a definition for each of the terms in the table. Refer to the table as you read the rest of the chapter. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Term	Definition
Air mass	a.
Source region	b.
Polar air mass	c.
Tropical air mass	d.
Continental air mass	e.
Maritime air mass	f.

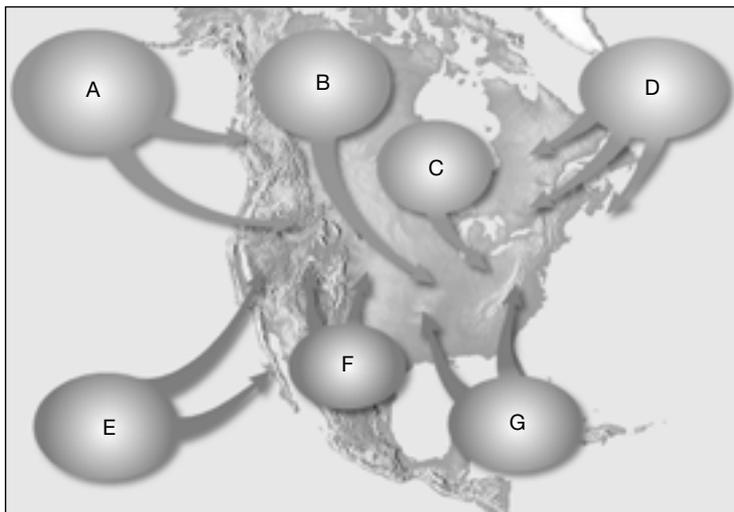
Air Masses and Weather

- Changes in weather patterns are often caused by movement of _____.
-  Is the following sentence true or false? As an air mass moves, its characteristics change. _____
- Circle the letter of a common size for an air mass.
 - 600 km or less across
 - 1600 km or more across
 - 16,000 km or more across
 - 160,000 km or more across

Chapter 20 Weather Patterns and Severe Storms

Classifying Air Masses

4. Identify each labeled air mass on the figure as continental tropical, continental polar, maritime polar, or maritime tropical.



- A. _____
- B. _____
- C. _____
- D. _____
- E. _____
- F. _____
- G. _____

5. List two characteristics used to classify air masses. _____

6. Circle the letter of the terms that describe the temperature characteristics of an air mass.
- a. continental and maritime
 - b. continental and tropical
 - c. polar and maritime
 - d. polar and tropical

Weather in North America

7. Is the following sentence true or false? Much of the weather in eastern North America is influenced by continental tropical and maritime polar air masses. _____

8. Although _____ air masses are not usually associated with heavy precipitation, they can sometimes cause lake-effect snow.

9. Circle the letter of the type of air mass that is the source of much of the precipitation that falls on the eastern United States.

- a. continental tropical
- b. maritime tropical
- c. maritime polar
- d. continental polar

10. Is the following sentence true or false? In the winter, maritime polar air masses often bring rain and snow to the west coast of North America. _____

11. What causes Indian summer? _____

Chapter 20 Weather Patterns and Severe Storms

Section 20.2 Fronts

This section explains how fronts form, describes different types of fronts, and explains how mid-latitude cyclones affect weather in the United States.

Reading Strategy

As you read, complete the outline below. Include information about how each of the weather fronts discussed in this section forms and the weather associated with each. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Fronts
I. Warm front
A. _____
B. _____
II. Cold front
A. _____
B. _____

Formation of Fronts

1. ➡ A front is a(n) _____ that separates two air masses.
2. Is the following sentence true or false? Like air masses, most fronts are very large. _____

Types of Fronts

Match each description with its front.

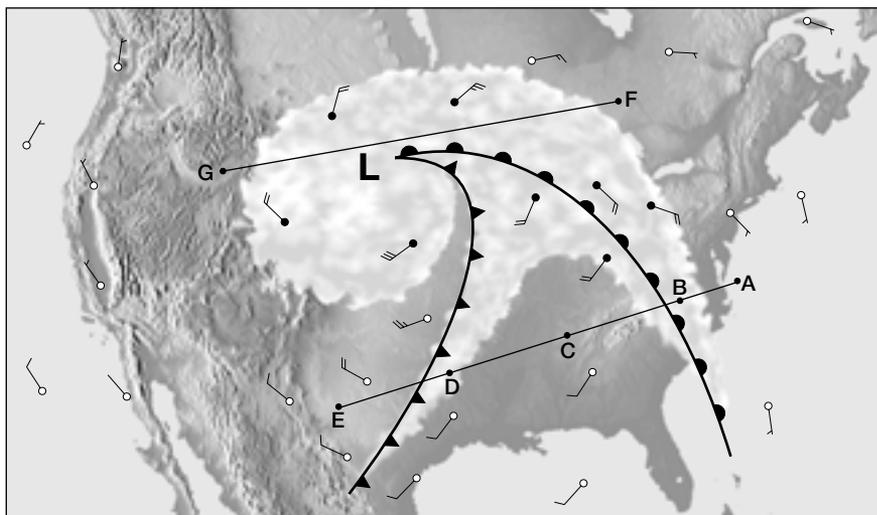
Description	Front
_____ 3. ➡ Air flow is almost parallel to the line of the front, and the position of the front does not move.	a. warm front
_____ 4. ➡ Cold, dense air moves into a region occupied by warmer air.	b. cold front
_____ 5. ➡ Warm air moves into an area formerly covered by cooler air.	c. stationary front
_____ 6. ➡ An active cold front overtakes a warm front.	d. occluded front

Chapter 20 Weather Patterns and Severe Storms

7. A warm front often produces a(n) _____ increase in temperature.
8. Is the following sentence true or false? Forceful lifting of air along a cold front can lead to heavy rain and strong winds.

Middle-Latitude Cyclones

9. ☞ The middle-latitude cyclone shown in the figure is a center of low _____.



10. Name the type of front shown at each of these locations in the figure.

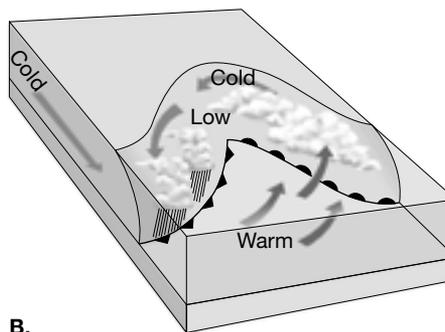
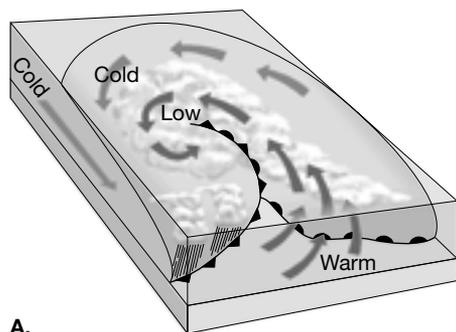
location B: _____

location D: _____

The Role of Airflow Aloft

11. ☞ What often fuels a middle-latitude cyclone? _____

12. In what order do the stages of a middle-latitude cyclone shown in the figures occur? _____



13. Is the following sentence true or false? Figure A shows the development of a stationary front. _____

Chapter 20 Weather Patterns and Severe Storms

Section 20.3 Severe Storms

This section discusses the causes and nature of thunderstorms, tornadoes, and hurricanes.

Reading Strategy

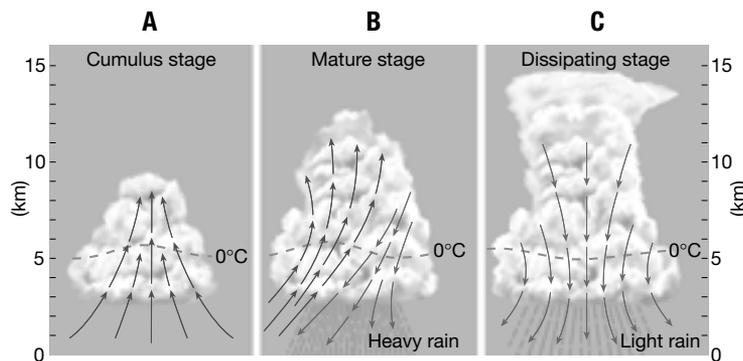
Complete the table as you read this section. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

Severe Storms		
	Causes	Effects
Thunderstorms	a.	b.
Tornadoes	c.	d.
Hurricanes	e.	f.

Thunderstorms

1. 🎧 A thunderstorm generates _____ and thunder.
2. 🎧 How do thunderstorms form? _____

Using the figure, match each description to its thunderstorm stage.



- | Description | Thunderstorm Stage |
|---|----------------------|
| _____ 3. The storm cools and dies down. | a. cumulus stage |
| _____ 4. Updrafts of warm air cause the cloud to grow upward. | b. mature stage |
| _____ 5. Heavy precipitation falls. | c. dissipating stage |

Chapter 20 Weather Patterns and Severe Storms

Tornadoes

6. ➡ A tornado is a violent windstorm in the form of a(n) _____ column of air.
7. Is the following sentence true or false? Tornadoes occur mainly in the winter. _____
8. ➡ Circle the letter of the type of storm usually associated with tornadoes.
 - a. hurricane
 - b. thunderstorm
 - c. lake-effect snow
 - d. typhoon
9. Why are the maximum winds inside a tornado so high? _____

10. A tornado _____ is issued when a tornado has actually been sighted in an area.

Hurricanes

11. ➡ To be considered a hurricane, a tropical _____ must produce winds of at least 119 km per hour.
12. Is the following sentence true or false? Hurricanes are the most powerful storms on Earth. _____
13. Why are hurricanes becoming a growing threat? _____

14. ➡ Hurricanes usually develop in late summer because they are fueled by heat and moisture from _____ water.
15. Is the following sentence true or false? The greatest wind speeds and heaviest rainfall in a hurricane occur in the eye.

16. Circle the letter of the center of a hurricane.
 - a. typhoon
 - b. eye wall
 - c. eye
 - d. surge
17. When a hurricane's eye lands, a dome of water about 65 to 80 km wide called a _____ sweeps across the coast.
18. List two situations in which a hurricane weakens. _____

