# Chapter- 17 Stars and the Solar System

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# The Moon

Our solar system consists of an average star we call the Sun, the planets Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto. It includes: the satellites of the planets; numerous comets, asteroids, and meteoroids; and the interplanetary medium.



The moon is the brightest object in the night sky. The stars, the planets, the moon and many other objects in the sky are called celestial objects. The various shapes of the bright part of the moon as seen during a month are called **phases of the moon**.

The Moon is Earth's only natural satellite and the fifth largest satellite in the Solar System. The average centre-to-centre distance from the Earth to the Moon is 384,403 km, about thirty times the diameter of the Earth. The Moon makes a complete orbit around the Earth every 27.3 days (the orbital period), and the periodic variations in the geometry of the Earth-Moon-Sun system are responsible for the lunar phases that repeat every 29.5 days.

The Moon is the only celestial body to which humans have travelled and upon which humans have performed a manned landing.

### **Eclipses**

Eclipses can occur only when the Sun, Earth, and Moon are all in a straight line. Solar eclipses occur near a new moon, when the Moon is between the Sun and Earth. In contrast, lunar eclipses



occur near a full moon, when the Earth is between the Sun and Moon. Because the Moon's orbit around the Earth is inclined by about 5° with respect to the orbit of the Earth around the Sun, eclipses do not occur at every full and new moon. For an eclipse to occur, the Moon must be near the intersection of the two orbital planes. The periodicity and recurrence of eclipses of the Sun by the Moon, and of the Moon by the Earth, is described by the soars cycle, which has a period of approximately 6 585.3 days (18 years 11 days 8 hours).



### The Stars

A star is a massive, luminous ball of plasma that is held together by gravity. The nearest star to Earth is the Sun, which is the source of most of the energy on Earth. Other stars are visible in the night sky, when they are not outshone by the Sun.

For most of its life, a star shines due to thermonuclear fusion in its core releasing energy that traverses the star's interior and then radiates into outer space. Almost all elements heavier than hydrogen and helium were created by fusion processes in stars. The total mass of a star is the principal determinant in its evolution and eventual fate. Other characteristics of a star are determined by its evolutionary history, including the diameter, rotation, movement and temperature.



# Constellations

Constellation is what astronomers call an asterism: a group of celestial bodies (usually stars) that appear to form a pattern in the sky or appear visibly related to each other. Examples are Orion (which appears like a human figure with a belt, often referred to as "The Hunter"), Leo (which contains bright stars that outline the form of a lion), Scorpius (which can seem reminiscent of a scorpion), and Crux (a cross).

Constellations are names for groups of stars that appear to form shapes in the sky. They were given their names many hundreds of years ago to help us remember the stars. We use constellations to divide up the sky; finding one can help us find another because constellations move so slowly that, in our lifetime, they will always be found in about the same place.

*Ursa Major* or **Big Dipper** or **Great** Bear or **Saptarshi** is a very famous constellation which is seen in the summers during early night time in the Northern Hemisphere.

It has seven bright stars and looks like a big inverted spoon or a question mark in the sky. This constellation helps us locating Pole Star.

There is another prominent constellation



There is another constellation "Cassiopeia - the princess". It depicts a princess sitting on a chair. It looks like a distorted W or M in the sky. It can be seen in the winters during early part of night in the Northern Hemisphere.

"Leo - The Lion" is another prominent constellation in the night sky. It is visible in springs during early night time in the Northern Hemisphere.





# The Solar System

The Sun and the celestial bodies which revolve around it form the solar system. It consists of large number of bodies such as planets, comets, asteroids and meteors. The gravitational attraction between the Sun and these objects keeps them revolving around it. The Earth also revolves around the Sun. It is a member of the solar system.



#### The Solar system

It is a planet. There are seven other planets that revolve around the Sun. The eight planets in their order of distance from the Sun are: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.

#### The Planets

The planets look like stars, but they do not have light of their own. They merely reflect the sunlight that falls on them. The simplest method of identifying planets from stars is that stars twinkle, whereas planets do not. Also the planets keep changing their positions with respect to the stars. A planet has a definite path in which it revolves around the Sun. This path is called an **orbit**. The time taken by a planet to complete one revolution is called its period of **revolution**. The period of revolution increases as the distance of the planet increases from the sun.

Some planets are known to have moons/satellites revolving round them. Any celestial body revolving around another celestial body is called its satellite.

#### **Planets Vs Stars**

- 1. Planets do not have their own light but stars have their own light.
- 2. Planets do not twinkle but stars twinkle.
- 3. Planets revolve around star but stars do not revolve around planets.
- 4. Planets could be rocky or gaseous but stars are only made up of gases.

#### The Sun

- 1. Like all stars it is a big ball of gas and fire.
- 2. It is the nearest star to Earth.



- 3. Light from sun reaches us in approximately 8 minutes. That is why we say sun is 8 Light minutes away from us.
- 4. It is the major source of energy on the Earth.

# Mercury (Budh)

- 1. It is a rocky planet.
- 2. It is the nearest to the Sun and smallest planet of the Solar system.
- 3. It has no satellite or moon.
- 4. Since it is very close to Sun so it is difficult to observe it from the Earth; it can be observed from the places where trees or buildings do not obstruct the view of Horizon.

## Venus (Shukra)

- 1. It is a rocky planet.
- 2. It has a very thick atmosphere having sulphur which traps heat and hence makes it hottest planet of the Solar system.
- 3. It has thick clouds which reflect big amount of light and hence make Venus the brightest planet in the night sky.
- 4. It has no moon of its own.
- 5. It rotates on its axis from east to west which is opposite to that of Earth's rotation.



Venus

- 6. It is either seen before Sunrise or after Sunset. So it is often called Morning or Evening star.
- 7. It shows phases like moon as seen from the Earth with the help of Telescope.



### The Earth

- 1. It is a rocky planet.
- It is the only planet having Life on it because of optimum distance, atmosphere, water and ozone layer.
- 3. It is tilted about its axis because of which we observe different seasons on the Earth.
- 4. It has one moon called 'Luna'.
- 5. Because of greenery and water it is called Blue-Green planet.



Earth

#### Mars (Mangal)

- 1. It is also a Rocky planet.
- 2. It is red in color because of presence of iron on its surface. So it is called red planet.
- 3. It has two moons phobos and deimos.

### Jupiter (Brihaspati)

- 1. It is a gaseous planet.
- 2. It is the largest planet of the solar system. 1300 Earths can accommodate in it!
- 3. It has rings around it.
- 4. It has more than 60 moons. 4 moons can be seen from the Earth with the help of telescope.

#### Saturn (Shani)

- 1. It is a gaseous planet.
- 2. It has rings of ice around it which can be seen with the help of telescope.
- 3. It is yellowish in color.
- 4. It is less dense than water which means if it is thrown in water, it will float in water.



5. It also has more than 60 moons.

### Uranus and Neptune:

- 1. Both are gaseous planets.
- 2. Both have rings around them.
- 3. Uranus rotates from East to West.
- 4. Uranus appears to roll on its side.



# Some Other Members of the Solar System

## Asteroids:

- 1. Mini planets revolving around sun.
- 2. These reside in asteroid belt between the orbit of Mars and Jupiter.
- 3. These are the pieces of planets.
- 4. These are big threat to Earth, as if collide with Earth; can cause major destruction.

### Comets:

- 1. These are made of ice and mud.
- 2. These revolve around sun in large and highly elliptical orbit.
- 3. These acquire a bright tail as they come near the Sun.
- 4. Tail is always directed away from the Sun.
- 5. Size of tail decreases as comet moves away from the Sun.
- 6. Comets appear periodically. Like Halley's Comet which comes after every 76 years.

## Meteors:

- 1. These are the small rocks or the left out pieces of Comet.
- 2. As these enter Earth's atmosphere at very high speed they burn up due to friction.
- 3. It's burning results in a bright streak of light which lasts for few seconds.



Meteors







Comets

- 1. Bigger meteors which do not get burnt completely.
- 2. These unburnt pieces reach Earth.
- 3. These are studied by scientists to study the composition of meteor and the nature of material from which Solar System was formed.
- 4. If these are very big in size, then may cause destruction.

# **Artificial Satellites**

- 1. Man made machines which revolve around Earth.
- 2. These revolve at a closer distance as compared to natural satellite Luna.
- 3. First Indian Satellite was Aryabhatta.
- 4. These are used for Communication, Weather Forecasting, Remote Sensing and Signal Transmission.

