

Science 8 work

fill out 9.1 notes with book

9.1 section review in book

fill out 9.2 notes with book

9.2 section review in book.

9.1-9.2 practice quiz

## 9.1 Thunderstorms, Lightning, and Tornadoes

\_\_\_\_\_ - localized storms involving lightning, thunder, strong winds, heavy rain, and sometimes hail or tornadoes

- Represent LARGE amounts of \_\_\_\_\_ → sometimes as much as an \_\_\_\_\_
- \_\_\_\_\_ occur yearly; \_\_\_\_\_ occurring at any given moment around the world
- Start with strong \_\_\_\_\_

### • Stages of a Thunderstorm

1. \_\_\_\_\_ - *marked by updraft forming cumulus to cumulonimbus clouds*

- Updraft of air \_\_\_\_\_ as it moves upward → forms a \_\_\_\_\_ cloud
- Warm, moist \_\_\_\_\_ air causes cumulus cloud to continue growing upward
- \_\_\_\_\_ & supercooled water \_\_\_\_\_ form inside cloud
- Stage lasts → \_\_\_\_\_ minutes
- At end of stage → a huge \_\_\_\_\_ has formed **BUT** no \_\_\_\_\_

2. \_\_\_\_\_ - *marked by the arrival of precipitation at earth's surface*

- Ice crystals & water droplets fall from cloud → too \_\_\_\_\_ for updraft to hold in air
- Precipitation arrives at earth's \_\_\_\_\_
- Heavy \_\_\_\_\_, lightning, hail, \_\_\_\_\_ may develop
- Sometimes create: \_\_\_\_\_ - concentrated blasts of cool downward blowing wind up to 130 mph
  - \_\_\_\_\_ - smallest, most intense downburst at almost 170mph
  - creates severe damage to \_\_\_\_\_ or \_\_\_\_\_
- Stage lasts → \_\_\_\_\_ minutes

3. \_\_\_\_\_ - *the updraft disappears, cutting off the thunderstorm's power supply*

- Downdrafts suppress flow \_\_\_\_\_ = no more rising \_\_\_\_\_ = no further creation of \_\_\_\_\_
- Clouds \_\_\_\_\_ due to no more flow of \_\_\_\_\_ air
- Gentle \_\_\_\_\_ may follow until storm disappears

### • 2 Types of Thunderstorm

1. \_\_\_\_\_ - consist of one \_\_\_\_\_ (an updraft system)

- Storm described above
- \_\_\_\_\_ → most powerful thunder
- storm
  - usually occur in spring, summer
  - tower to 65,000 feet
  - 5-10 miles long with anvil or mushroom shape

2. \_\_\_\_\_ - consist of one or more cells

- \_\_\_\_\_ - long advancing line of multiple-cell thunderstorm

\_\_\_\_\_ - an abrupt discharge of electricity through the air that produces a quick flash of bright light

- Every second → about \_\_\_\_\_ lightning strikes happen in the world
- Each year in U.S. → kills about \_\_\_\_\_ people / injures \_\_\_\_\_ of others
- Lightning Formation
  1. In cumulonimbus cloud → huge amounts of \_\_\_\_\_ form (possibly from \_\_\_\_\_ between ice crystals & hail)
  2. Some electricity with \_\_\_\_\_ charge collects at \_\_\_\_\_ of cloud (strong negative region)
  3. Cloud then moves over an area → \_\_\_\_\_ charge develops on the \_\_\_\_\_
    - ❖ Large \_\_\_\_\_ charge in cloud is attracted to \_\_\_\_\_ charge on ground
    - ❖ **BUT** the \_\_\_\_\_ keeps the two charges apart
    - ❖ Eventually, attraction is too \_\_\_\_\_ for air to keep apart
  4. From cloud → a \_\_\_\_\_ - the first electron (negatively charged) stream moving jerkily toward the ground
    - ❖ Comes within \_\_\_\_\_ of feet of ground
  5. From ground → a \_\_\_\_\_ rises from the ground to meet the stepped leader
  6. At meeting point → a \_\_\_\_\_ - the upward flow of positive charge back toward the cloud
    - ❖ This is the brilliant flash of light that can be \_\_\_\_\_
    - ❖ **FACTS** → 1. \_\_\_\_\_ inches wide
    - 2. 2 trillion \_\_\_\_\_
    - 3. heats air in stroke to over \_\_\_\_\_ (5 time the temp. of the \_\_\_\_\_)
  7. From cloud → a \_\_\_\_\_ - second huge electrical charge that travels down the channel of the first strike
    - ❖ Does not travel as jerkily as \_\_\_\_\_
    - ❖ Initiates a second \_\_\_\_\_
  8. Up to \_\_\_\_\_ dart leader / return strokes can happen in less than a \_\_\_\_\_  
→ gives appearance of single \_\_\_\_\_ bolt
- Types of Lightning
  1. \_\_\_\_\_ - lightning travels from a negative region of the cloud down to the ground
    - ❖ described above
  2. \_\_\_\_\_ - lightning travels from the positively charged upper region to strike a negatively charged portion of the ground
    - ❖ Less common than negative cloud-to-ground
    - ❖ More dangerous → releases more \_\_\_\_\_ & can strike up to \_\_\_\_\_ miles away

3. \_\_\_\_\_ - lightning occurs between two clouds or between negative & positive sections of the same cloud

❖ \_\_\_\_\_ - entire sky flickers but bolts are obscured by clouds

❖ \_\_\_\_\_ - reflected light from high-altitude cloud-to-cloud strikes of distant thunderstorms

- storm is too far away to hear its \_\_\_\_\_

4. \_\_\_\_\_ - lightning originates from a tall, positively charged object on the ground

\_\_\_\_\_ - shock wave of sound formed from the return stroke causing the air near it to expand explosively

- Can be heard up to \_\_\_\_\_ miles away

- \_\_\_\_\_ travels faster than sound → lightning can be \_\_\_\_\_ before thunder is heard

\_\_\_\_\_ - a narrow funnel of rapidly whirling wind that stretches from a cloud to the ground

- Each year → about \_\_\_\_\_ in the U.S.

- 1 out of every \_\_\_\_\_ thunderstorms produces one

- Shapes of Tornadoes

1. \_\_\_\_\_ → most common shape

2. Narrow \_\_\_\_\_

3. Giant, swirling \_\_\_\_\_

- Color

- Starts out \_\_\_\_\_ or \_\_\_\_\_ → due to condensed water vapor

- Darkens as it picks up \_\_\_\_\_

- Formation of Tornado

1. Starts with \_\_\_\_\_ rotating winds at earth's surface

2. \_\_\_\_\_ picks up rotating "cylinder"

3. The above two merge → creating a \_\_\_\_\_ - rotating updrafts found in many supercell thunderstorms

4. As supercell grows → mesocyclone draws \_\_\_\_\_ up through itself (like a pipe) causing it to widen and grow taller

5. First visible sign of possible tornado → formation of \_\_\_\_\_ - a large rotating cylindrical extension from the base of the supercell

❖ Even after wall cloud formation → only a few supercells produce \_\_\_\_\_

6. An inner "cylinder" of rotating air spins within \_\_\_\_\_

→ when this reaches the \_\_\_\_\_, it becomes a tornado

7. \_\_\_\_\_ → the swirling, condensed air that is the distinctive visual feature of the tornado

- \_\_\_\_\_ - *best suited place for tornado formation in the world*
  - **Location?** The Mississippi Valley and the eastern Great Plains of the U.S.
  - **What happens?** Warm, moist air moves north from \_\_\_\_\_ as cool, dry air moves east from \_\_\_\_\_. Air masses collide creating ideal conditions for supercell storms
  
- \_\_\_\_\_ - a tornado that forms over the water
  - Not usually associated with \_\_\_\_\_ thunderstorms
  
- \_\_\_\_\_ - rotating column of air that begins on the ground and carries dust and light debris high into the air
  - Differs from tornado → 1. tornadoes \_\_\_\_\_ from cloud to ground  
2. dust devils not associated with \_\_\_\_\_

9.2 Hurricanes – intense low-pressure systems that develop in the \_\_\_\_\_

- Its massive size & power is \_\_\_\_\_ by any other meteorological phenomenon
- Release the energy of a \_\_\_\_\_ every \_\_\_\_\_ minutes
- Known by different names world wide
  - in Western Pacific & Indian Oceans - \_\_\_\_\_
  - in the Philippines - \_\_\_\_\_

• 2 Ingredients to Form a Hurricane

1. warm \_\_\_\_\_ (at least \_\_\_\_\_)
2. a region where the \_\_\_\_\_ is pronounced
  - ❖ between \_\_\_\_\_ & \_\_\_\_\_ latitude north and south of equator

• Hurricane Formation → Movement → Death

1. Start as a \_\_\_\_\_
  - Regions of \_\_\_\_\_ move west across ocean due to \_\_\_\_\_
  - \_\_\_\_\_ develop causing the moist, warm air to form \_\_\_\_\_
  - Winds begin to \_\_\_\_\_ due to Coriolis effect

**NOTE** → \*at this point it becomes a \_\_\_\_\_ (hurricane)\*

2. The warm ocean air “\_\_\_\_\_” the tropical cyclone → increasing its strength and \_\_\_\_\_

3. It moves in the direction of \_\_\_\_\_ winds (at speeds of 10 up to 70 mph)

4. Hurricanes:

- as it leaves Tropics → \_\_\_\_\_ as its cutoff from the warm ocean & moist air
- as moves onto a continent → it \_\_\_\_\_ into a mass of \_\_\_\_\_ showers

• Cyclone Stages

1. \_\_\_\_\_ → sustained speed of less than \_\_\_\_\_ mph
2. \_\_\_\_\_ → wind speeds reach \_\_\_\_\_ mph
  - it's given a \_\_\_\_\_
3. \_\_\_\_\_ → wind speeds reach \_\_\_\_\_ mph

• Saffir-Simpson Hurricane Wind Scale – scale by which hurricanes are \_\_\_\_\_

- Ranked into \_\_\_\_\_ possible categories based on wind \_\_\_\_\_
- **EX** Hurricane \_\_\_\_\_ (1992) → a category \_\_\_\_\_ hurricane (wind speeds greater than 155mph)

• Hurricane Structure

- Center of the hurricane → \_\_\_\_\_ - a region of very low pressure a few miles wide about which the storm rotates
  - the eye of the storm is \_\_\_\_\_
  - WHY?** Surface winds spiral inward \_\_\_\_\_ the eye but are deflected by the \_\_\_\_\_
  - typically \_\_\_\_\_ in diameter
- \_\_\_\_\_ - the cylinder of thick whirling clouds that surround the eye
  - Formed by \_\_\_\_\_
  - Up to \_\_\_\_\_ miles high

- \_\_\_\_\_ - long, narrow lines of thunderstorms around the lower eye wall
  - Rotate around the \_\_\_\_\_
  - \_\_\_\_\_ near the eye; \_\_\_\_\_ near the edge of the storm

- Hurricane Dangers

- \_\_\_\_\_ → one of the hurricane's most destructive forces
- \_\_\_\_\_ - elevated water levels caused by a hurricane's winds pushing water ahead of the storm
  - Can cause ocean levels to rise \_\_\_\_\_ feet above usual level (\_\_\_\_\_ stories of water)
  - Brings great \_\_\_\_\_

NAME: \_\_\_\_\_

1-3. Name the three stages of a thunderstorm and give its brief description.

1. \_\_\_\_\_ - \_\_\_\_\_

2. \_\_\_\_\_ - \_\_\_\_\_

3. \_\_\_\_\_ - \_\_\_\_\_

4. The smallest most intense downbursts are called \_\_\_\_\_.

5. Why does a dart leader/return stroke combination give the impression of a single flickering bolt? \_\_\_\_\_

6. What two ingredients are needed to form a hurricane?

1. \_\_\_\_\_

2. \_\_\_\_\_

7. What is the difference between a tornado and a dust devil? \_\_\_\_\_

8. What is the most powerful thunderstorm known as? \_\_\_\_\_

9. Why do we see lightning before we hear thunder? \_\_\_\_\_

10. Name the scale by which meteorologists rank hurricanes. \_\_\_\_\_

11. How many categories does the above scale have and what are they are based upon?

1. \_\_\_\_\_ 2. \_\_\_\_\_

12. What is the first visible sign that a tornado may be forming from a mesocyclone? \_\_\_\_\_

13. At least what temperature must ocean water be for a hurricane to form? \_\_\_\_\_



14-17. Name and describe the four types of lightning.

1. \_\_\_\_\_ - \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_ - \_\_\_\_\_

\_\_\_\_\_

3. \_\_\_\_\_ - \_\_\_\_\_

\_\_\_\_\_

4. \_\_\_\_\_ - \_\_\_\_\_

\_\_\_\_\_

18. What "fuels" a tropical cyclone? \_\_\_\_\_

19. What is Tornado Alley? Explain. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

20. What is a storm surge? \_\_\_\_\_

\_\_\_\_\_

21. Give the name for each stage of tropical cyclone based on its rotating speed:

1. less than 39 mph = \_\_\_\_\_

2. 39-73 mph = \_\_\_\_\_

3. 74 mph or more = \_\_\_\_\_

22. The \_\_\_\_\_ is the swirling, condensed air that is the distinctive visual feature of a tornado.

23. The \_\_\_\_\_ creates the brilliant flash of light that be seen when lightning strikes.

24. Why is the eye of the storm (hurricane) calm? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

25. What is heat lightning? \_\_\_\_\_  
\_\_\_\_\_

26. What terms are used for "hurricanes" in other parts of the world?

- In the Western Pacific & Indian Ocean → \_\_\_\_\_

- In the Philippines → \_\_\_\_\_

27. A \_\_\_\_\_ is long advancing line of multiple-cell thunderstorms.

28. Describe the eye wall:

- Define it - \_\_\_\_\_  
\_\_\_\_\_

- What's it formed from - \_\_\_\_\_

- How high can it reach - \_\_\_\_\_

29. At what point does a tropical disturbance become a tropical cyclone? \_\_\_\_\_  
\_\_\_\_\_

30. What is a stepped leader? \_\_\_\_\_  
\_\_\_\_\_