

Weather: Air Patterns



Weather results from global patterns in the atmosphere interacting with local conditions. You have probably experienced seasonal shifts, such as winter in New England, when it snows; or fall in the Southwest, when temperatures begin to drop. These seasonal changes occur because of the Earth's tilt on its axis. As the Northern Hemisphere tilts away from the sun temperatures in that area drop, for example, and this temperature change causes weather patterns to shift.

Wind Patterns

The difference in temperature across the Earth creates wind circulation patterns. At the equator, the imaginary line circling the Earth midway between the North and South poles, the air is very hot from solar radiation. The heat releases moisture from plants and bodies of water that results in humidity. As the hot, humid air rises, it forms clouds and becomes an air mass. This air then travels either north or south, where it cools as it approaches the poles before heading back to the equator, creating circular systems of weather. As a result of the Earth's spin, winds in the Northern Hemisphere travel to the right and in the Southern Hemisphere,

they travel to the left. This is called the Coriolis effect. These global wind currents have a great deal of influence on weather.

Air masses are pushed against each other as they travel along the currents. They vary in temperature, moisture and density depending on geographic conditions where they form. Where two different air masses meet is called a front. A cold front is where a cold air mass replaces a warm one, and a warm front is where a warm air mass replaces a cold one. You can view this on a local weather map.

Very high in the atmosphere the wind is especially strong and forms jet streams. These carry air masses along very quickly, resulting in faster changes in the weather we experience.

A high-pressure system is where dry air sinks to the ground. High-pressure systems usually result in fair days without much precipitation. Low-pressure systems force air to rise at the center, resulting in cloud formation and more moisture in the atmosphere. Low-pressure systems are usually associated with rain or storms.

Wind patterns not only shape our weather, they have also shaped our history. Sailors traveling from Europe to North America were aided by circular wind currents and mirroring ocean currents pushing in the same direction. Similarly, people are believed to have migrated from South America to Polynesia, across the Pacific Ocean, just by following the wind and ocean currents.

Clouds and Storms

Clouds are masses containing small droplets of water. How small? According to some scientists, so small that a coffee cup filled with typical cloud would contain 100,000 droplets. If all the water condensed to the sides of the cup it would barely be wet. Because water refracts light, we're able to see clouds even though the droplets are small and it's mostly empty air. This also explains why clouds take on the color of the light that illuminates them. Clouds appear white when the light is purest at mid-day. When a cloud is so dense it blocks out the sun, it appears black, such as during a severe thunderstorm.

The droplets in clouds are always falling but they do so very slowly. As they grow heavier, they fall faster, eventually becoming precipitation. Precipitation can be rain, snow, sleet or hail

depending on the temperature of the air as it falls. Sometimes the air can be cold so that hail forms, falling so fast that even if it is a warm summer day on the ground the hail is still ice when it hits the ground.

Thunderstorms form when a low-pressure system forms, or because of differences in air temperature at the Earth's surface that force warm, humid air aloft. These storms often include hail, heavy rain, high winds, thunder and lightning. They most often occur in summer months, but sometimes snowstorms also have thunder and lightning.

You can use thunder and lightning to figure out how far away a storm is. After you see a flash of lightning, count the number of seconds until you hear thunder. For every five seconds, the storm is one-mile away.

Name: _____ Date: _____

1. What is the cause of wind circulation patterns?

- A the speed of the Earth spinning
- B the difference in temperature across the Earth
- C the movement of jet streams
- D the occurrence of thunder and lightning

2. This passage sequences how circular systems of weather are created. What happens after hot, humid air near the equator rises?

- A The hot, humid air becomes a tornado.
- B The hot, humid air sinks closer to the ground.
- C The hot, humid air travels either north or south.
- D The hot, humid air travels either east or west.

3. Read the following sentences: "At the equator, the imaginary line circling the Earth midway between the North and South poles, the air is very hot from solar radiation. The heat releases moisture from plants and bodies of water that results in humidity."

The word "**solar**" is used to describe something related to the sun. What can be concluded about the sun based on this information?

- A The sun does not affect the Earth.
- B The sun impacts the Earth's weather.
- C The sun has a very limited effect on the Earth's weather systems.
- D The Earth affects the radiation of the sun.

4. Based on the information in the passage, what can be concluded about the weather during high-pressure systems?

- A It is always raining during high-pressure systems.
- B It is always sunny during high-pressure systems.
- C Thunderstorms are unlikely during high-pressure systems.
- D Thunderstorms are very likely during high-pressure systems.

5. What is this passage mostly about?

- A the changing of the seasons
- B the way that air patterns affect weather
- C the Coriolis effect
- D the way that sailors used wind to travel

6. Read the following sentences from the passage: "Because water refracts light, we're able to see clouds even though the droplets are small and it's mostly empty air. This also explains why clouds take on the color of the light that **illuminates** them. Clouds appear white when the light is purest at mid-day."

As used in the passage, what does the word "**illuminate**" mean?

- A to darken
- B to burn
- C to heat up
- D to light up

7. Thunder and lightning normally happen during the summer. _____, they occasionally appear during snowstorms as well.

Choose the answer that best completes the sentence below.

- A However
- B Consequently
- C Particularly
- D On the contrary

8. What is the cause of seasonal and temperature changes?

9. What is the Coriolis effect?

10. Explain how wind circulation patterns create circular systems of weather. Use information from the passage to support your answer.
