

What Causes the Seasons?

The text and images are from NASA Space Place.

It's all about Earth's tilt!

Many people believe that Earth is closer to the sun in the summer and that is why it is hotter. And, likewise, they think Earth is farthest from the sun in the winter.

Although this idea makes sense, it is incorrect.

It is true that Earth's orbit is not a perfect circle. It is a bit lop-sided. During part of the year, Earth is closer to the sun than at other times. However, in the Northern Hemisphere, we are having winter when Earth is closest to the sun and summer when it is farthest away!

Compared with how far away the sun is, this change in Earth's distance throughout the year does not make much difference to our weather.

There is a different reason for Earth's seasons.

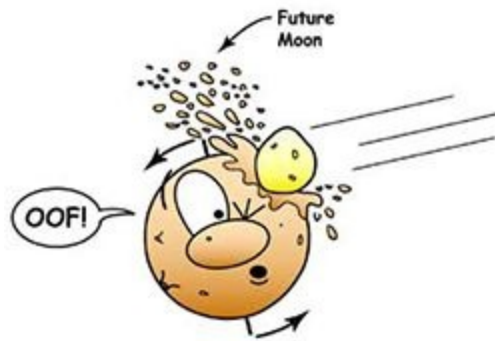
Earth's axis is an imaginary pole going right through the center of Earth from "top" to "bottom." Earth spins around this pole, making one complete turn each day. That is why we have day and night, and why every part of Earth's surface gets some of each.

Earth has seasons because its axis doesn't stand up straight.

But what caused Earth to tilt?

Long, long ago, when Earth was young, it is thought that something big hit Earth and knocked it off-kilter. So instead of rotating with its axis straight up and down, it leans over a bit.

By the way, that big thing that hit Earth is called Theia. It also blasted a big hole in the surface. That big hit sent a huge amount of dust and rubble into orbit. Most scientists think that that rubble, in time, became our Moon.



As Earth orbits the sun, its tilted axis always points in the same direction. So, throughout the year, different parts of Earth get the sun's direct rays.

Earth has seasons because its axis is tilted. Earth rotates on its axis as it orbits the Sun, but the axis always points in the same direction.

Southern Hemisphere Northern Hemisphere

December:
Summer south of the equator, winter north of the equator. The Sun shines directly on the Southern Hemisphere and indirectly on the Northern Hemisphere

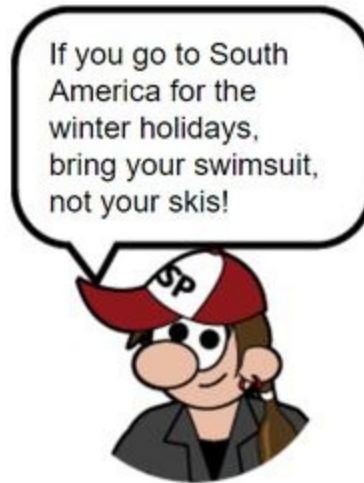
March:
Fall south of the equator, spring north of the equator. The Sun shines equally on the Southern and Northern Hemispheres

June:
Winter south of the equator, summer north of the equator. The Sun shines directly on the Northern Hemisphere and indirectly on the Southern Hemisphere

September:
Spring south of the equator, fall north of the equator. The Sun shines equally on the Southern and Northern Hemispheres

Sometimes it is the North Pole tilting toward the sun (around June) and sometimes it is the South Pole tilting toward the sun (around December).

It is summer in June in the Northern Hemisphere because the sun's rays hit that part of Earth more directly than at any other time of the year. It is winter in December in the Northern Hemisphere, because that is when it is the South Pole's turn to be tilted toward the sun.



Name: _____ Date: _____

1. What is the Earth's axis?

- A. an imaginary pole that passes through the center of the Earth
- B. the path that the Earth travels around the sun
- C. the object that hit young Earth long ago, causing it to lean over
- D. the distance between the Earth and the sun

2. This text describes what causes us to have seasons at different times of the year on different parts of the Earth. What is one thing that causes seasons?

- A. the shape of the Earth
- B. the oval-shaped orbit of the Earth
- C. the tilt of the Earth
- D. the distance between the Earth and sun

3. The text says, although many people believe that we have summer when the Earth is closest to the hot sun, that we actually have summer when the Earth is farthest away from the sun. What conclusion can be drawn from this evidence?

- A. Earth's orbit changes shape almost every year.
- B. Scientists do not know for sure why we have seasons.
- C. Earth's seasons are caused by the moon rather than the sun.
- D. Earth's distance from the sun does not affect the seasons.

4. Based on the text, what causes a hemisphere on Earth to have summer?

- A. direct sunshine from the sun hitting that hemisphere
- B. indirect sunshine from the sun hitting that hemisphere
- C. that hemisphere's closeness to the sun, relative to its closeness at other parts of the year
- D. that hemisphere's natural climate and the warmth of the Earth's atmosphere in that area

5. What is the main idea of this text?

- A. Earth's oval-shaped orbit causes the seasons.
- B. Earth's tilted axis causes the seasons.
- C. The shape of the Earth causes the seasons.
- D. Earth's distance from the sun causes the seasons.

6. Please read the following sentences from the passage.

"But what caused the Earth to **tilt**? Long, long ago, when Earth was young, it is thought that something big hit Earth and knocked it off-kilter. So instead of rotating with its axis straight up and down, it leans over a bit."

What does the word **tilt** mean as used in these sentences?

- A. skip
- B. spin
- C. move
- D. lean

7. Please choose the answer that best completes the sentence below.

When the Northern Hemisphere is tilted towards the sun, the Southern Hemisphere does not receive direct sunshine, ____ it is winter in the south.

- A. because
- B. if
- C. so
- D. first

8. Why is the Earth's axis tilted?

9. Why does the Northern Hemisphere have summer in June? Use evidence from the text in your answer.

10. Imagine that the Earth's axis went straight up and down, instead of tilting. Explain whether or not the Earth would still have different seasons. Support your answer with evidence from the text.

1. What is the Earth's axis?

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2. This text describes what causes us to have seasons at different times of the year on different parts of the Earth. What is one thing that causes seasons?

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8. Why is the Earth's axis tilted?

People believe that long ago, something big hit the Earth, knocking it off-kilter.

9. Why does the Northern Hemisphere have summer in June? Use evidence from the text in your answer.

Answers may vary. Students should use evidence from the text. It is summer in June in the Northern Hemisphere because the Earth's slanted axis means that the Northern Hemisphere is tilted toward the sun in June. The sun's rays shine directly on the Northern Hemisphere at this time, making the weather there warm.

10. Imagine that the Earth's axis went straight up and down, instead of tilting. Explain whether or not the Earth would still have different seasons. Support your answer with evidence from the text.

Students should use evidence from the text. If the Earth's axis was vertical, the sun's rays would shine equally on the Northern and Southern hemispheres throughout the year. Therefore, there would be no seasons.

Name: _____ Date: _____

1. What is a meaning of the word **orbit**?

- A. the science of matter
- B. the uniform of a chef
- C. a sphere of influence

2. What is another meaning of the word **orbit**?

- A. a feeling of self-respect and personal worth
- B. the path of a moon, planet, or space capsule
- C. buying or selling securities or commodities

Please use each answer choice only once. Choose the one word that best completes the sentence.

3. The _____ itself looked like a stubby airplane.

- A. orbited
- B. orbits
- C. orbit
- D. orbiter
- E. orbiting

4. Many thought that the Sun and all the planets _____, or move around, Earth.

- A. orbited
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5. Many comets have _____ that are tilted.

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6. They _____ the earth, passing over most of its countries in turn.

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7. Traveling around an object in space is called _____.

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8. Please write your own sentence using the word **orbit**.

9. What would you like to remember about the meaning of the word **orbit** so that you can use it when you write or speak?

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