

Neptune's composition is that of a gas giant: (1) upper atmosphere, (2) atmosphere composed of hydrogen, helium and methane gas, (3) mantle of water, ammonia and methane ice, (4) core of rock and ice.

## Extremes of Cold and Wind

Neptune's blue color is mostly because of frozen methane (CH<sub>4</sub>). When Voyager 2 visited Neptune in 1986, there was a large dark-blue spot that scientists named the Great Dark Spot, south of the equator. When the Hubble Space Telescope took pictures of Neptune in 1994, the Great Dark Spot had disappeared but another dark spot had appeared north of the equator. Astronomers think that both of these spots represent gaps in the methane clouds on Neptune.

The changing appearance of Neptune is caused by its turbulent atmosphere. The winds on Neptune are stronger than on any other planet in the solar system, reaching speeds of 1,100 km/h (700 mi/h), close to the speed of sound. This extreme weather surprised astronomers, since the planet receives little energy from the Sun to power weather systems. Neptune is also one of the coldest places in the solar system. Temperatures at the top of the clouds are about -218°C (-360°F).

## Neptune's Rings and Moons

Neptune has faint rings of ice and dust that may change or disappear in fairly short time frames.

Neptune has 13 known moons. Triton, shown in **Figure** below, is the only one of them that has enough mass to be spherical in shape. Triton orbits in the direction opposite to the orbit of Neptune. Scientists think Triton did not form around Neptune, but instead was captured by Neptune's gravity as it passed by.



This image Triton, Neptune's largest moon, was taken by Voyager 2 in 1989.

Fly by Neptune's moon Triton by watching this video: http://www.space.com/common/media/video/player.php?videoRef=mm32\_SunDeath#playerTop

## Lesson Summary

- The four outer planets are all gas giants made primarily of hydrogen and helium. They have thick gaseous outer layers and liquid interiors.
- The outer planets have numerous moons, as well as planetary rings.
- Jupiter, by far the largest planet in the solar system, has bands of different colored clouds, and a long-lasting storm called the Great Red Spot.
- Jupiter has more than 60 moons including the four largest, the Galilean moons.
- Europa has an ocean of liquid water under a layer of ice where life may have formed.
- Saturn is smaller than Jupiter but has a large system of beautiful rings.
- Titan's atmosphere is similar to early Earth's and the moon could harbor primitive life.
- Uranus and Neptune were discovered relatively recently since they are so far away.
- Uranus is tilted on its side, probably because of a past collision with a large object.
- Neptune is very cold and has strong winds. Its dark spots are storms in Neptune's atmosphere.

## **Review Questions**

- 1. Name the outer planets a) in order from the Sun outward, b) from largest to smallest by mass, and c) from largest to smallest by size.
- 2. Why are the outer planets called gas giants?
- 3. How do the Great Red Spot and Great Dark Spot differ?
- 4. Name the Galilean moons, and explain why they have that name.
- 5. Why might Europa be a likely place to find extraterrestrial life?