

St Aiden's Homeschool



Our Solar System

Jupiter

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Jupiter

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Jupiter Facts:

- *Due to its magnetic field trapping particles from the Sun, Jupiter is surrounded by very powerful radiation belts which would kill anyone who entered them.*
- *Jupiter's moon Europa is thought to have a giant ocean below its surface*
- ***Jupiter** is by far the largest planet within our Solar System: two and a half times larger than all of the other planets put together.*
- *It is the fifth planet from the Sun and one of the brightest planets.*
- *Jupiter is sometimes called a "gas giant" because most of this planet is made up of liquid and gas.*

How Big is Jupiter?

Jupiter is 142,984 km or about 11 Earths in diameter at the **equator**. That makes it about one tenth as big as the Sun! You could fit about 1,400 Earths into the volume of Jupiter. It is 133,709 km or 10 Earths in diameter from pole to pole. Jupiter's rapid **rotation** makes it bulge out at the equator.

Jupiter's magnetic field is the largest single planetary thing in the Solar System. It is 26 million kilometers across, making it about 20 times bigger than the Sun. It has a tail that extends past Saturn's orbit. If it could be seen from Earth, it would appear to be five times the size of the full moon.

Comparing the sizes of Earth and Jupiter



Jupiter : Fast Facts

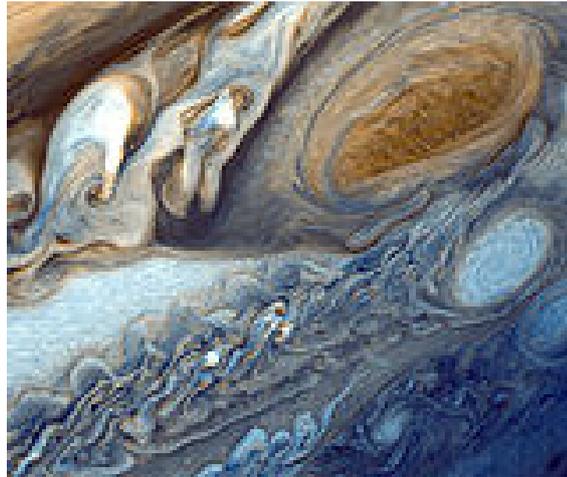
Jupiter is so large that all of the other planets in the solar system could fit inside of it.

Jupiter is a large gas planet whose clouds change colours daily. This planet is made mostly of hydrogen and helium gases. Jupiter gives off two times more heat than it gets from the Sun. It shines very brightly in the night sky for nine months of the year when it is closest to Earth. Huge areas of swirling gases can be found in Jupiter's atmosphere. The largest swirling area of gas is called the Great Red Spot. Scientists believe this is a large hurricane-like storm which has lasted for hundreds of years. Large bolts of lightning have also been seen in Jupiter's atmosphere. Pictures taken by space probes have shown thin rings around Jupiter. Jupiter has forty-nine named moons (and may have as many as 63!). One of Jupiter's moons, Io, has active volcanoes on it. Areas on Io that are near the volcanoes are very, very hot.

In July of 1994, Jupiter was hit by pieces of the Shoemaker-Levy comet. Dark areas appeared in Jupiter's atmosphere after the large pieces hit the planet.

What is the surface like on Jupiter ?

The surface we see is not solid. This enormous planet has a relatively small solid and rocky core. Liquids and gases surround this core and blend with the atmosphere.



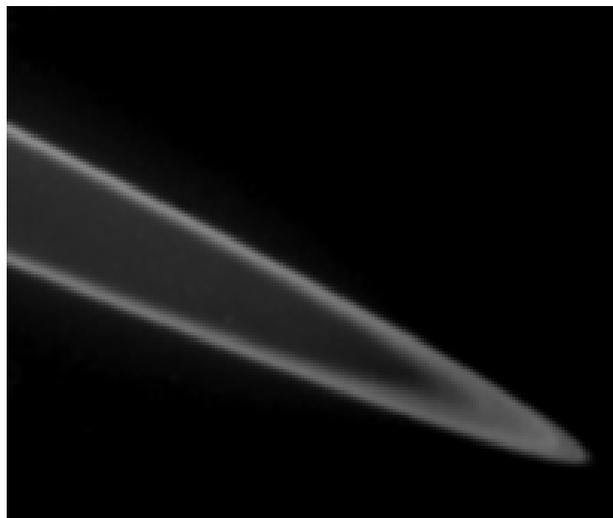
Jupiter is a cloudy, windy and stormy planet. It is always covered by a layer of clouds, and wind speeds of 600 km/h are not uncommon. The storms are visible as swirls, bands and spots. A particularly violent storm, about three times Earth's diameter, is known as the Great Red Spot. This storm has been in existence for nearly 300 years!

The layer of clouds is divided into several bands. The lighter coloured bands are called **zones** and the darker bands are called **belts**. The colours are caused by small changes in the temperature and chemistry. Each band rotates in the opposite direction from its neighbours. Along the edges where the bands meet, these winds collide and create swirling patterns.

The stormy atmosphere of Jupiter has flashes of lightning just like on Earth. However these can be up to 100 times more powerful. The lightning is made by water near the tops of the clouds.

What are its rings like?

Jupiter's rings are dark and hard to see. They are made of tiny particles that meteors knocked off Jupiter's small inner moons and debris left over from comets and other objects that came close to the surface of Jupiter. In fact, until the Voyager spacecraft arrived near Jupiter and took close-up pictures of the rings of Jupiter, scientists didn't even know that it even had rings at all. Two rings are clearly from material that can be associated with two sets of the inner moons of the planet.



These are the names of the rings and their sizes:

Rings of Jupiter		
Ring Name	Inner Radius	Outer Radius
Halo	100,000 km	122,000 km
Main	122,000 km	129,000 km
Gossamer (inner)	129,000 km	182,000 km
Gossamer (outer)	182,000 km	225,000 km

What are its moons like?

Did You Know?

Jupiter has 63 known moons. There are four major moons that were discovered by Galileo in 1610. Those moons are Io, Europa, Ganymede and Callisto. They are called the Galilean moons. There are often eclipses on Jupiter's cloud tops by the Galilean moons.

Amalthea Group

There are four small moons **orbiting** inside Io's orbit. That group is called the Amalthea group because Amalthea is the largest one. They are all small and potato shaped. Amalthea is very red. The material of Jupiter's rings came from meteors knocking it off of those moons.

Io

Io (pronounced EYE-oh) is Jupiter's closest major moon. It is 3643.2 km across, slightly larger than Earth's Moon. It has the most spectacular **volcanoes** in the solar system and molten **sulphur** lakes. Any craters formed by asteroids hitting the surface are quickly covered up by the volcanic activity. Io's core is made of molten **iron** and is surrounded by a rock shell. Unlike Jupiter's other moons, there is very little water on Io. Scientists think that when Jupiter was forming, it was hot enough to dry out Io, but not the other major moons. In Roman mythology, Io was a beautiful young woman that Jupiter loved.

Europa

Europa is 3,121.6 km across, about ten percent smaller than Earth's Moon. It is made of silicates and has a layer of smooth water ice 10 to 30 km thick. The ice has long cracks in it and very few craters. It looks like the sea ice on Earth. The ice had slid around at the cracks. There is liquid water under the ice up to 100 km below the surface. There are also some large spots on the surface. In Roman mythology Europa was courted by Jupiter in the form of a bull.

Jupiter as seen by the space probe "Cassini". This is the most detailed colour portrait of Jupiter ever assembled.



Ganymede

Ganymede is 5262.4 km across, making it 380 km wider than Mercury. It is Jupiter's largest moon and the largest moon in the Solar System. It had **plate tectonics** like Earth. There are older, darker regions and newer areas with grooves where the plates have moved. Newer craters have bright rays around them from material thrown up by impacts. Older craters look flat and faded because the icy surface does not hold the shape of the crater as well as rock does over long periods of time. Ganymede may have an iron and sulphur core with a silicate **mantle** and an icy shell. It may be like Io except with a layer of ice on it. In Roman mythology Ganymede was a beautiful young man who Jupiter kidnapped and made cupbearer to the gods on Mt. Olympus.

Callisto

Callisto is 4820.6 km across, about the same size as Mercury. It has many craters. Like craters on Ganymede, the older craters had faded. The largest crater is *Valhalla*. It has a bright centre 600 km across with rings around it up to 3000 km across. Callisto is made of silicates and ice. There is a 200 km thick icy **crust** with a

liquid water sea under it. In Roman mythology Callisto was turned into a bear by Jupiter's jealous wife Juno. Later Jupiter placed her in the stars as The Great Bear.

Other moons

The other moons are tiny ones in several groups outside the orbits of the major moons, there is a small moon, Themisto and four groups of little moons that orbit very far from Jupiter.

How long is a day on this planet?

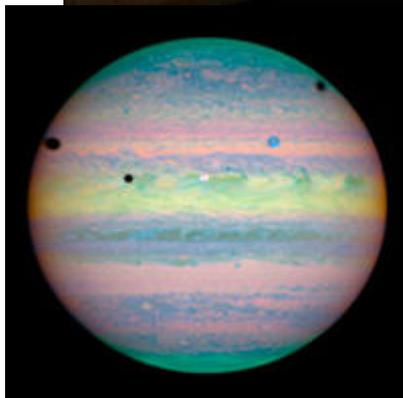
One Jupiter day is about 10 Earth hours long. You have to say "about" because different parts of Jupiter rotate about its axis at different speeds. This is caused by the fact that Jupiter is mostly gases that are in constant motion and sometimes going in opposite directions. Some efforts have been made to try and measure the rotation speed of the inner rocky core of Jupiter, but that has proved to be quite difficult to accomplish due to the magnetic fields that surround Jupiter and the very active radio energy that is generated by the atmosphere of Jupiter, which interferes with measuring techniques like radar that has been used to measure the surface of Venus and Mars.

How long is a year on this planet?

The Great Red Spot



Jupiter Eclipses



One year on Jupiter is 4,335 Earth days or 11.87 Earth years long.

A Jupiter year is about equal to four-tenths (or two-fifths) of a Saturn year. Thus after every two Saturn years, Jupiter has completed five full orbits about the Sun. So after 59 years, Saturn and Jupiter will be back in nearly the same position.

When the orbits of two planets are simple ratios of each other like this, it is called a **resonance**.

How much would Jupiter's gravity pull on me?

If someone were floating close to the cloud tops of Jupiter, it would pull them down with a force about two and a half times as strong as the force of Earth's gravity.

Jupiter's rapid rotation causes the equator to bulge out. This would also cancel out about 10 percent of gravity's force on them if they were at the equator. The amount of this counteraction becomes lower the closer they get to the poles.

Who is it named after?

Statue of Zeus (Jupiter) in Olympia, Greece



Jupiter is named after the chief of the Roman gods, also called Zeus in ancient Greece. It was so named because of the planet's enormous size, which dominates all the others.

Fact Sheet

Orbit

5.20 astronomical units (AU) from the Sun
Earth is 1 AU from the Sun

Length of year

11.9 Earth years

Length of Day

9.9 Earth hours

Tilt of Rotation Axis

3.1 degrees versus 23.5 degrees for Earth

Size

Diameter: 11.0 times the diameter of Earth

Surface Gravity

2.36 times greater than Earth's gravity

If you weigh 80 pounds on Earth, you would weigh about 203 pounds on Jupiter!

Mass

Jupiter is more than twice as massive as all of the other planets combined; it is 318 times as massive as Earth.

Atmosphere

Jupiter is about 90% hydrogen and 10% helium, with traces of methane, water, ammonia and "rock." This is very close to the composition of the primordial solar nebula from which the entire solar system was formed. Saturn has a similar composition, but Uranus and Neptune have much less hydrogen and helium.

Surface

The gas planets do not have solid surfaces; their gaseous material simply gets denser with depth. What we see when looking at these planets are the tops of clouds high in their atmospheres.

Moons

As of February, 2004, Jupiter has 63 known satellites: the four large Galilean moons, 34 smaller named moons, plus many more small moons discovered recently and not yet named.

Past Missions

Jupiter was first visited by Pioneer 10 in 1973 and later by Pioneer 11, Voyager 1, Voyager 2, Ulysses, and Cassini-Huygens. The spacecraft Galileo orbited Jupiter for eight years. Jupiter is still regularly observed by the Hubble Space Telescope.

Jupiter

Fifth planet from the Sun



USGS/NASA PIA00343

The largest and most massive of the planets was named Zeus by the Greeks and Jupiter by the Romans; this was the most important deity in both mythologies. Some satellites in the Jovian system are named for Zeus/Jupiter's lovers and descendants.

Beneath thousands of miles of hydrogen, helium, methane, and ammonia, Jupiter's solid core is probably 10 to 20 times as massive as Earth.

Jupiter is visible to the naked eye without the aid of a telescope. Its motion against the field of background stars shows it to be a planet. The word "planet" is derived from a Greek word for "wanderer."

Student Activity ~ Jupiter

Describe Jupiter.

How big is it?

What is its surface like?

Why is there no life on Jupiter?

How many Moons does Jupiter have?

How long is a day and a year on this planet?

What is Jupiter made of?

What are its rings like?

What are its moons like?

- **Amalthea Group**

- **Io**

- **Europa**

- **Ganymede**

- **Callisto**

- **Other moons**
