

EXTENDED INFORMATIONAL READING COMPREHENSION

Weird, Wild Weather: Lightning

Read the passage below, and then answer the questions that follow.

- 1 Meteorologists and storm chasers alike know that lightning is one of the wildest weather features on Earth. After all, a flash of lightning is a giant spark of electricity that instantly heats the surrounding air to over 50,000 degrees Fahrenheit. That's about five times hotter than the surface of the sun!
- 2 The lightning we experience during thunderstorms may seem jarring, but it's really a great equalizer. Lightning happens when there is an imbalance between positively and negatively charged particles within or between clouds or between a cloud and the ground. To fix the imbalance, negatively charged particles usually flow towards positively charged particles in a "flash." This is called **negative lightning**, and it accounts for about 95 percent of all lightning that we experience. And as wild as this lightning is, it's a pretty common phenomenon: it's estimated that 100 lightning bolts strike the surface of the Earth every second. But there are some specific types of lightning that are much less common—and maybe even a little weird.

Ball Lightning

- 3 Imagine a mysterious, glowing orb of light floating for about ten seconds near the ground, perhaps accompanied by a hissing sound and an unpleasant smell, before disappearing. Or imagine a similar glowing orb crashing through a church window, singeing people's hair and clothes, as was reported in 1638. These aren't just scenes you might see in a science fiction movie. In fact, **ball lightning** is a rarely observed phenomenon that has nevertheless been reported thousands of times over hundreds of years. Witnesses have reported this type of lightning either harmlessly floating around—such as inside an airplane cabin—or violently crashing into things and causing fires and destruction—as was described in 1809 aboard the ship HMS *Warren Hastings*.
- 4 So what causes ball lightning? Scientists really don't know. In fact, most scientists didn't even believe ball lightning was real until recently. Researchers studying lightning during a thunderstorm in 2012 actually observed the phenomenon and even caught evidence of it with their instruments. But its cause is still debated. Because ball lightning seems to occur

during thunderstorms, some scientists theorize that it is caused by a lightning strike that vaporizes and electrifies minerals in the soil. Still, that is just one of many theories; as of yet, there is no definite answer as to what causes ball lightning.



Ball lightning has been a mystery to scientists over the years. "Great Balls of Lightning" captured by Joe Thomassen. CC BY-SA 3.0/cropped.

Blue Jets

- 5 When we think of lightning, we tend to think of it as striking downward from a storm cloud, or even streaking across the sky inside of or between clouds. But **blue jets** are a rare kind of lightning that streak *up*. Blue jet lightning flashes its blue, laser-like electrical surge from the top of a storm cloud. It zaps into the stratosphere as far as 32 miles (51 km) above the ground—all in a fraction of a second.
- 6 Blue jets are seldom seen from Earth because they're usually hidden by the storm clouds from which they are emitted. Therefore, much like ball lightning, blue jets are a bit of a mystery to scientists. However, in 2019, astronauts on the International Space Station, which orbits high up in Earth's thermosphere, observed and recorded blue jets with their instruments. These tall, blue flashes of lightning appear to start as small, superfast sparks of electricity at the top of an actively storming cloud. From these sparks, the blue jet streaks upward. While you don't have to worry about being struck by blue jet lighting, it can still cause problems: lightning events high up in the atmosphere can interfere with satellite and radio communications to and from Earth.

EXTENDED INFORMATIONAL READING COMPREHENSION

Weird, Wild Weather: Lightning

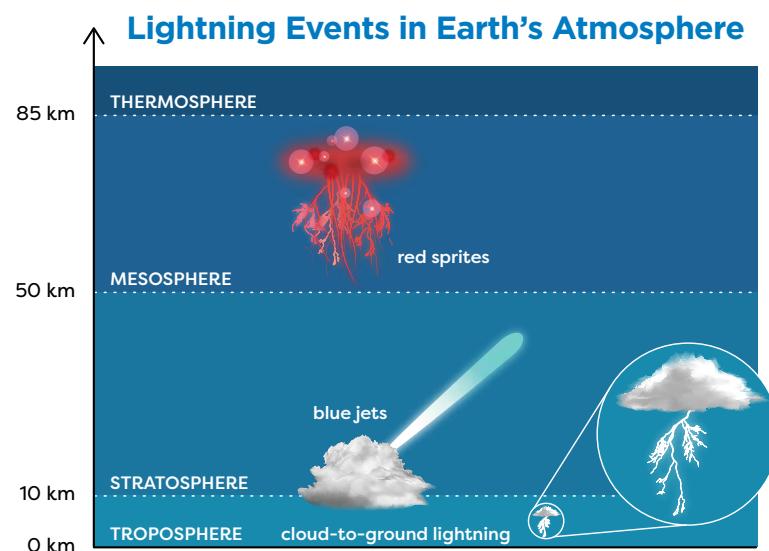
Continue reading, and then answer the questions that follow.

Red Sprites

- 7 Red sprites** occur even higher in the atmosphere than blue jets, up to about 53 miles (85 km) above Earth, in the mesosphere. These giant red bursts of electricity look a little like falling fireworks after they explode in the sky. Some people say they resemble red jellyfish with their tentacles dangling down. Pilots had actually observed red sprites before scientists were able to record them. However, these red wonders were so fleeting that many who had observed them thought they had imagined them; after all, red sprites disappear in a blink of an eye.
- 8** Scientists believe red sprites are probably associated with positive cloud-to-ground lightning strikes. **Positive lightning** occurs when positively charged particles high up in a cloud flow toward negatively charged particles on the ground. Positive lightning is usually much more powerful than negative lightning, and when a strike occurs, the cloud becomes negatively charged. Scientists theorize that an equalizing burst of energy is then emitted upward into the atmosphere, causing red sprites. Since positive lightning often occurs a good distance from the storm in which it originates, the resulting red sprites can sometimes be observed from the ground. However, from such a distance, they appear quite small, and they disappear in a tiny fraction of a second. Although they occur all over the world, red sprites are quite difficult to spot.



A red sprite and a blue jet were caught on camera in Hawaii in 2017. "Red sprite blue jet NOIRLab" captured by International Gemini Observatory/NOIRLab/NSF/AURA/A. Smith. CC BY 4.0/cropped.



Catatumbo Lightning

- 9** While red sprites can occur anywhere in the world, **Catatumbo lightning** occurs in only one place: at the mouth of Venezuela's Catatumbo River, over and around Lake Maracaibo. The lightning here is unique not in its form, but in its frequency. For 150-300 days each year, lightning strikes at an average rate of 28 strikes per minute for 9-10 hours. Because of this, Lake Maracaibo was named "The Lightning Capital of the World" by NASA in 2016.
- 10** Catatumbo lightning is often visible from 250 miles away. Locals have become accustomed to being able to use the natural light produced by the nearly constant lightning flashes to find their way around at night. As with most strange lightning events, scientists are not exactly sure why this place is a literal lightning hotspot. It is theorized that the Catatumbo lightning is caused by a unique combination of the region's terrain and wind patterns.

Weird, Wild Lightning

- 11** Ball lightning, blue jets, red sprites, and Catatumbo lightning aren't the only kinds of strange lightning. Other unique types of lightning include dark lightning, volcanic lightning, and even a type called elves—doughnut-shaped lightning that occurs in the mesosphere and which, like red sprites, is associated with positive lightning. All of these fascinating lightning phenomena rank as some of the world's weirdest and wildest weather events.

EXTENDED INFORMATIONAL READING COMPREHENSION

Weird, Wild Weather: Lightning

Answer the questions about “Weird, Wild Weather: Lightning.”

1. Read this sentence from paragraph 2.

“And as wild as this lightning is, it’s a pretty common phenomenon.”

Which of the following words is a synonym for “phenomenon” as it is used in the sentence above?

- A. object B. task C. occurrence D. experiment

2. Read the following excerpt from paragraph 2.

“The lightning we experience during thunderstorms may seem jarring, but it’s really a great equalizer.”

What does the underlined phrase mean?

- A. Lightning strikes everywhere around the world equally.
B. Fires caused by lightning strikes help maintain a healthy balance in forest ecosystems.
C. Lightning is nature’s way of correcting an imbalance of positively and negatively charged particles.
D. There is always a balance of positive and negative lightning in the atmosphere.

3. How does the author introduce the topic of ball lightning?

- A. by presenting a visual description
B. by defining unfamiliar terms
C. by providing scientific facts
D. by relating a personal experience

4. Red sprites can be visible from the ground, but they are difficult to spot. Why? Choose all that apply.

- A. Red sprites are extremely rare phenomena that happen in only a few places.
B. Red sprites disappear in a fraction of a second.
C. Red sprites are usually hidden by the tall storm clouds below them.
D. Red sprites appear very small because they are very high up.
E. Red sprites strike upward from storm clouds.

5. Why does the author include a section about Catatumbo lightning, a “regular” type of lightning, in a passage about “weird and wild” weather? Use evidence from the text to support your answer.

6. According to the diagram on page 2, where does most regular lightning occur?

- A. the stratosphere C. the troposphere
B. Lake Maracaibo D. the mesosphere

7. Based on information in the passage, describe two differences between negative and positive lightning.

1. _____

2. _____

EXTENDED INFORMATIONAL READING COMPREHENSION

Weird, Wild Weather: Lightning

Answer the questions about “Weird, Wild Weather: Lightning.”

8. A. According to the text, what are some possible negative effects of blue jet lightning, and why?

- B. Based on the information in the text and the diagram on page 2, what other type(s) of lightning might have similar negative effects as blue jets? Cite evidence from the article to support your answer.

9. What do all the main types of “weird and wild” lightning addressed in detail in the passage have in common?

- A. Many scientists are still not sure of their existence.
B. They occur during specific times of the year.
C. Although they are not easily visible, they are quite common.
D. Scientists do not fully understand how they occur.

10. In your own words, summarize the passage, including the main idea and key details.
