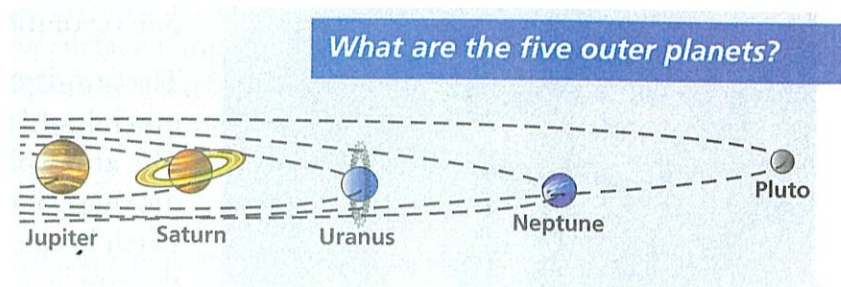


Objectives

After reading this lesson, you should be able to

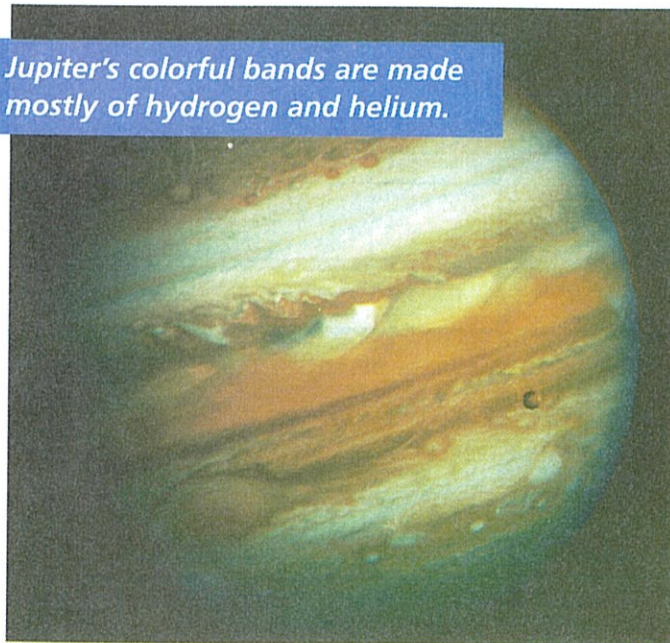
- ▶ identify the five outer planets.
- ▶ describe the five outer planets.

The outer planets, except for Pluto, are larger than the inner planets and are made up mostly of frozen gases. Over the last 20 years, *Voyager* and *Galileo* spacecraft have collected much information about these planets.

**Jupiter**

Jupiter is the largest planet in the solar system. It has a mass $2\frac{1}{2}$ times that of all the other planets put together. The diameter of Jupiter is more than ten times larger than Earth's. It's no wonder Jupiter was named for the Roman king of the gods.

Jupiter's colorful bands are made mostly of hydrogen and helium.



Among the most noticeable features of Jupiter are the colorful bands. These bands are clouds of gases where storms are taking place. The bands change shape every few days but generally run in the same direction. Jupiter's fast rotation might cause these bands. It takes Jupiter only ten hours to rotate once.

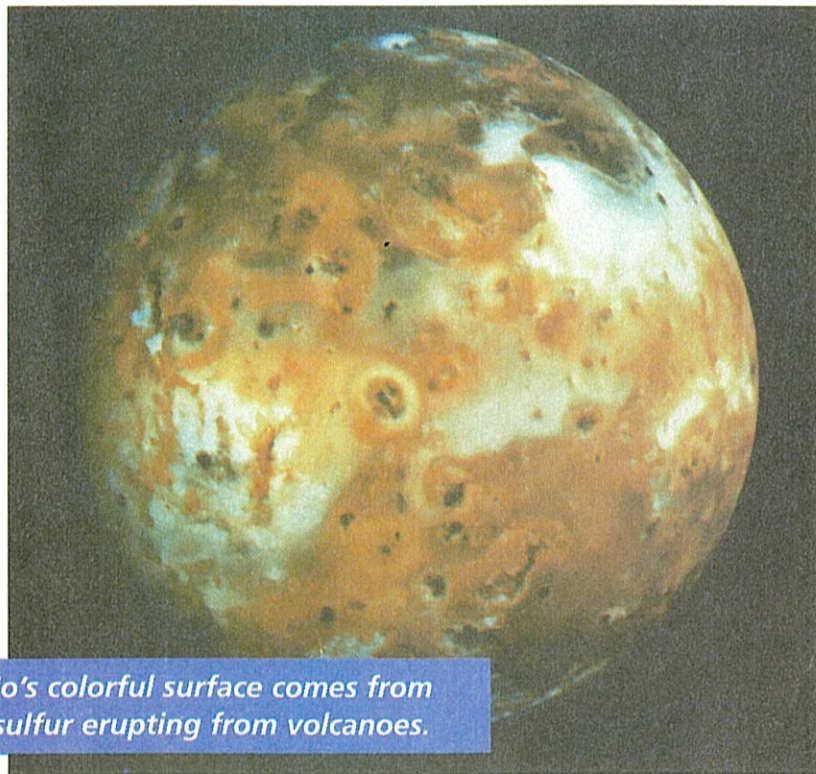
Find the oval at the lower left in the photo. This area is called the Great Red Spot.

The red spot is more than twice as wide as the entire Earth. It is a storm that has lasted for more than 300 years!

When Vöyager spacecraft flew by Jupiter in 1979, astronomers discovered faint rings around the planet. Astronomers also discovered more moons than they had thought existed. At least 16 moons orbit this giant planet.

The largest of Jupiter's moons is Ganymede. It is bigger than the planet Mercury. The smallest moon is named Leda and is only about 20 kilometers in diameter. A moon called Europa is an icy world with a smooth, cracked surface. It has been described as a giant cue ball.

The photograph below shows the moon Io. Like Earth, Io has active volcanoes. The volcanoes erupt constantly, spewing out sulfur that colors the moon yellow, orange, and red. In fact, the photograph of Io shown here might remind you of a pizza!



Io's colorful surface comes from sulfur erupting from volcanoes.

Did You Know?

One of Saturn's moons, Mimas, has a crater so huge that scientists think the object that caused the crater came close to destroying this moon.

Saturn

You are probably familiar with the rings of Saturn. Saturn, the sixth planet from the sun, was named for the Roman god of agriculture. Saturn is the second largest planet in the solar system.

The rings that orbit Saturn's equator are made up mostly of ice particles and dust. When you look at Saturn through a telescope, you can see the rings only at certain times during Saturn's orbit. That is because the rings are very thin, and Saturn is tilted on its axis. When the edge of the ring system is pointed toward Earth, the rings disappear from view.

Saturn's rings are made of ice particles and dust.



Like Jupiter, Saturn is a giant planet of gases with stormy bands of clouds running along its surface. Winds in these storms reach speeds of 1,800 kilometers per hour. Also like Jupiter, Saturn spins very fast. One day is about ten hours.

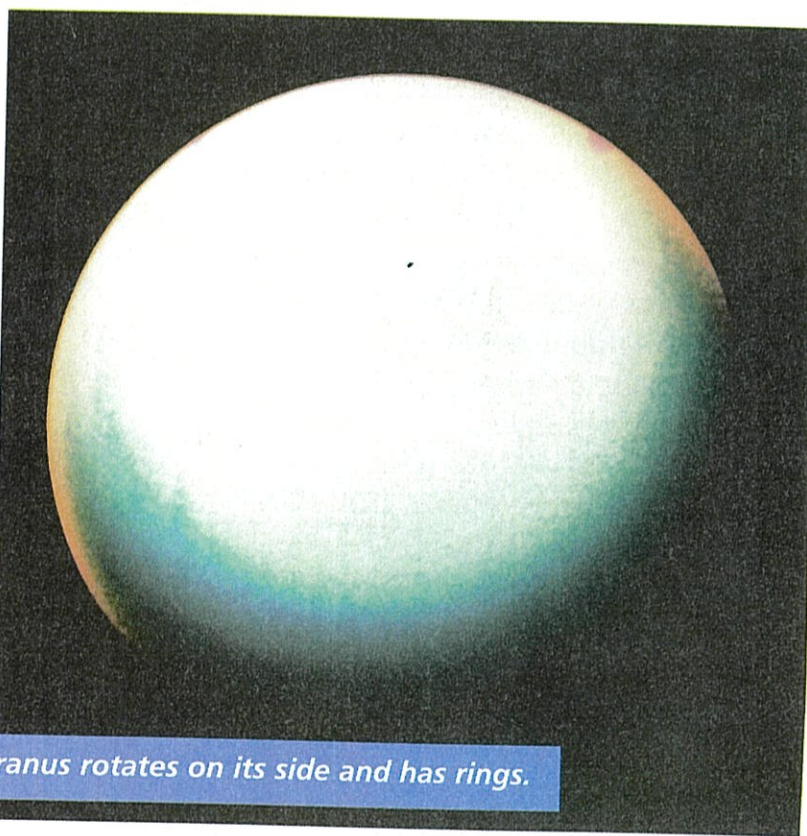
Saturn has 18 known moons, the largest of which is Titan. Titan is the only moon in the solar system that is known to have an atmosphere of its own. This atmosphere is mostly nitrogen. Titan may also have active volcanoes.

Uranus

The seventh planet from the sun is Uranus. This planet was named for the Greek god of the sky. One unusual thing about Uranus is the tilt of its axis. Uranus rotates on its side. During some parts of its revolution, one pole of Uranus points directly at the sun.

In 1977, astronomers discovered that Uranus has a ring system. They were using a telescope to observe Uranus as it passed in front of a star. They noticed that the star dimmed briefly many times. Each dimming occurred as another ring passed in front of the star. A Voyager spacecraft has studied the rings and Uranus's 15 moons up close.

Because Uranus is so far out in the solar system, it takes 84 Earth years to complete a single orbit of the sun. Uranus rotates on its axis once every 17 hours.



Uranus rotates on its side and has rings.



Methane gas gives Neptune's atmosphere its color.

Neptune

Neptune is the eighth planet from the sun. Named after the Roman god of the sea, Neptune cannot be seen without a telescope. Like Uranus, Neptune appears greenish blue because of methane gas in its atmosphere. Neptune also has a ring system.

It takes Neptune 165 Earth years to complete a revolution around the sun.

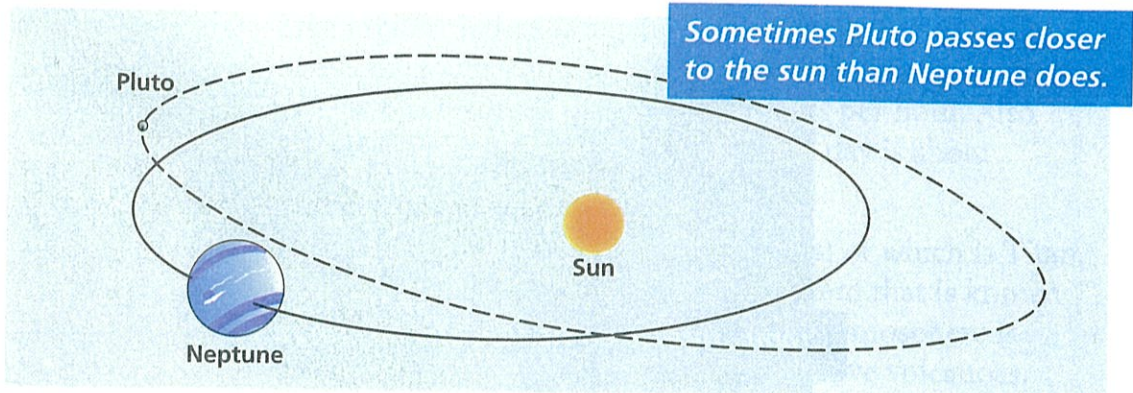
The planet rotates once on its axis every 16 hours.

Neptune has two moons. One of them, Triton, is unusual because it rotates in the opposite direction from Neptune's rotation. Triton also has active volcanoes.

Pluto

Pluto is the outermost planet of the solar system, but it is not always the farthest from the sun. Part of its orbit goes inside the orbit of Neptune.

Pluto is much smaller than the other outer planets, and it is the only outer planet without a thick atmosphere. Pluto has one known moon, Charon. At an average distance from the sun of almost six billion kilometers, Pluto takes 248 Earth years to make one revolution. Pluto seems to rotate about once every six days.

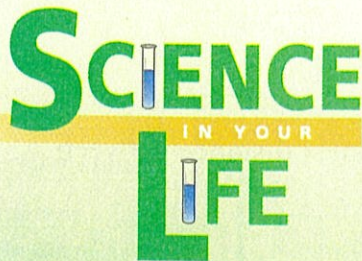


Facts About the Outer Planets

	Jupiter	Saturn	Uranus	Neptune	Pluto
Distance from the sun (millions of kilometers)	774	1,420	2,853	4,470	5,866
Diameter (kilometers)	143,000	120,000	51,520	50,000	2,300
Number of satellites (moons)	16	18	15	2	1
Length of day (Earth hours)	10	10	17	16	6 days
Length of year (Earth years)	12	29	84	165	248

Self-Check

1. What are the five outer planets of the solar system?
2. What kind of matter are the large outer planets made of?
3. Which of the outer planets have rings?
4. Which is the largest planet in the solar system?
5. Which outer planet has the same number of moons as Earth has?



How fast is that CD?

The planet Uranus takes 84 years to revolve around the sun. You could also say that Uranus has a period of revolution of 84 years. Mercury's period of revolution is 88 days, more than 300 times greater than that of Uranus. An extremely fast period of revolution is measured in revolutions per minute, or rpm. One rpm is equal to one full turn every minute. A compact disc can turn at 500 revolutions per minute. At that speed, how many times does a CD turn in one second? How many times in one hour? How did you find out? How fast is that CD?