Secondary Education

3rd year: Sections LH - SE

Physics

Chapter 8: The Solar System

تم الاعتماد على الكتاب المدرسي الوطني الصادر عن المركز التربوي للبحوث والانماء

إعداد مصطفى سكرية

Chapter 8 : The Solar System

Objective:

List the basic data of the

constituents of the solar system.

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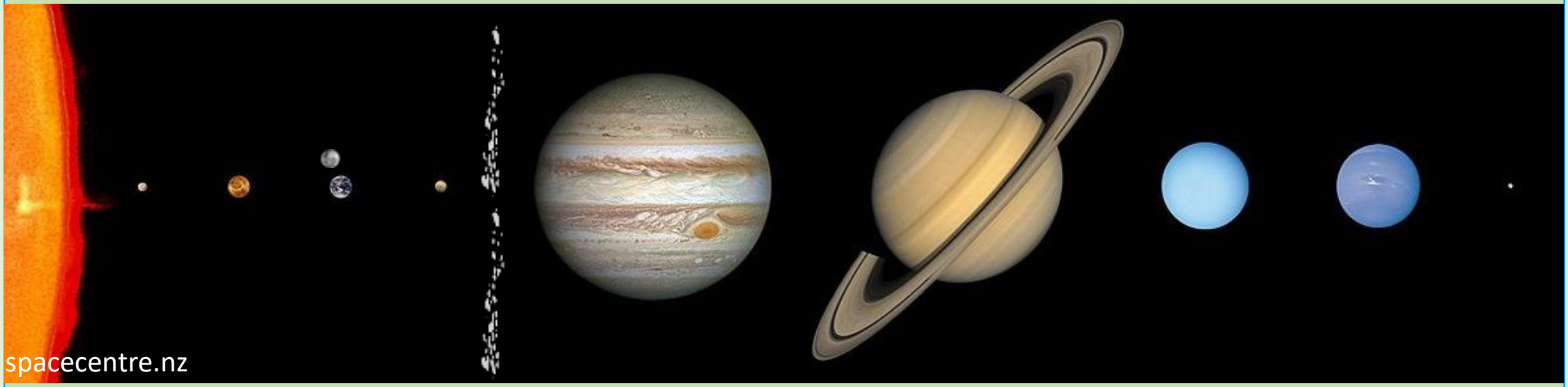
The solar system is composed of the Sun and the group of celestial bodies that orbit around it due to its gravitational pull.



This group includes nine planets **(Mercury, Venus, the Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto** *that is considered as a dwarf planet since 2006*), and their **moons**, a great number of **comets** , thousands of smaller objects that are the **asteroids** and **meteoroids**.

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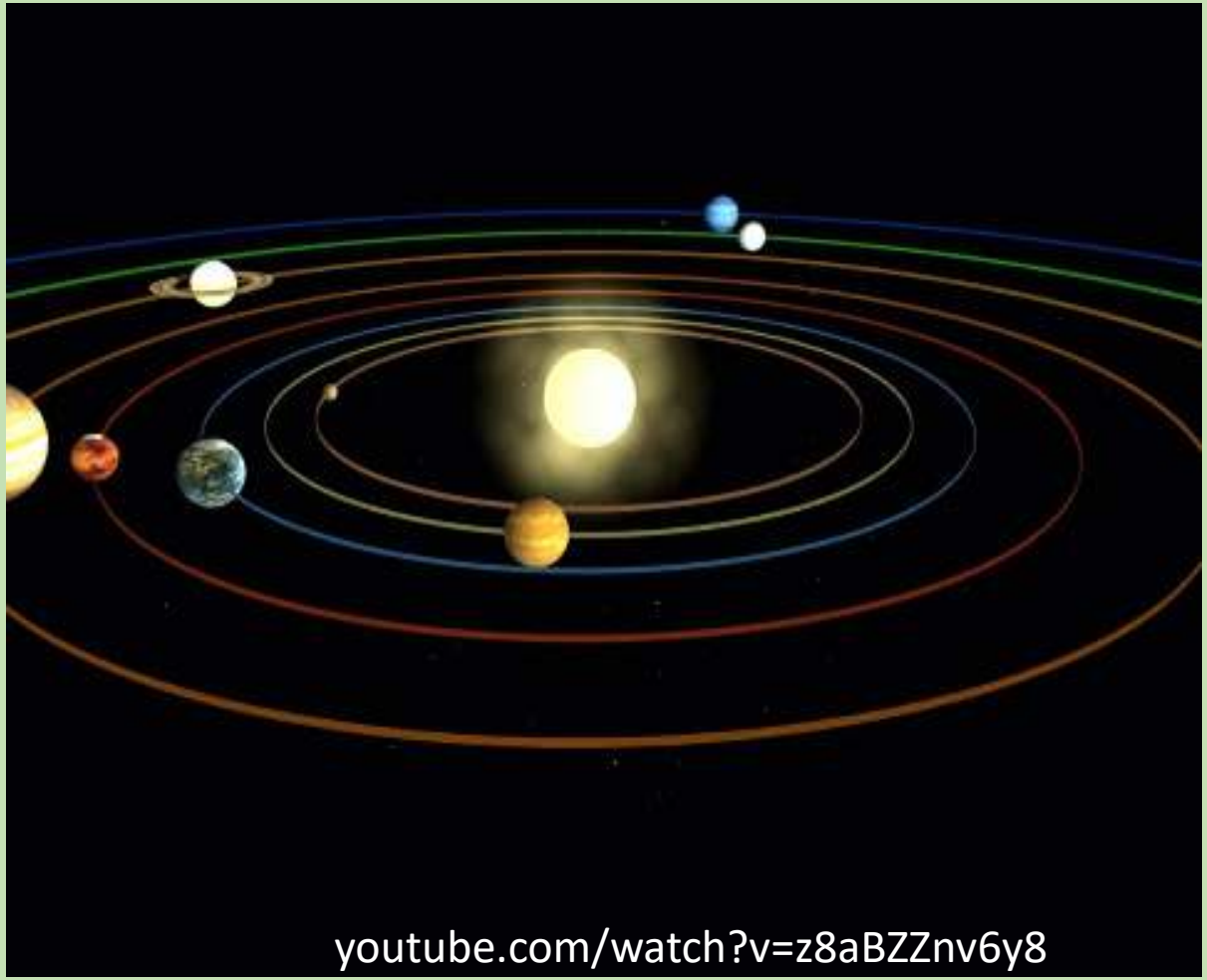
Rotation and Revolution

Revolution: around the Sun.

The elliptic paths of the planets are in almost coinciding planes that pass through the center of the Sun.

Therefore, the solar system is almost flat and is located in a plane perpendicular to the axis of rotation of the Sun. This plane is called: **the plane of the ecliptic.**



All planets orbit around the Sun in a direct motion.

The opposite direction is called retrograde direction.

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Rotation and Revolution

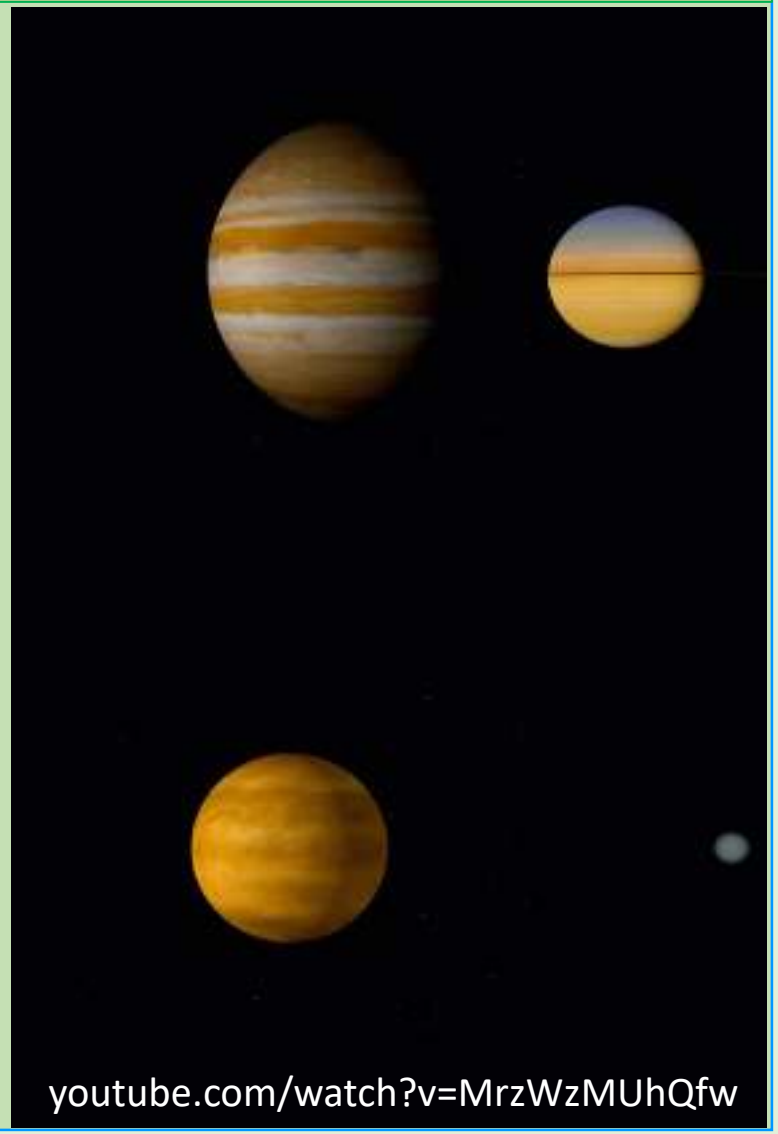
Rotation: around the axis of the planet.

All planets rotate around their axis in a direct motion, except Venus, Uranus, and Pluto.

The period of revolution of the Earth is 365,26 days, and its period of rotation is 23 hours 56 minutes.

The largest period of rotation is that of mercury, of value 58.65 days, and the smallest one is that of Jupiter, of value 9 hours 55 minutes.

The moon moves around the Earth in an elliptical orbit. Its period of revolution and period of rotation are equals.



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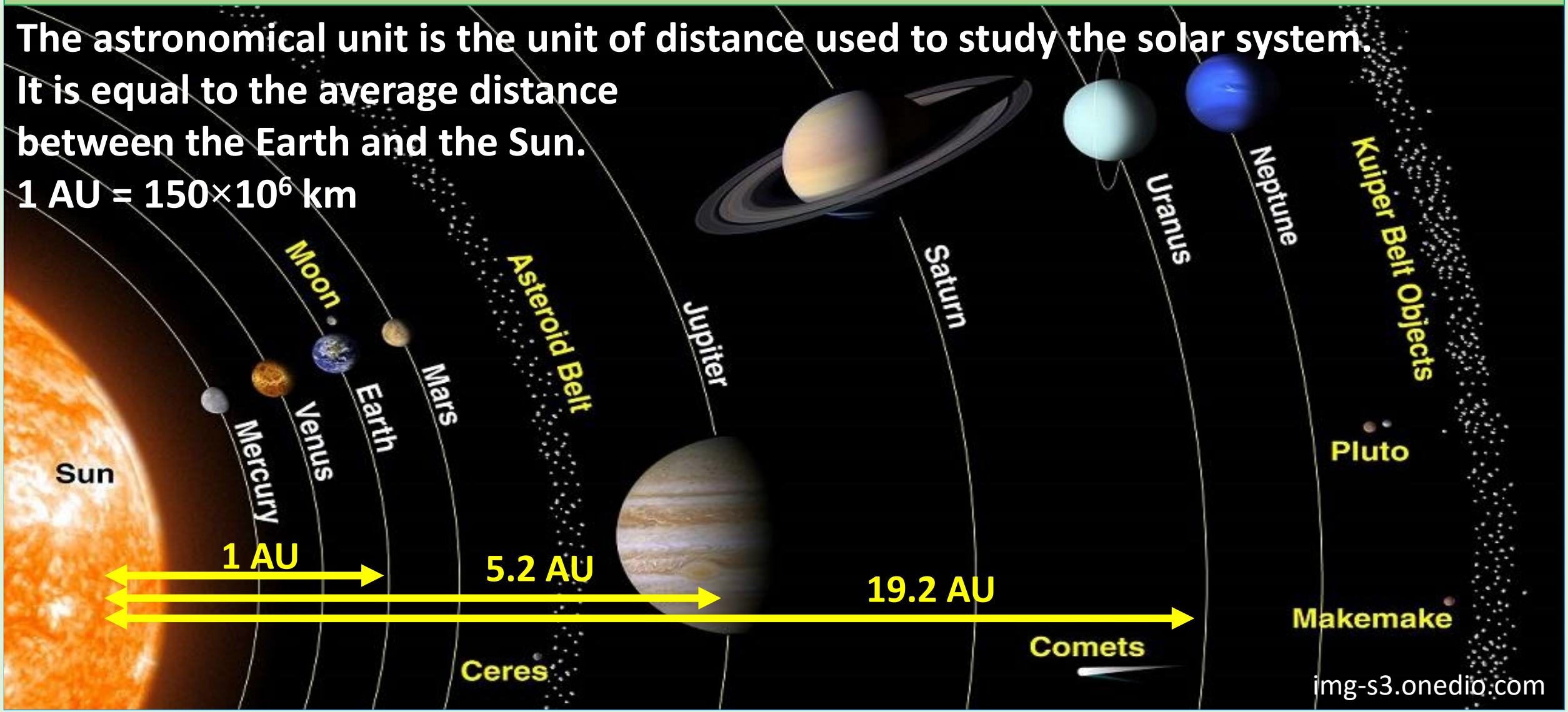
The astronomical unit is the unit of distance used to study the solar system.
It is equal to the average distance between the Earth and the Sun.
1 AU = 150×10^6 km



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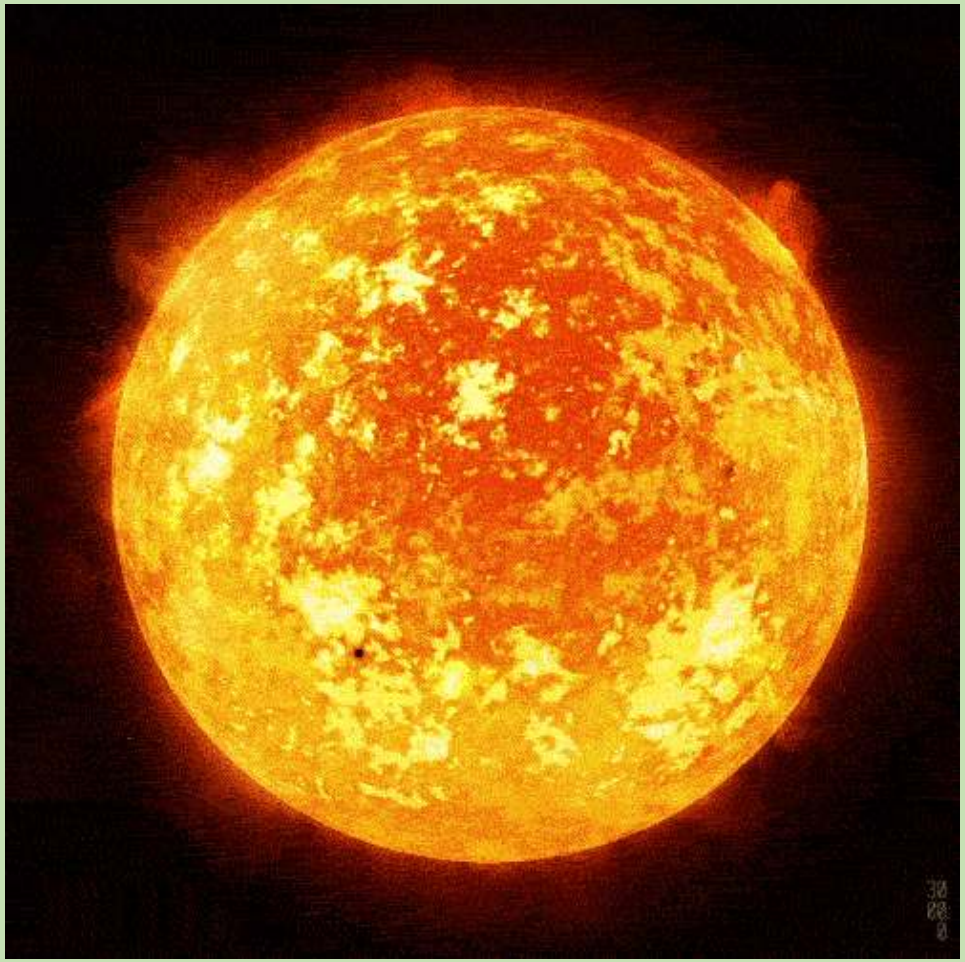
The Sun

The Sun is the center of the solar system. It is mainly composed of hydrogen (≈ 75 %) and helium (≈ 25 %).
The Sun represents 99.87 % of the total mass of the solar system.
In the core of the Sun, nuclear fusion reactions take place. At the surface, called photosphere, the temperature is of the order of 5700 K, which gives the Sun its color.
The atmosphere of the Sun is formed of two Layers: The chromosphere, that has a thickness of some thousands of kilometers, and the corona, that has a thickness of some millions of km.



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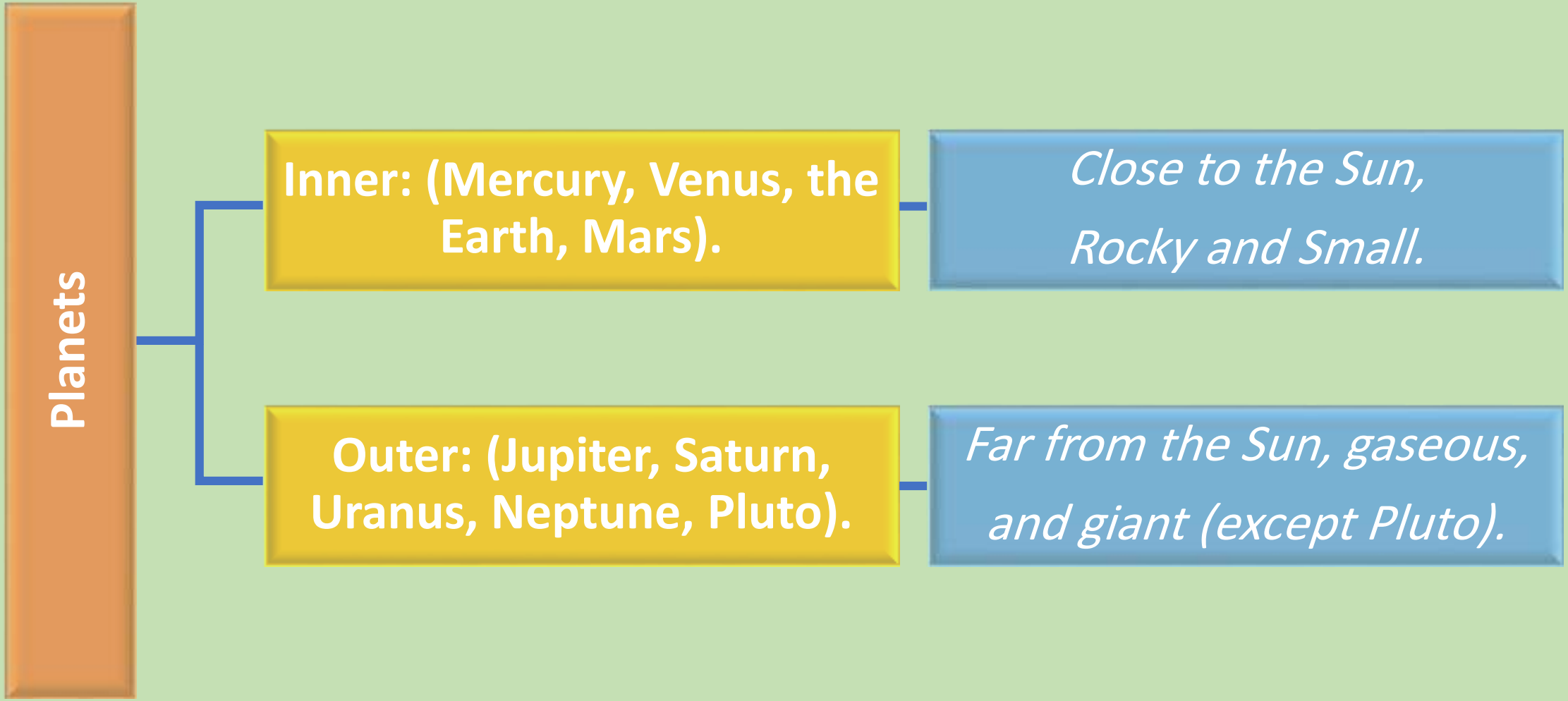

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The Inner Planets

- This group is formed of four planets: Mercury, Venus, the Earth and Mars.
- The inner planets have a solid structure like the structure of the Earth. Therefore, they are called terrestrial.
- Mercury and Venus have no moons whereas the Earth has one (The Moon) and Mars has two (Phobos and Deimos).
- Venus and the Earth have each a thick atmosphere. The atmosphere of the Earth makes life possible whereas that of Venus does not. The presence of CO_2 in the atmosphere of Venus increases the temperature of the surface of the planet and causes the green house effect.
- Mars is called the red planet due to the iron oxide on its surface.

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The Outer Planets

- Except Pluto that is solid and of small size, the other four planets are all similar : Jupiter, Saturn, Uranus and Neptune.
- They are giant planets, gaseous and have rings; they are called Jovian.
- The outer planets have, each, many moons, whereas Pluto has only one.
- The presence of methane gas on Neptune gives the planet a blue color.

Note:

In August 2006 the International Astronomical Union (IAU) downgraded the status of Pluto to a "dwarf planet." This means that only the rocky worlds of the inner Solar System and the gas giants of the outer Solar system will be designated as planets.

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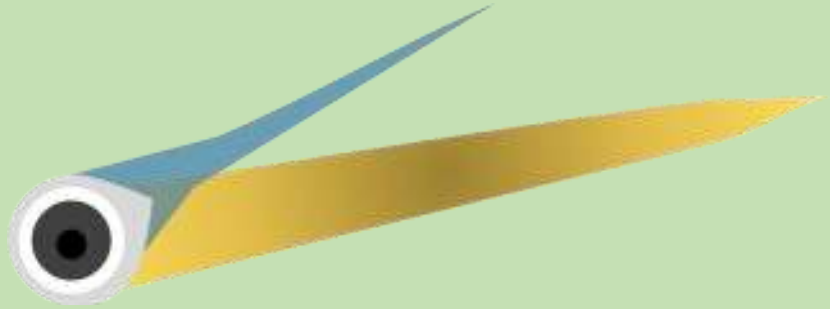
Other Celestial Objects

The solar system contains the Sun and the planets, but it also includes moons, comets, asteroids, and meteoroids.

- The moons are solid objects that orbit around the planets, like our Moon that orbits around the Earth, and as in the adjacent animation the dwarf planet Pluto and its moon Charon.
- Comets are Solar System bodies, characterized by their long tails, move along elliptical paths around the Sun, of period of revolution that can vary from a few years to thousands of years. A comet comprises three parts: The nucleus, the coma and the tails that stretch over tens of millions km.



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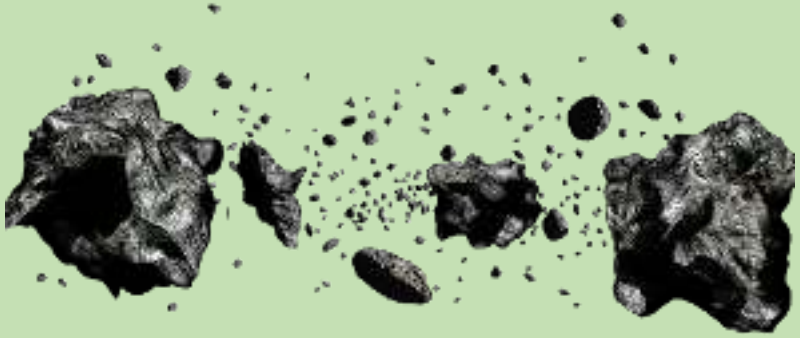
Other Celestial Objects

- Asteroids are rocky objects with irregular shapes that orbit around the Sun. The biggest one is Ceres, of diameter 1000 km.
  The asteroids form two belts:
  - The first one, called the asteroids belt, separates the inner planets from the outer planets;
  - The second one, called the Kuiper Belt, is a doughnut-shaped ring of icy objects around the Sun, extending beyond the orbit of Neptune from about 30 AU to 55 AU from the Sun.



- The meteoroids are rocky objects of extra terrestrial origin. They are similar to asteroids. When they enter Earth’s atmosphere at high speed and burn up, the resulting meteors will be shooting stars. If a large meteoroid survives its passage through the Earth's atmosphere and lands on Earth's surface, it is then called a meteorite.

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Application

1) The planets Mercury, Venus and Earth belong to one of the two groups of our solar system.
   a) Name this group.
      These planets belong to the inner group Or terrestrial Or rocky.
   b) Name the fourth planet of this group.
      The fourth planet is mars
2) As every year, the orbit of the Earth will cross the clouds of cometary dust scattered by the comet ''Swift-Tuttle''. As they enter the Earth's atmosphere, the dust will burn and give us a stream of shooting stars.
   a) Name the three main parts of a comet.
      The three parts of the comet are: The nucleus, The coma and the tails.
   b) Indicate the part of a comet that contains cometary dust.
      The Yellow tail of the comet contains the cometary dust.
   c) Using the given information, explain the process of formation of shooting stars
      If cometary dusts enter the Earth atmosphere, they burn and form shooting stars.

youtube.com/watch?v=usYC_Z36rHw

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