Name_____ Test Date _____ Hour__

ASTRONOMY#3 - NOTEBOOK

The Solar System

LEARNING TARGETS

- ❑ **I can describe the objects that make up our solar system.**
- ❑ **I can identify the inner and outer planets.**
- ❑ **I can explain the difference between the inner planets and outer planets.**
- ❑ **I can describe the asteroid belt and identify its location.**
- ❑ **I can describe the difference between a planet and an asteroid.**
- ❑ **I can explain how a comet is different from an asteroid.**
- ❑ **I can describe the composition of a comet and its tail.**
- ❑ **I can describe the characteristics of a comet as it moves through its orbit around the Sun.**
- ❑ **I can use AUs to show the distances of the planets from the Sun.**
- ❑ **I can compare planets using their masses, rotations and revolutions.**

SCIENTIFIC LANGUAGE

1. **Solar System** – The collection of eight planets and their moons along with other smaller bodies that orbit around the sun.
2. **Planet**– A celestial body moving in an elliptical orbit around a star.
3. **Inner Planets**– The four smaller planets made mostly of rocky materials.
4. **Outer Planets**– The four larger planets having thick atmospheres and no solid surface.
5. **Asteroid** – Small rocky body orbiting the Sun.
6. **Asteroid Belt** – A disc of small rocky bodies in the Solar System between the orbits of Mars and Jupiter.
7. **Astronomical Unit**– The average distance between the center of Earth to the center of the Sun.
8. **Comets** – A celestial object consisting of a nucleus of ice and dust that forms a "tail" which points away from the Sun when near it.
9. **Kepler's 2nd Law of Planetary Motion**– The closer an object is in its orbit around the Sun, the faster it moves.
10. **Moon** – A natural satellite of a planet.

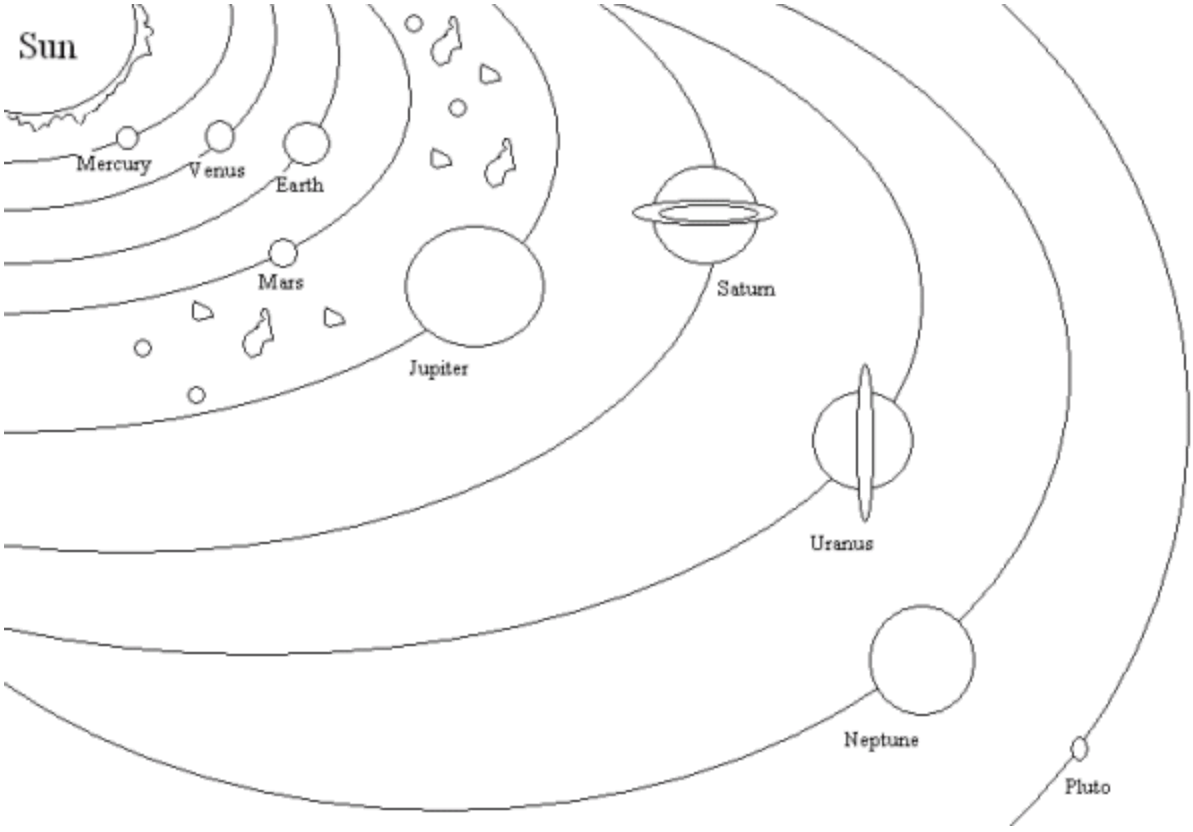
Our Solar System

Solar System

Our Solar System is made up of _____ planets, including Earth, and smaller objects that orbit the _____. The Sun contains _____% of the mass of the solar system and is the central object because of its huge _____ pull.

The Planets

Planets are celestial bodies moving in an elliptical _____ around a _____. The planets in our Solar System are divided into two smaller categories: the _____ planets and the _____ planets based on _____ and their general make-up (_____).



The Inner Planets

The Inner Planets are called the _____ planets. These are small, rocky planets with _____ cores. They are located between the _____ and the _____ belt. These planets include _____ , _____ , _____ and _____ .

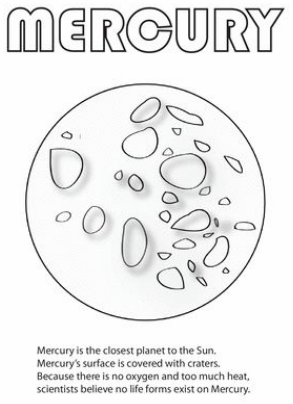
Mercury - _____ planet from the Sun

_____ of the size of Earth

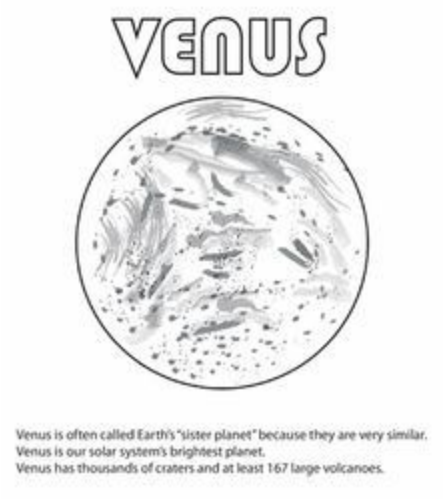
_____ moons

_____ atmosphere

Temperatures range from _____ to _____



Mercury is the closest planet to the Sun.
Mercury's surface is covered with craters.
Because there is no oxygen and too much heat, scientists believe no life forms exist on Mercury.



Venus is often called Earth's "sister planet" because they are very similar.
Venus is our solar system's brightest planet.
Venus has thousands of craters and at least 167 large volcanoes.

Venus- _____ planet from the Sun

About the _____ size diameter and mass as Earth

Earth's _____ , except she's hotter

_____ moons

_____ atmosphere with sulfuric _____ rain

Temperatures average about _____ due to the huge _____ effect

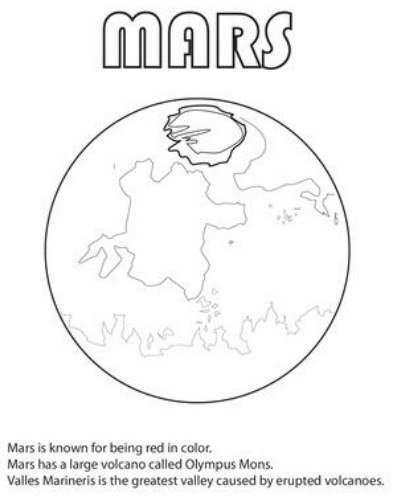
Earth is about 4.5 billion years old.
71% of Earth's surface is covered by water.
Unlike other planets, Earth's crust is divided into plates that move above the mantle below.

Earth- _____ planet from the Sun

_____ moons

Atmosphere of nitrogen and _____ that allows _____ to exist

Temperatures average about _____ (_____)



Mars is known for being red in color.
Mars has a large volcano called Olympus Mons.
Valles Marineris is the greatest valley caused by erupted volcanoes.

Mars- _____ planet from the Sun

_____ of the size of Earth

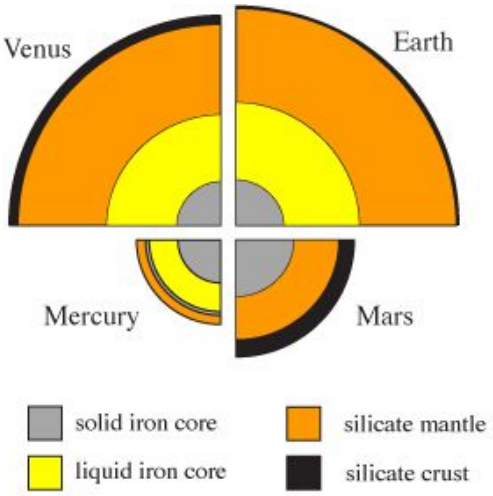
_____ moons

Atmosphere is mostly carbon dioxide and is _____

Temperatures range from _____ to _____

What do these all have in common??

Relatively _____, very few to no _____, solid _____ planets, they are _____ to the sun and _____ together, and they are inside the _____ belt.



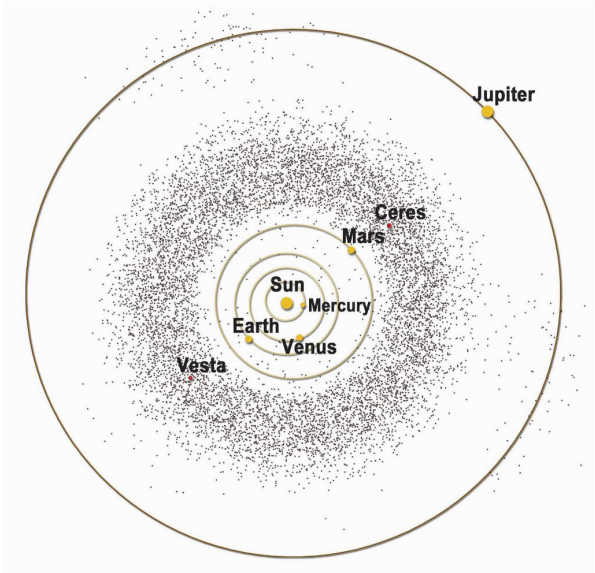
Terrestrial planet interiors to same scale

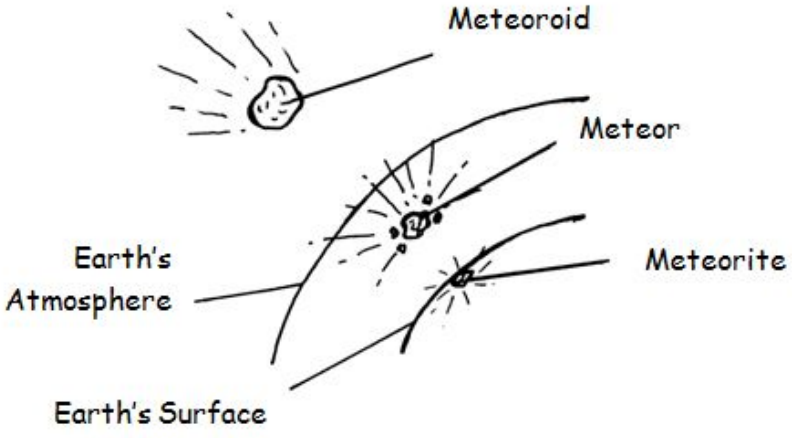
The Asteroid Belt

Made up of asteroids which are _____ _____ bodies orbiting the _____. The largest, Ceres, is nearly _____ across, it is called a dwarf planet. Scientist believe the rocks are left over from a _____ that never formed.

Asteroids _____ as the _____ around the Sun, just like the planets. Some asteroids even have _____! We have even landed a space _____ on the asteroid Eros.

Smaller rocks and particles orbiting the sun are called _____. If these happen to enter Earth's atmosphere we call them a _____ or _____ _____. If there are pieces left over that land on Earth's surface we call these _____.

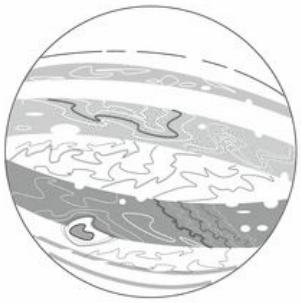




The Outer Planets

The Outer Planets are called the _____ _____. These planets are much _____ and are made mostly of lighter substances such as hydrogen, helium, methane and ammonia. They are located _____ the asteroid belt. The outer planets include _____, _____, _____ and _____.

JUPITER



Jupiter has at least 64 moons.
Jupiter's atmosphere has many cloud layers and different bands, which cause many storms.
The Great Red Spot on Jupiter is a giant storm.

Jupiter- _____ planet from the Sun

_____ times the size of Earth

_____ moons (and counting)

Atmosphere is hydrogen and helium, and is very _____

The large ____ _____ is a huge storm, ___ to ___ times larger than Earth

Does not have a _____surface

Temperatures average _____ at cloud level

Saturn- _____ planet from the Sun

_____ times the size of Earth

_____ moons (and counting)

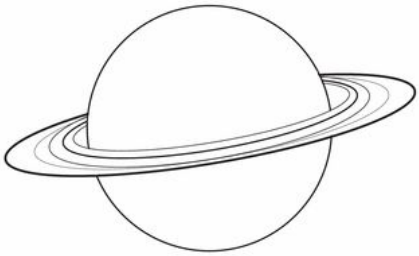
Atmosphere is hydrogen and helium

Has a _____ system surrounding the planet made of water _____ with some rocky material

Does not have a _____ surface

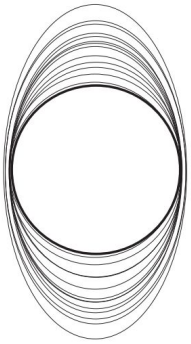
Temperatures average _____

SATURN



Saturn is the second largest and sixth planet from the sun.
Saturn's rings are 93% ice and 7% amorphous carbon.
Saturn has over 62 moons, Titan being the largest.

URANUS



Uranus's axis of rotation is tilted on its sides so the north and south poles are located where most planets have their equators.
Uranus is the coldest planet and is composed of clouds, rock and ice.
Uranus has 13 rings but they are very dark. The lightest one is called Epsilon.

Uranus- _____ planet from the Sun

_____ times the size of Earth

_____ moons (and counting)

Atmosphere is hydrogen, helium and methane

Uranus rotates on its _____

Does not have a _____ surface

Temperatures average _____

Neptune - _____ planet from the Sun

_____ times the size of Earth

_____ moons (and counting)

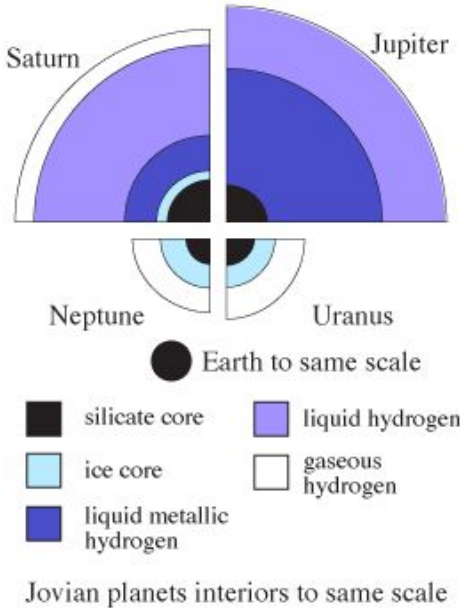
Atmosphere is methane, this gives it the _____ _____ color

Revolution path can cross _____ orbital path

Does not have a _____ surface

Temperatures average _____

Neptune is the farthest planet from the Sun.
The Great Dark Spot is located on the southern hemisphere. It is created by the many storms and strong winds on Neptune.
Neptune's planetary rings are made of ice.



Jovian planets interiors to same scale

What do these all have in common??

Relatively _____, many _____, no _____ surface planets, they are _____ from each other and the sun, and they are outside the _____ belt.

Pluto - In 2006, Pluto was reclassified as a _____ planet, because of its _____in space and its _____ size.

In July 2015, a space probe called _____ _____ (launched by NASA in January 2006) had its flyby for Pluto. New Horizons collected _____ and took _____ of Pluto. http://pluto.jhuapl.edu/index.php

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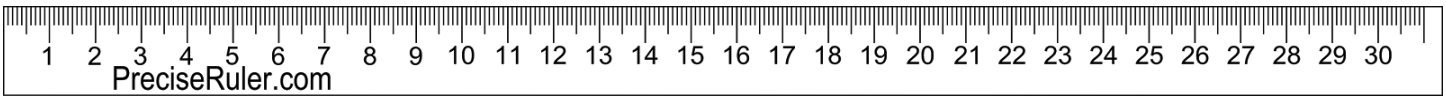
Planetary Comparisons

Distance - To compare distances between between objects in space, we have to use a different unit. The unit we use is called an _____ _____ (AU) and it represents the average distance between the center of _____ to the center of the _____ . One AU is equal to _____ miles (149,597,870.691 km). New Horizons is currently about _____ AUs from Earth.

Average Distance of the Planets from the Sun

Planet	Average Distance (km)	Average Distance (AU)
Mercury	57,910,000	0.39
Venus	108,210,000	0.72
Earth	149,600,000	1.00
Mars	227,920,000	1.52
Jupiter	778,570,000	5.20
Saturn	1,433,530,000	9.58
Uranus	2,872,460,000	19.20
Neptune	4,495,060,000	30.05

Use this ruler to show the average distances of the planets to the Sun. Use the scale 1 AU = 1 cm



Mass - To compare the mass of planets, we also have to use a different unit. The unit we use is the mass of the _____ . This means we set the mass of Earth equal to _____. Then, we use that amount to express the mass of the _____ planets. For example, the mass of Venus, our twin, is _____. This means it is close to the mass of _____, but a little _____.

This chart includes the mass of the other planets compared to Earth.

Solar System Data

Celestial Object	Mean Distance from Sun (million km)	Period of Revolution (d=days) (y=years)	Period of Rotation at Equator	Eccentricity of Orbit	Equatorial Diameter (km)	Mass (Earth = 1)	Density (g/cm³)
SUN	—	—	27 d	—	1,392,000	333,000.00	1.4
MERCURY	57.9	88 d	59 d	0.206	4,879	0.06	5.4
VENUS	108.2	224.7 d	243 d	0.007	12,104	0.82	5.2
EARTH	149.6	365.26 d	23 h 56 min 4 s	0.017	12,756	1.00	5.5
MARS	227.9	687 d	24 h 37 min 23 s	0.093	6,794	0.11	3.9
JUPITER	778.4	11.9 y	9 h 50 min 30 s	0.048	142,984	317.83	1.3
SATURN	1,426.7	29.5 y	10 h 14 min	0.054	120,536	95.16	0.7
URANUS	2,871.0	84.0 y	17 h 14 min	0.047	51,118	14.54	1.3
NEPTUNE	4,498.3	164.8 y	16 h	0.009	49,528	17.15	1.8
EARTH'S MOON	149.6 (0.386 from Earth)	27.3 d	27.3 d	0.055	3,476	0.01	3.3

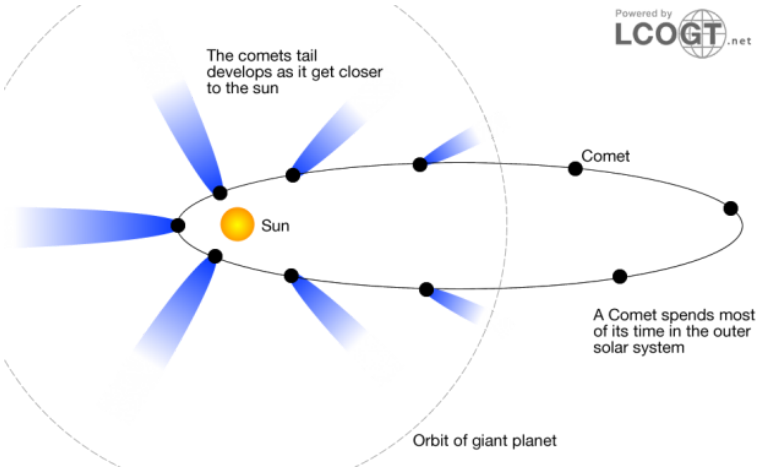
Comets

Comets are also a part of our solar system. They are often called _____ _____. Comets are small _____ bodies containing _____, _____ , carbon dioxide, ammonia and methane. Like planets, comets also _____ the Sun, but their orbits run _____ to the planets' orbits.

The extreme _____ orbit of comets has them _____ as they approach the _____ and its gravity and then they can spend hundreds to _____ of years out in the depths of the solar system.

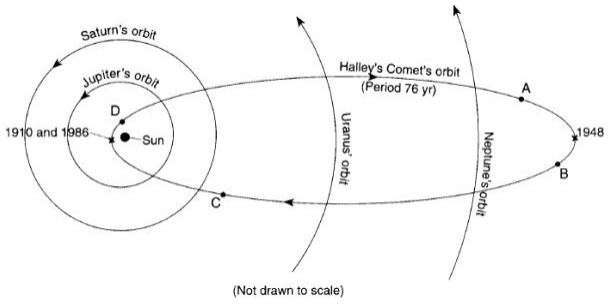
Like all orbiting bodies, comets follow _____ _____ _____ of Planetary Motion - the _____ they are to the Sun, the _____ they move. This happens because as objects get closer to the Sun the _____ pull between the two bodies _____.

When comets get close to the Sun they start to _____ creating a _____ of dust and gas. The solar winds _____ the tail _____ from the sun.



Some of our famous comets:

Halley's Comet is the most famous of the comets. Halley's Comet takes about ___ years to travel around the Sun. The last time it passed by Earth was in _____ and it will be back by in _____.



Hyakutake is an icy-blue comet and is the closest comet to come by the Sun in _____ years. The Ulysses space probe passed through its tail in _____, and found the tail was _____ _____ km (350 million miles) long!!

Hale Bopp is a large and spectacular comet. It made its closest approach to Earth in _____. The last time it flew by was _____ BC. Hale Bopp is so bright we could see it when it was still outside of the orbit of _____!