

CHAPTER 13 STUDY GUIDE

THE NATURE OF STORMS

SECTION 13.1 Thunderstorms

In your textbook, read about thunderstorm formation.

Use each of the terms below just once to complete the passage.

condensation	warmer	unstable	convection
cumulonimbus	moisture	stable	

At any moment, more than 2000 thunderstorms are occurring on Earth. Thunderstorms develop from cumulus clouds that grow into huge (1) cumulonimbus clouds.

Thunderstorms form when three conditions exist that cause cumulus clouds to grow by the energy transfer method of (2) convection. First, there must be sufficient (3) moisture in the lower atmosphere to condense and release latent heat. Second, some mechanism must make the air rise, causing the cloud to grow. Third, the portion of the atmosphere that the cloud grows through must be (4) unstable. The rising cloud must stay (5) warmer than the air around it in order for the growth to continue.

The cloud's growth stops when the rate of (6) condensation in the cloud, which diminishes with height, is insufficient to create enough heat to keep the cloud warmer than the air around it. Growth will also stop if the rising air meets a layer of (7) stable air that it cannot overcome.

In your textbook, read about different types of thunderstorms.

For each item in Column A, write the letter of the matching item in Column B.

Column A		Column B
<u>B</u> 8.	Forms when an air mass rises as a result of orographic lifting	a. frontal thunderstorm
<u>C</u> 9.	Forms because of temperature differences between the air over land and the air over water	b. mountain thunderstorm
<u>A</u> 10.	Forms as cold air pushes warm air up at a boundary between cold and warm air masses	c. sea-breeze thunderstorm

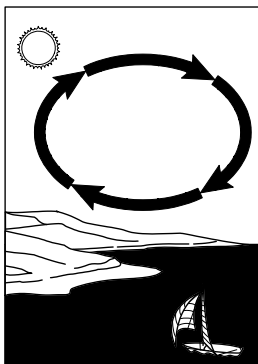
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SECTION 13.1 Thunderstorms, continued

In your textbook, read about air-mass thunderstorms.

Examine the diagram below. Then answer the questions.



- 11.** What phenomenon is pictured in the diagram?

A sea breeze

- 12.** Describe how a sea breeze may lead to the formation of a thunderstorm.

In a sea breeze, cool dense air over the water moves inland, forcing up the warm, less-dense air over the land. This process can produce strong updrafts that result in a thunderstorm.

- 13.** Why is a sea-breeze thunderstorm considered a type of air-mass thunderstorm?

Thunderstorms are often classified according to the mechanism that causes the air to rise. Air-mass thunderstorms result from unequal heating of Earth's surface within one air mass. Interaction between warm air over land and cool air over the ocean is an example of such unequal heating and may lead to a sea-breeze thunderstorm.

In your textbook, read about the stages of thunderstorm development.

Number the stages in the development of a thunderstorm in the order in which they occur.

- __4__ **14.** Equal amounts of updrafts and downdrafts form convection cells.
- __1__ **15.** Warm, moist air rises quickly, and the moisture condenses into a visible cloud. Then updrafts form.
- __3__ **16.** Falling precipitation cools the air around it, forming downdrafts.
- __2__ **17.** Precipitation begins to fall.
- __6__ **18.** The updrafts cease and precipitation stops.
- __5__ **19.** The updrafts slow as downdrafts decrease the supply of warm, moist surface air.

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SECTION 13.2 Severe Weather

In your textbook, read about thunderstorms and the dangerous conditions they cause.

Circle the letter of the choice that best completes the statement.

1. Extremely powerful thunderstorms that develop intense, rotating updrafts are
 - a. ~~downbursts.~~
 - b. supercells.
 - c. ~~cumulus cells.~~
 - d. ~~convection bursts.~~
2. Electricity caused by the rapid rush of air in a cumulonimbus cloud is
 - a. ~~thunder.~~
 - b. ~~hail.~~
 - c. ~~friction.~~
 - d. lightning.
3. Violent downdrafts that are concentrated in one local area are
 - a. ~~downdraft cells.~~
 - b. ~~downstrokes.~~
 - c. downbursts.
 - d. ~~updrafts.~~
4. Powerful downdrafts that affect an area of less than 3 km are
 - a. microbursts.
 - b. ~~macrobursts.~~
 - c. ~~supercells.~~
 - d. ~~updrafts.~~
5. Precipitation in the form of balls or lumps of ice is
 - a. ~~sleet.~~
 - b. ~~drizzle.~~
 - c. ~~snow.~~
 - d. hail.
6. The intense updrafts and downdrafts that characterize severe thunderstorms are the result of
 - a. unstable air caused by temperature differences between the upper and lower parts of a storm.
 - b. ~~the contact between rising air and a layer of stable air.~~
 - c. ~~the slowing of the rate of condensation within a cloud.~~
 - d. ~~the cooling of the air inside a cumulonimbus cloud to a temperature lower than the surrounding air.~~
7. Flooding often occurs if rain falls faster than
 - a. ~~snow.~~
 - b. ~~rates of condensation.~~
 - c. the ground can absorb it.
 - d. ~~clouds can form.~~
8. Hail forms in part because of the presence of
 - a. supercooled water droplets.
 - b. ~~above-freezing temperatures.~~
 - c. ~~high-pressure systems.~~
 - d. ~~melting snow.~~

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SECTION 13.2 Severe Weather, continued**In your textbook, read about tornado formation.***Answer the following questions.*

9. What is a tornado?

A tornado is a violent, whirling column of air in contact with the ground.

10. Describe how a tornado forms.

Tornadoes often form when wind speed and direction shift suddenly with height. This can produce a horizontal rotation near Earth's surface. Updrafts can then shift the twisting column of wind from a horizontal to a vertical position, creating a tornado.

11. During which time of year do most violent tornadoes form? Explain why.

Most form in spring when the temperature contrast between polar air and tropical air is greatest.

12. Where in the United States do many tornadoes occur? Explain why.

Many occur in the central United States, where cold continental polar air and maritime tropical air collide to produce tornadoes.**In your textbook, read about tornado classification.***Examine the table below. Then answer the questions.***Enhanced Fujita Tornado Damage Scale**

Rank	Category	Wind Speed (km/h)
EF0 and EF1	Weak	105–177
EF2 and EF3	Strong	178–266
EF4 and EF5	Violent	more than 267

13. The Enhanced Fujita scale classifies tornadoes according to what criteria?

Wind Speed & Destruction

14. What is the wind speed of the most violent tornadoes on the scale?

More than 267 km/h

15. Which Category is an EF3 tornado?

Strong

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SECTION 13.3 Tropical Storms

In your textbook, read about the life cycle of a hurricane.

Number the stages in the development of a hurricane in the order in which they occur.

- __1__ 1. tropical disturbance
 __4__ 2. hurricane
 __3__ 3. tropical storm
 __2__ 4. tropical depression

In your textbook, read about tropical cyclones and the damage they cause.

Determine if the statement is true. If it is not, rewrite the italicized part to make it true.

- ____ True _____ 5. To people living near the Atlantic Ocean, tropical cyclones are known as *hurricanes*.
 ____ False, Low Pressure ____ 6. Tropical cyclones are large, rotating, *high-pressure* storms.
 ____ True _____ 7. Tropical cyclones originate over the warm waters of most *tropical* oceans.

F, Saffir-Simpson Hurricane Wind Scale 8. Hurricanes are classified according to the *Fujita scale*.

- ____ True _____ 9. The minimum wind speed for a *Category 1* hurricane is 74 mph (120 kph).
 ____ False, Eyewall ____ 10. The eye of a hurricane is surrounded by a band of strong winds called the *eye current*.
 ____ True _____ 11. Hurricane winds can drive a mound of water toward the coast, where it washes over land. This is called a *storm surge*.

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SECTION 13.4 Recurrent Weather

In your textbook, read about weather patterns and problems they cause.

Complete the table by writing the result of each weather pattern. Choose from the following: cold wave, drought, flood, heat wave.

Weather Pattern	Result
1. Thunderstorm remains over an area for many hours	<i>Flood</i>
2. Extended period of well-below-normal rainfall	<i>Drought</i>
3. Extended period of above-normal temperatures	<i>Heat Wave</i>
4. Extended period of below-normal temperatures	<i>Cold Wave</i>

Complete the table by writing the name of each weather pattern associated with each atmospheric event. Choose from the following: cold wave, flood, heat wave, drought.

Atmospheric Event	Weather Pattern
5. Large pools of extremely cold air develop strong high-pressure systems over polar continental areas. Jet streams move systems.	<i>Cold Wave</i>
6. Large, warm, high-pressure system develops, remains over an area, and blocks cooler air masses from entering the area.	<i>Heat Wave</i>
7. Sinking air from a strong high-pressure system stops air from rising and condensation from occurring over a long period of time.	<i>Drought</i>
8. A thunderstorm unleashes heavy precipitation.	<i>Flood</i>