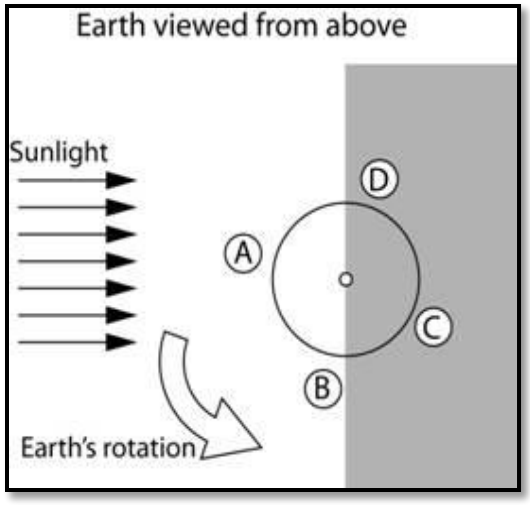
Reading Science

Name: _____ Date: _____

Rotation and Revolution



1 Have you ever wondered what it was like on the other side of the world as you were getting ready for bed? Perhaps you have wondered what season it was in Australia as you were sweating on a hot summer day. The first question can be answered by examining the tilt of Earth on its axis. The second answer comes from understanding the position of Earth during its revolution around the Sun.

2 First of all, let's discuss what an axis is. Picture an imaginary pole running from the North Pole through Earth's center all the way to the South Pole. This imaginary pole is called an axis. Earth rotates on its axis, taking about 24 hours to complete one entire spin. Thus, one complete rotation cycle results in 12 hours of daylight and 12 hours of night, as different parts of Earth are rotated into the Sun's light. Have you ever stood outside and watched as the Sun sinks below the horizon? You have actually been witnessing Earth's rotation. The Sun is not moving, although it appears to be. Earth is moving! The rotating Earth also makes the other stars in the night sky seem to glide across the sky when, in fact, it is the rotation of Earth on its axis that makes them appear to move. At any given time during the 24-hour rotation, half of Earth is in sunlight and half of Earth is in darkness. This means as you get ready for bed, somewhere on the other side of Earth, someone is just getting up.

3 Think of Earth as a ball with a rod through it, representing the axis. This makes it easier to visualize Earth's orientation in space relative to other objects like the Sun. Now consider the Sun as another ball. Imagine the Sun located in the center of a disc, somewhat like a Frisbee. The planets in the solar system would be positioned on the Frisbee, but at varying distances from the Sun. The area we are visualizing as a Frisbee is actually called the plane of the ecliptic. It is the plane of Earth's orbit around the Sun. Earth's axis is not oriented perpendicular to the plane of its orbit, but rather it is tilted at 23.5 degrees from the perpendicular. Why is this an important detail? This orientation in space, relative to the Sun, has great influence on Earth's seasonal changes.

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4 Now, to address our second question. What would cause it to be summer in North America and winter in Australia? We have just learned that rotation is the spinning of Earth on its axis that causes day and night. We also learned that the orientation of Earth's axis is tilted 23.5 degrees from the perpendicular of the plane of the ecliptic. Now picture this: While Earth is rotating, it is also revolving around the Sun in a nearly circular path called an orbit. This revolution takes one year, or 365 days, to complete. During this one year, Earth experiences four different seasons. The seasons are summer, fall, winter, and spring, but they do not happen at the same time in the northern and southern hemispheres. In June, July, and August, Earth's tilt positions the northern hemisphere so that sunlight hits it more directly. The northern hemisphere has a larger number of daylight hours, causing a summer season. During that period of time, the southern hemisphere is angled so the sunlight is not as direct. The number of daylight hours is smaller, causing the opposite winter season. This explains why the northern and southern hemispheres experience different seasons.

5 The next time you watch a sunset or sunrise, think about the rotation of Earth. Remember that you are experiencing the same thing that is causing day and night. On the next scorching, hot summer day or frigidly cold winter day, think about the tilt of Earth on its axis. Remember how its position in Earth's revolution around the Sun brings you the seasons.

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1 In paragraph 3, what word or phrase gives you a clue to what the word **perpendicular** means?

A "somewhat like a Frisbee"

B "relative to the Sun"

C "instead, it is tilted"

D "orientation in space"

2 Which of the following effectively summarizes paragraph 2?

A The orientation in space, relative to the Sun, is the cause of Earth's seasonal changes.

B There is an imaginary pole running through the center of Earth from the North Pole to the South Pole, which is called an axis.

C We also learned that Earth's axis is tilted 23.5 degrees from the perpendicular of the plane of the ecliptic.

D The northern hemisphere has more daylight hours.

3 According to this passage, what is rotation?

A the constant spinning of Earth on its axis

B the movement of Earth through space around the Sun

C an orbital path shaped more like a circle than an oval

D the four seasons: summer, fall, winter, and spring

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4 Which of the following statements best shows why it would be winter in the southern hemisphere and summer in the northern hemisphere?

A Earth's tilt positions the northern hemisphere to receive more of the Sun's direct rays.

B Earth's tilt positions the southern hemisphere to receive more of the Sun's direct rays.

C Earth's tilt exposes the northern hemisphere to longer periods of daylight.

D Both A and C are correct.

5 The rotation of Earth takes approximately _____ to complete, and the revolution of Earth takes approximately _____ to complete.

A 1 day, 30 days

B 12 hours, 24 hours

C 365 days, 24 hours

D 24 hours, 365 days