Name _____

Date _____

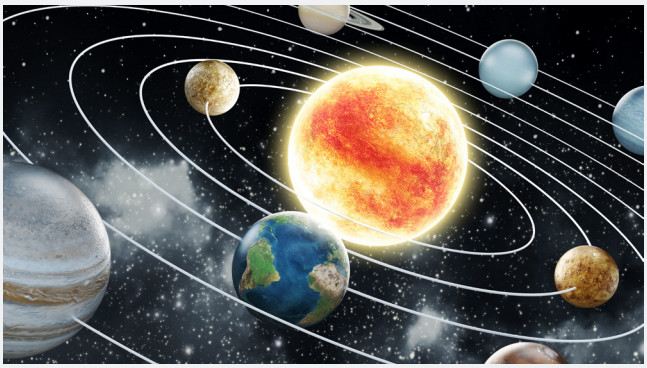
Speeding in Space

The solar system is composed of many things. It includes our star, the Sun, the planets and their moons, comets, and asteroids. All of these objects are in motion. Let's see how fast one type of object—the planets—move.

First, let's examine our planet, Earth. You know that Earth orbits around the Sun. Its revolution, or the time it takes Earth to travel around the Sun, is just over 365 days, or one year. But do you know how fast Earth moves? Earth moves at a speed of 107,206 kilometers (66,615 miles) per hour. To put this into perspective, think about a car traveling 97 kilometers (60 miles) per hour. Earth is moving around the Sun more than 1,100 times faster than that car!

Now, let's examine the three other inner planets. Mercury is the planet closest to the Sun, and Venus is just behind it. Mercury is the fastest-moving planet in our solar system. It travels around the Sun at a speed almost twice as fast as Earth—172,332 kilometers (107,082 miles) per hour. Because Mercury's orbital path is smaller than Earth's, at this speed, Mercury makes a trip around the Sun every 88 Earth days. Venus moves at a speed between that of Mercury and Earth at 126,071 kilometers (78,337 miles) per hour. In the time it takes Earth to complete one revolution, Venus has already completed one revolution and started a second! Mars is the inner planet farthest from the Sun. It takes almost two Earth years for Mars to complete one trip around its orbital path, even though it travels at 86,676 kilometers (53,858 miles) per hour.

Jupiter, Saturn, Uranus, and Neptune are the outer planets. They are the planets in our solar system that are the farthest from the Sun. Jupiter travels at a speed of 47,051 kilometers (29,236 miles) per hour—about half the speed of Earth. It takes Jupiter almost 12 Earth years to make one trip around the Sun. Saturn is next, and it travels at a speed of 34,883 kilometers (21,675 miles) per hour, while Uranus moves at 24,515 kilometers (15,233 miles) per hour. That translates to about 29.5 Earth years for Saturn and 84 Earth years for Uranus to orbit the Sun. If you live to be 84 years old, Uranus will just be completing the revolution around the Sun it started when you were born. The slowest planet in our solar system is Neptune. This planet travels at a mere 19,547 kilometers (12,146 miles) per hour. At this pace, it takes Neptune almost 165 Earth-years to travel around the Sun.



Credit: cigdem/Shutterstock.com

Questions:

1. Describe the pattern of the speed of a planet's revolution as you get farther from the Sun.

2. Jaime says that Mercury travels at a speed that is five times faster than Neptune. Do you agree? Why?

3. What are two factors that cause the length of a planet's year to get longer the farther it is from the Sun?

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Questions:

1. Describe the pattern of the speed of a planet's revolution as you get farther from the Sun. *(As you get farther from the Sun, the speed of revolution slows.)*

2. Jaime says that Mercury travels at a speed that is five times faster than Neptune. Do you agree? Why? *(Students should multiply to calculate the difference in speed. If you multiply Neptune's speed by 5, it is close to the speed Mercury moves.)*

3. What are two factors that cause the length of a planet's year to get longer the farther it is from the Sun? *(As you get farther from the Sun, the distance a planet must travel to complete a revolution gets much longer. The planets that are farther from the Sun also revolve more slowly.)*

Name _____

Date _____

Land of the Midnight Sun

Have you ever heard of the midnight Sun? If you live near the Arctic Circle, it's an annual occurrence. The Arctic Circle is an imaginary line that circles the globe at about 66° N latitude and defines the Arctic region. Within the arctic are parts of Greenland, Canada, Russia, Norway, and the United States. Once a year, on the summer solstice, the Sun does not set, even at midnight—thus the name, midnight Sun. This happens each year on or around June 21.

Much of Alaska lies within the Arctic Circle. Barrow is the northernmost town in Alaska. In Barrow, from about May 10 until August 2, the Sun doesn't set. But winter is a different story for the people of Barrow. From November 18 to January 24, the Sun doesn't rise. Could you imagine going to school and coming home when it is dark? What about sleeping when the Sun is still shining? Places south of Barrow also experience extremely long summer days and extremely short winter ones. Take Anchorage, Alaska, for example. On July 1, the Sun rises at 4:28 in the morning. It doesn't set until 11:35 at night. That's 19 hours of daylight! In contrast, on January 1, the Sun rises at 10:10 the morning and sets at 3:54 p.m. That's less than six hours of daylight.

Why such differences in the number of daylight hours? It has to do with Alaska's location on Earth and Earth's tilt as it revolves around the Sun. Earth is tilted on its axis at approximately 23°. On the day of the summer solstice, the area inside the Arctic Circle is pointed most directly at the Sun. Everywhere inside the circle experiences 24 hours of sunlight. As summer changes to fall, Earth moves farther along in its orbit. The Arctic Circle points less and less directly at the Sun. The hours of daylight decrease. Finally, on the winter solstice, the Sun no longer shines directly on the Arctic Circle. On this day, the Sun doesn't rise above the horizon anywhere above the Arctic Circle.

Questions:

1. Why doesn't a state such as Wyoming experience the midnight Sun?

2. How do Earth's revolution and the tilt of its axis affect how sunlight falls on the planet?

3. Does everyone on Earth see the Sun appear to move across the sky in the same way? Explain.

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Questions:

1. Why doesn't a state such as Wyoming experience the midnight Sun? *(Answers will vary, but students should understand that Wyoming does not experience the midnight Sun due to its location on Earth, which is south of the Arctic Circle.*)

2. How do Earth's revolution and the tilt of its axis affect how sunlight falls on the planet? *(Earth is tilted on its axis. As it revolves around the Sun, different parts of the planet receive the most direct sunlight. This causes areas to have differences in their hours of daylight during different seasons.)*

3. Does everyone on Earth see the Sun appear to move across the sky in the same way? Explain. *(Answers will vary. Students should recognize that while everyone on Earth can observe an apparent east-to-west motion of the Sun, how high in sky the Sun rises during the day and the number of daylight hours varies from location to location on Earth.)*

Credit: Senthil Raman/Shutterstock.com

Name _____

Date _____

California's Water Shortage

Did you know that Earth is sometimes called the water planet? Water doesn't stay in just one place, though. The water cycle is the constant movement of water among the land, ocean, and atmosphere. The key processes in the water cycle are evaporation, condensation, and precipitation. The ocean is the greatest source of water for evaporation. When ocean water evaporates, the salts in the water are left behind. As water vapor in the air cools, it condenses into liquid water. The water drops grow and form clouds. When the drops become large enough, they fall as precipitation, and the cycle continues.

Although water is continually cycling, not all areas of the planet receive the same amount of precipitation. Parts of California sometimes are at risk of experiencing water shortages. For some communities, that means mandatory water restrictions. These restrictions limit the consumption of water to certain days, times, and uses.

What causes water shortages? Like much of the western U.S., California greatly depends on melting snow to resupply rivers, lakes, and streams. Recently, winter storms have not dropped the usual amount of snow. Record temperatures have increased evaporation. The combination of these factors leaves the land parched. With surface resources low, some areas, especially those that are heavily farmed, have drilled for groundwater. This water is used for growing crops or watering livestock. Groundwater resources take many years to recharge. The shortage of water could have negative impacts on the agriculture industry.

Scientists and engineers are looking at ways to help California and other places on Earth that experience droughts. Some of the technology they are investigating includes turning salt water into freshwater, harvesting water with fog catchers, and recycling wastewater.

Questions:

1. You drop your water bottle on the sidewalk. Describe how the water cycle will change the spilled water.

2. Northern California has many forests. How might droughts affect these environments?

3. California produces almost half of all the fruits, nuts, and vegetables grown in the United States. How might a long-term drought in California affect all parts of the country?

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Questions:

1. You drop your water bottle on the sidewalk. Describe how the water cycle will change the spilled water. *(Students should understand that the water on the sidewalk will evaporate to form water vapor in the air. This vapor will eventually cool, condense, and fall to the ground as rain.)*

2. Northern California has many forests. How might droughts affect these environments? *(Answers will vary. Students may suggest that the lack of rainfall may affect plant growth; reduce the amount of water that is available for animals to drink; not replenish streams, which may then dry up, affecting aquatic ecosystems; or that dry conditions may lead to forest fires.)*

3. California produces almost half of all the fruits, nuts, and vegetables grown in the United States. How might a long-term drought in California affect all parts of the country? *(Students should infer that food shortages may result from a lack of water in California.)*