

Name: \_\_\_\_\_

# The Sun

The Sun is an average sized \_\_\_\_\_. Earth, Mars, Jupiter and Uranus are \_\_\_\_\_.

A star is the only object in space that makes its own \_\_\_\_\_. This includes \_\_\_\_\_ and \_\_\_\_\_.

The sun is about \_\_\_\_\_ million miles from Earth. This distance is known as 1 \_\_\_\_\_ or \_\_\_\_\_ unit.

The closest other stars are about \_\_\_\_\_ AUs from the solar system!

The Sun is made up of what two gases? \_\_\_\_\_ 71% and \_\_\_\_\_ 27%

## What are the layers of the sun?

\_\_\_\_\_ - where most of its energy is produced. It is 10-20 million degrees Celsius here!

\_\_\_\_\_ - energy moves out in all directions. It takes energy takes millions of years to move through this layer!

\_\_\_\_\_ - gases here move in circles. It takes about a week for energy to move through layer.

\_\_\_\_\_ - this is the visible surface of the Sun. The gases here are very still hot, but much cooler than inside – about 6,000°C.

## Sun's Atmosphere

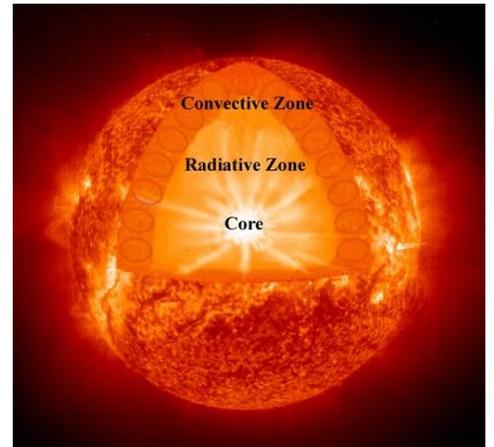
\_\_\_\_\_ - is the inner layer of the Sun's atmosphere. When it is visible it appears as a red circle around the Sun.

\_\_\_\_\_ - the outer layer of the Sun's atmosphere. It can take on many shapes.

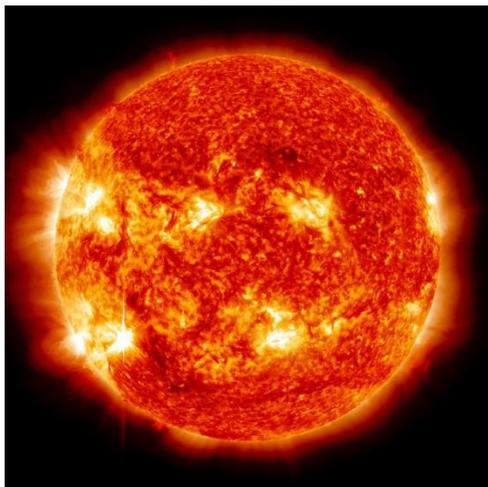
\_\_\_\_\_ - these are bursts of energy that stretch from these two layers into space. These can interrupt radios, cell phones and TV here on Earth. In the photo above, can you find one of these in the top picture above?

\_\_\_\_\_ - this is a dark spot on the photosphere. They appear dark because their temperatures are lower than other gases around them. They can be as small as 600 miles across to up to many thousands of miles.

\_\_\_\_\_ - these are hotter areas of the photosphere. They usually last for several days.



# The Sun



The Sun is an average sized **star**. Earth, Mars, Jupiter and Uranus are **planets**.

A star is the only object in space that makes its own **energy**. This includes **heat** and **light**.

The sun is about **93** million miles from Earth. This distance is known as **1 AU** or **astronomical** unit.

The closest other stars are about **270,000** AUs from the solar system!

The Sun is made up of what two gases? **hydrogen** 71% and **helium** 27%

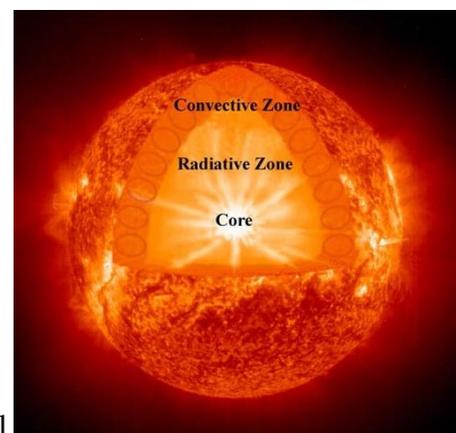
## What are the layers of the sun?

**core** - where most of its energy is produced.  
It is 10-20 million degrees Celsius here!

**radiative zone** - energy moves out in all directions.  
It takes energy takes millions of years to move through this layer!

**convective zone** - gases here move in circles. It takes about a week for energy to move through layer.

**photosphere** - this is the visible surface of the Sun. The gases here are very still  
– about 6,000°C.

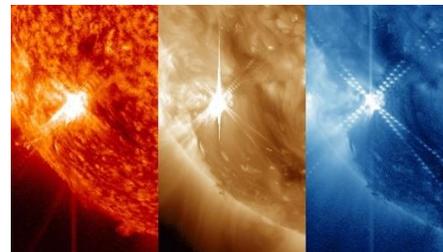


## Sun's Atmosphere

**chromosphere** - is the inner layer of the Sun's atmosphere. When it is visible it appears as a red circle around the Sun.

**corona** - the outer layer of the Sun's atmosphere. It can take on many shapes.

**solar flare** - these are bursts of energy that stretch from these two layers into space. These can interrupt radios, cell phones and TV here on Earth. In the photo above, can you find one of these in the top picture above? (It is in the lower left hand corner. This is an actual image provided by NASA from Nov. 2012.)



**sunspots** - this is a dark spot on the photosphere. They appear dark because their temperatures are lower than other gases around them. They can be as small as 600 miles across to up to many thousands of miles.

**flares**- these are hotter areas of the photosphere. They usually last for several days.

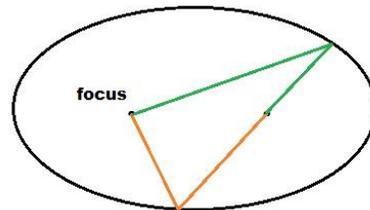
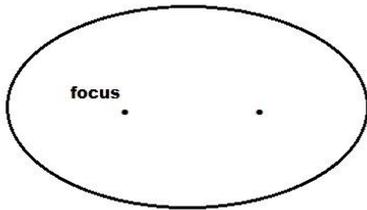
Name: \_\_\_\_\_

# Planetary Orbits

What are some of the things that orbit around the Sun?

What is the shape of the orbit of the planets?

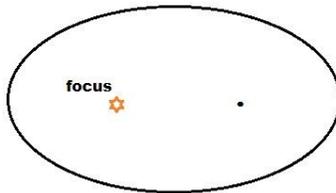
A circle has \_\_\_\_\_ center point, whereas an ellipse has \_\_\_\_\_ foci (below left).



If you add the distance of each of those foci to the same point on the ellipse, they always add up to the same amount. In other words, if you add the length of the two orange lines above (right) and you add the length of the two green lines above, the sums will both be equal.

An astronomer named Johannes \_\_\_\_\_ described the motion of the planets around the Sun. His descriptions are now called \_\_\_\_\_'s Laws of Planetary Motion. Here are his three laws:

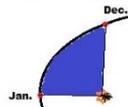
1. All planets travel in \_\_\_\_\_ orbits with the \_\_\_\_\_ at one focus.



Nothing is at the other focus!

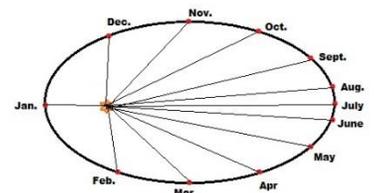
2. Each planet travels in such a way that a line joining the planet and the Sun sweeps equal \_\_\_\_\_ in equal \_\_\_\_\_.

By area... imagine in the diagram below a short, fat area and a long thin area.



Farther away from the sun, the planet moves more \_\_\_\_\_.

Closer to the sun, the planet moves more \_\_\_\_\_. Compare the distance traveled between June and July to the distance traveled from December to January.



3. The \_\_\_\_\_ a planet is from the Sun, the \_\_\_\_\_ it takes to go around the Sun.

# Planetary Orbits

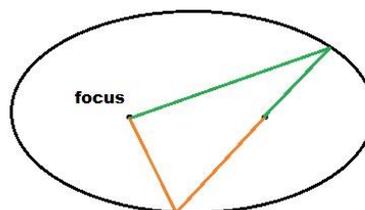
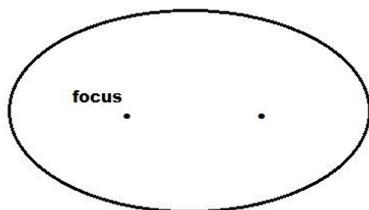
What are some of the things that orbit around the Sun?

Planets, moons, asteroids, comets

What is the shape of the orbit of the planets?

ellipse

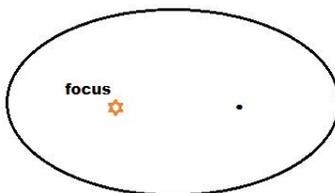
A circle has **one** center point, whereas an ellipse has **two** foci (below left).



If you add the distance of each of those foci to the same point on the ellipse, they always add up to the same amount. In other words, if you add the length of the two orange lines above (right) and you add the length of the two green lines above they will both be equal.

An astronomer named Johannes **Kepler** described the motion of the planets around the Sun. His descriptions are now called Kepler's Laws of Planetary Motion. Here are his three laws:

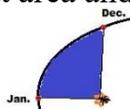
1. All planets travel in **elliptical** orbits with the **Sun** at one focus.



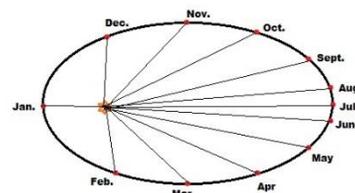
Nothing is at the other focus!

2. Each planet travels in such a way that a line joining the planet and the Sun sweeps equal **areas** in equal **times**.

By area... imagine in the diagram below a short, fat area and a long thin area.



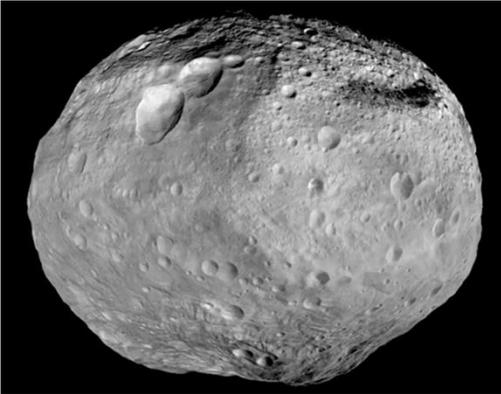
Farther away from the sun, the planet moves more **slowly**. Closer to the sun, the planet moves more **quickly**. Compare the distance traveled between June and July to the distance traveled from December to January.



3. The **further** a planet is from the Sun, the **longer** it takes to go around the Sun.

Name: \_\_\_\_\_

## Smaller Objects in our Solar System

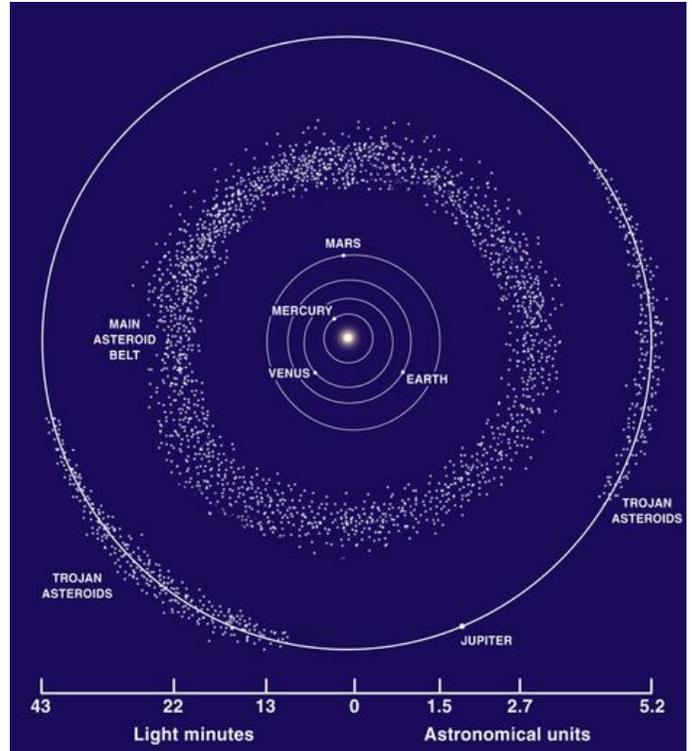


\_\_\_\_\_ : These are rocks that travel around the Sun. They are sometimes called minor \_\_\_\_\_. Scientists believe these rocky remnants are left over from the formation of the solar system 4.6 billion years ago. There are millions of asteroids. Most of them are in the asteroid \_\_\_\_\_ which lies between Mars and Jupiter.

Asteroids are covered in a layer of fine rock and dust called \_\_\_\_\_. Most asteroids are less than 328 feet wide. Larger asteroids are \_\_\_\_\_, while smaller asteroids are irregular in shape. All asteroids have craters that are caused by space object impacts.

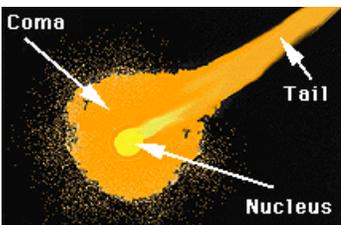
The largest asteroid is called \_\_\_\_\_. It is almost \_\_\_\_\_ miles wide.

The Galileo spacecraft found that asteroids can have \_\_\_\_\_.



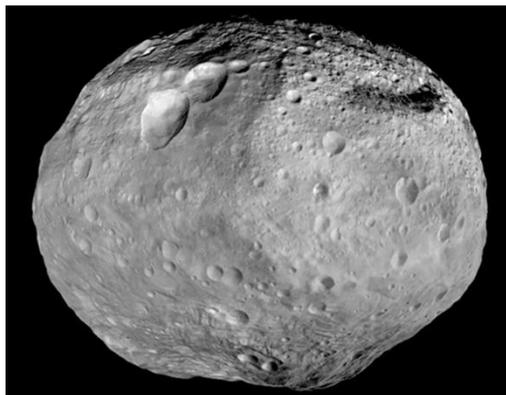
\_\_\_\_\_ : This is a mass of rock, frozen gases, ice and dust. Usually, a comet has two or three \_\_\_\_\_ behind it.

The \_\_\_\_\_ of a comet is a mix of ice and rock dust. As a comet nears the Sun, a tail of gas and dust forms. The tail points \_\_\_\_\_ from the Sun.



When a comet is far away from the Sun, it has a cold, dusty surface. When it comes closer to the Sun, it heats up and releases gas and dust. This glowing cloud around comet is called a \_\_\_\_\_.

## Smaller Objects in our Solar System

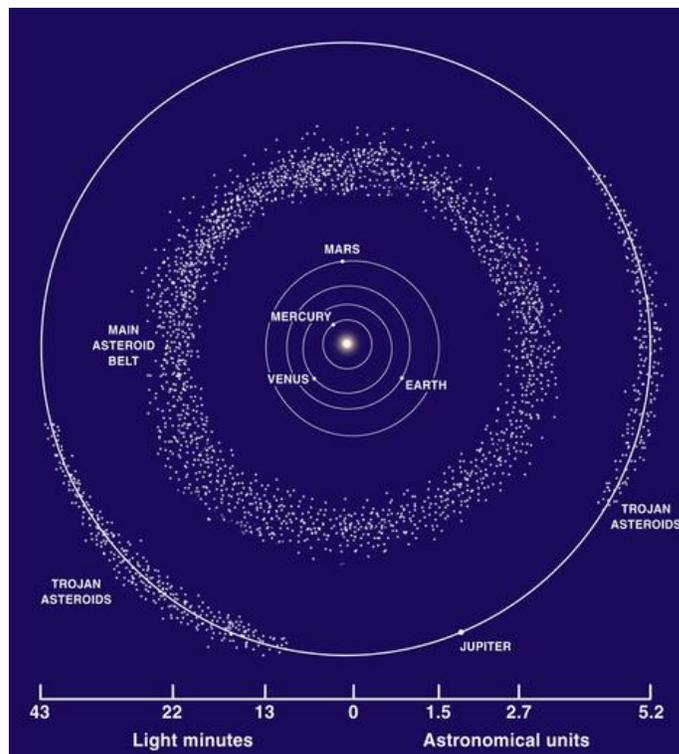


**asteroids:** These are rocks that travel around the Sun. They are sometimes called minor **planets**. Scientists believe these rocky remnants are left over from the formation of the solar system 4.6 billion years ago. There are millions of asteroids. Most of them are in the asteroid **belt** which lies between Mars and Jupiter.

Asteroids are covered in a layer of fine rock and dust called **regolith**. Most asteroids are less than 328 feet wide. Larger asteroids are **round**, while smaller asteroids are irregular in shape. All asteroids have craters that are caused by space object impacts.

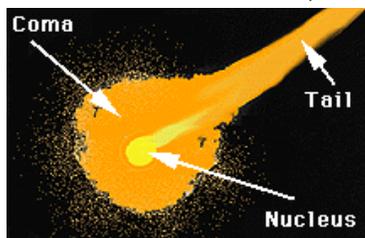
The largest asteroid is called **Ceres**. It is almost **621** miles wide.

The Galileo spacecraft found that asteroids can have **moons**.



**Comets:** A comet is a mass of rock, frozen gases, ice and dust. Usually, a comet has two or three **tails** behind it.

The **nucleus** of a comet is a mix of ice and rock dust. As a comet nears the Sun, a tail of gas and dust forms. The tail points **away** from the Sun.



When a comet is far away from the Sun, it has a cold, dusty surface. When it comes closer to the Sun, it heats up and releases gas and dust. This glowing cloud around comet is called a **coma**.



