

WE AND OUR WORLD

(A Book of Social Sciences)

(Class-VI)



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The Planet Earth and the Solar System

We can see countless glittering tiny objects in the sky at night. Most of these appear twinkling. They are stars. The other glittering objects which do not seem to be twinkling may be planets. During the day, we see the Sun, which is also a star.

All the objects in the sky, which appear similar to us, are the heavenly bodies. The sun, the stars, the moon, the planets and other objects are all **heavenly** or **celestial bodies**. You would be surprised to know that even our earth, on which we live, is a celestial body.

The stars and the planets, which we see in the sky, are very small part of the vast 'Space', which is limitless. There are billions of celestial bodies spread over the vast space. They are very, very far away from us. Hence, we cannot see all of them. The vast limitless space which includes all celestial bodies is called **Universe**.

GALAXIES

Though there are billions of celestial bodies spread in the vast universe, they are not uniformly distributed in the space. The countless stars in the space form huge clusters. One cluster may contain billions of stars. All the stars in a cluster are held together by mutual gravitational force. Such a huge cluster of billions of stars, along with the giant collection of gas and dust, is called a **Galaxy**.



Galaxy

Our earth, along with the other planets, forms the **Solar System**. The Solar System is located in the outward spiral (Orion Arm) of the Milky Way Galaxy (*Akash Ganga*). Most likely, there are billions of other solar systems in our galaxy and billions of galaxies in the universe.



Do You Know?

Milky Way Galaxy, a faint white band, stretching across the sky, is a barred spiral galaxy. It contains a bar across its center region and has two major arms. The Orion Arm is located between two major arms.

As we know, there are different types of celestial bodies in the universe. Let us learn more about some of them.

STARS

Stars are self-luminous heavenly bodies. They are made up of hot gases. They generate heat and light and radiate it in the space. The number of stars is countless. We cannot see all of them at a time. It has been said that, at one time, we can see not more than 6,000 stars. Though, stars are very huge bodies, they look very small as they are very far away from the earth. The distance between celestial bodies is usually measured in a unit known as **light year**.

Some stars are so far away that the light radiated by them reaches us in millions of years. The nearest star to the earth, other than the sun, is the 'Proxima Centauri'. It is about 4½ light years away from us.



Do You Know?

- Disturbance in the atmosphere causes star light to bend slightly. As a result, some of the light reaches us directly and some gets slightly bent away. This makes a star to twinkle.
- Light travels at a speed of about 3 lakh km per second. The distance covered by a ray of light in a year or 365 days is called a **light year**.

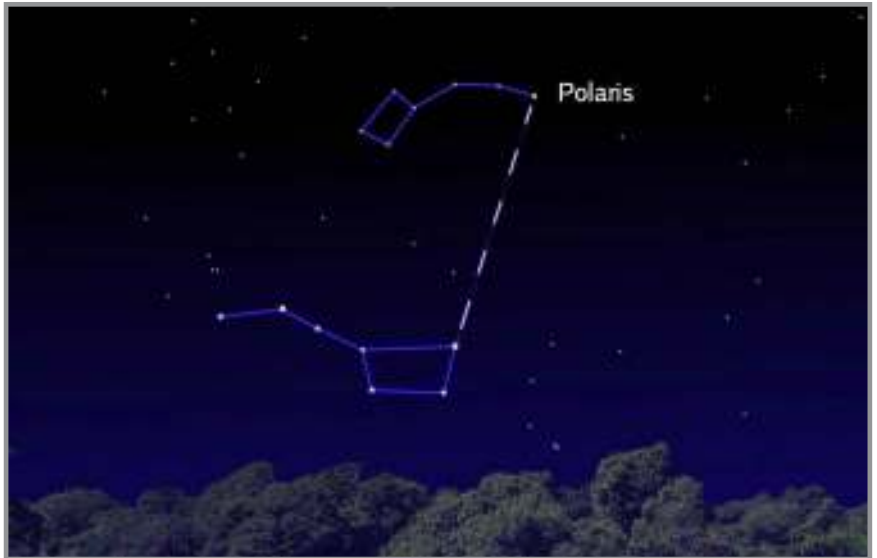
CONSTELLATIONS

If you observe the stars in the clear night sky, they appear to form different shapes and patterns and move from west to east. The formations may resemble animals, humans or any other object. The groups of stars which are recognised by their formations are called **Constellations**.

Ursa Major, also called the **Great Bear**, is a constellation of several stars. It appears in the northern sky. In India, the seven stars called **Saptarishi Mandal**, is a part of Great Bear. There are several other

formations of stars, which have been given names by the astronomers. The two brightest stars at the head of the Saptarishi Mandal, called **Pointers**, point towards the stationary star called **Pole Star** or **Dhruv Tara** in the northern sky. Pole Star lies above the North Pole. It always indicates the **North direction**.

Indians and Greeks have been studying the shapes and patterns of stars since ancient times. In modern times, the space scientists and astronomers use powerful and large-sized telescopes to study the celestial bodies.



Constellation

THE SOLAR SYSTEM

The sun and its companion celestial bodies constitute the **Solar System**. The eight planets, their companion satellites, asteroids, meteors and comets are the members of the solar system. They all revolve around the sun on their fixed paths called **Orbits**.

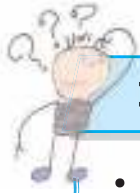
The Evolution of the Solar System

A question sometimes arises in our minds, how were the sun and its companions born? Some scientists believe that a giant cloud of gases and dust, called the **Nebula**, appeared moving in the space about 4.6 billions of years ago. It cooled and gained very fast rotation. The eight balls of gases of different sizes were separated from the Nebula. The remaining central mass of the Nebula changed into a star known as the **Sun**. The other eight balls changed into **planets**.



Nebula forming Planets

It is believed that the satellites were formed when small balls of gases separated from the central mass and were attracted by their companion planets. They began to revolve around their planets.



Do You Know?

- The word 'planet' is derived from the Greek word *planas thai* which means 'wanderer'.
- The word 'satellite' is derived from the Latin word *satellite* which means 'an attendant'.
- The word 'solar' is derived from a Latin word *solaris* which means sun.

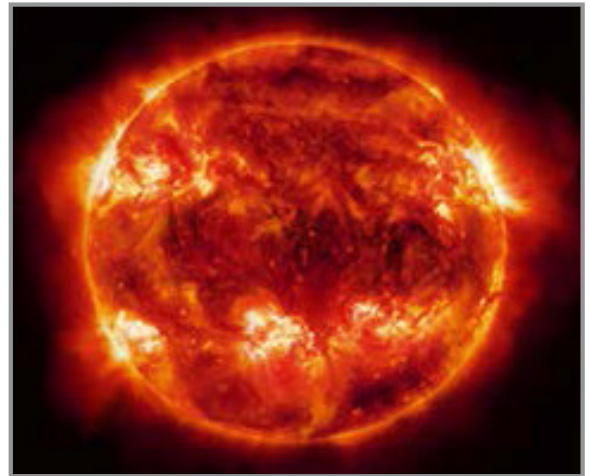
THE SUN

The **Sun** is a star. A star does not have a solid surface, but is a ball of gases held together by its own gravity. It generates heat and light and radiates them into space. The Sun does not have any rings. It is the centre of our solar system. Life would not be possible on earth without the sun's intense energy.

The Sun is a very huge mass, much bigger than all its companions put together. It is about 1.3 million times bigger than our earth.

Due to the sun's huge size, all members of the solar system are held by its gravitational pull and they revolve round it in their respective orbits.

Though, the distance between the earth and the sun is about 150 million kilometres, it is the nearest star to the earth as compared to other stars. The rays of the sun reach the earth's surface in about eight minutes.



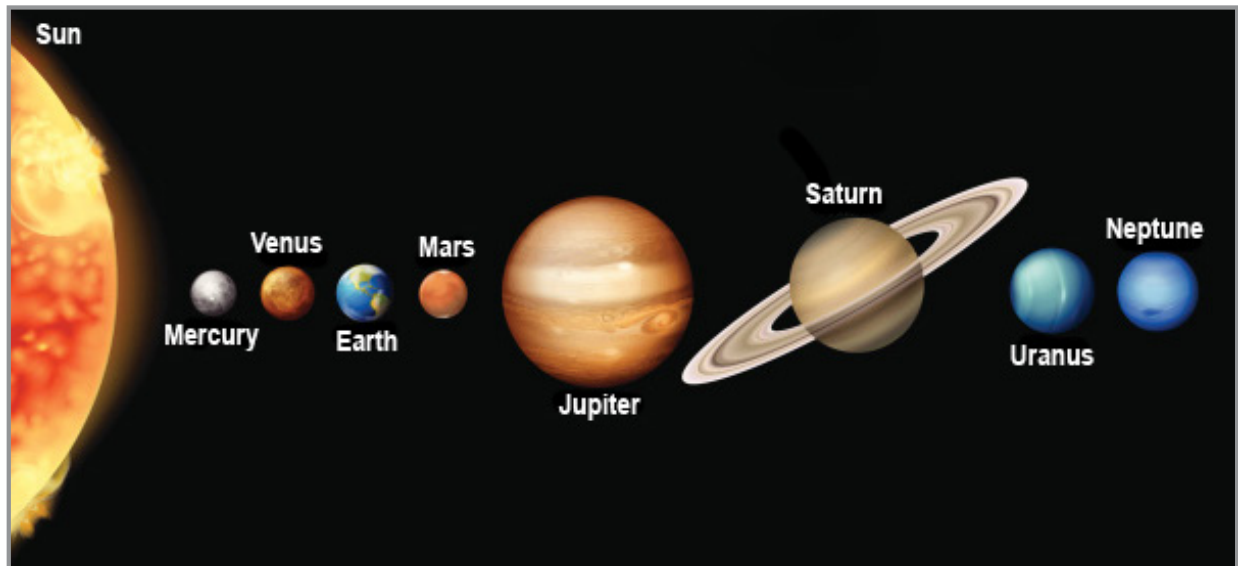
The Sun

THE PLANETS

Planets are the heavenly bodies which receive light and heat from the Sun. They do not have their own light. The total number of planets in the solar system are eight. In the order of their distances from the sun, they are— Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.

The first four planets in order of their distance from the Sun are— Mercury, Venus, Earth and Mars. They are called the **terrestrial planets** because they have solid, rocky surfaces. Two of the outer planets, Jupiter and Saturn, are known as **gas giants** whereas the more distant, Uranus and Neptune, are called **ice giants**.

Mercury has a thin atmosphere. The days are very hot, but at night temperature drops hundreds of degree below freezing point. It is the smallest planet in our solar system. **Venus** is the hottest planet due to its volcanic activities and thick atmosphere. It spins backwards. **Earth**, our home planet, is the only planet which supports life due to its optimum amount of heat, light and oxygen. **Mars**, known



The eight planets in the order of their distance from the Sun

as the **Red Planet**, is a cold desert. Its atmosphere is too thin for liquid water to exist for long on the surface. **Jupiter, Saturn, Uranus and Neptune** have rings. The rings around Jupiter are very faint and hence, cannot be seen by naked eyes. The atmosphere of Jupiter, Saturn and Uranus is mostly made up of hydrogen and helium. Other than these gases, Uranus has methane, which gives blue tint to it. Neptune is similar in composition to Uranus, composed primarily of hydrogen and helium along with traces of hydrocarbons and nitrogen. It also contains a higher proportion of ammonia and methane.



Do You Know?

- Earlier Pluto was considered as the ninth planet. In 2006, the International Astronomical Union (IAU) established a new category, **dwarf planet**, for Eris and Pluto.
- The ring around the saturn were first seen by Galileo — a great astronomer of Italy, through his telescope in 1610 A.D.
- The rotation time and revolution time of eight planets are as follows:

Planets	Rotation Time	Revolution Time around the Sun
Mercury	59 days	88 days
Venus	243 days	225 days
Earth	24 hours	365 days and 6 hours
Mars	Little over 24 hours	687 days
Jupiter	10 hours	12 years
Saturn	10.7 hours	29 years
Uranus	17 hours	84 years
Neptune	16 hours	165 years

THE EARTH—A UNIQUE PLANET

The earth, on which we live, is placed at third position in order of the distance from the sun. It ranks fifth in size. The earth completes one rotation on its axis from west to east direction in about 24 hours, which makes one day. Its revolution around the sun is covered in 365 days and 6 hours, which makes one year.

In ancient times, it was believed that the earth is a flat body, but in the fifth century CE, Aryabhata, an Indian astronomer declared that the earth is spherical in shape. Now, the photographs of the earth taken from the space confirm its spherical shape. The earth bulges slightly at the equator and flattens at the poles.



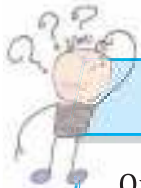
Photograph of the earth taken from the space

Now let us learn the favourable conditions which support life on the earth.

Firstly, the earth receives moderate heat and light from the sun. This much quantity of heat and light is just sufficient to evolve and sustain all forms of life on the earth's surface. Other planets are either very hot or very cold.

Secondly, about two-third of earth's area is covered with water. Water is essential for human beings, animals and plants. No life can exist without water.

Thirdly, the earth has an envelope of air around it. It contains gases, water vapours and dust particles which help in supporting life on the planet. Earth's atmosphere protects us from the incoming meteoroids.



Do You Know?

On September 24, 2014, India became the fourth country in the world to reach the orbit of Mars and the first to achieve it in its first attempt!

SATELLITES

The heavenly bodies that revolve around their respective planets are called **Satellites**. Like the planets, satellites also do not have their own light and heat. They reflect light, which they receive from the sun. Each planet has one or more satellites, except the Mercury and the Venus. Our earth has one satellite. We call it the **Moon**. As of 2015 Saturn has 53, Jupiter has 50, Uranus has 27, Neptune has 13 and Mars has 2 satellites.



Saturn with its satellites

THE MOON—OUR NEAREST COMPANION

The moon is the closest celestial body to the earth. Its distance from the earth is about 3,84,000 km. The moon also reflects light which it receives from the sun.

The moon rotates on its axis and also revolves around the earth. The period of rotation of moon on its axis and that of revolution around the earth is the same, that is, 27.3 days. Due to the same period of both the movements, only one side of the moon is visible from the earth. The other side always remains invisible.

The moon has a barren land comprising of plains, valleys and craters. Scientists believe that long ago, earth collided with another space object and resulted in throwing a big chunk of rocky material into the space and that led to the formation of the moon.



The Moon

The moon does not have atmosphere around it. It becomes extremely hot during the day time in the light of the sun and extremely cold during night or in shadow. The temperature may increase to more than 214°C during the day and falls down to - 184°C during the night. Thus, no life can possibly exist on the moon.

Phases of the Moon

We have already learnt that one side of the moon gets illuminated by the sun, which is visible to us. The position of the moon in relation to the sun changes every day. When the illuminated side of the moon is fully hidden from our view, it is called the **New Moon** (*Amavasya*).



Do You Know?

Astronaut Neil Armstrong was the first human to set foot on the moon. He, along with Edwin Aldrin, landed the Lunar Module of Apollo 11 on the moon's surface on July 20, 1969.



The visible portion goes on increasing gradually day by day after the New Moon Day. At first, the moon appears in crescent shape. On eighth day, half portion of the moon comes in our view. The full moon becomes visible after 15 days when half of its revolution is completed. The day when the moon is completely visible to us, is the **Full Moon Day** (*Purnima*). After this day, the decline of the moon's illuminated part starts. The illuminated part slowly disappears and the moon again comes to the position of New Moon.



The phases of the moon are used to determine the lunar dates and to fix the duration of lunar months in India and Arab countries. The Hindu and the Muslim festivals, such as Deepawali and Eid, are usually fixed on the basis of lunar dates and months.

OTHER CELESTIAL BODIES IN THE SOLAR SYSTEM

Apart from the sun, stars, planets and satellites, there are other celestial bodies also, like asteroids, meteoroids and comets, that revolve around the sun.

Asteroids

Asteroids are rocky, space objects that orbit our Sun. These can be a few feet wide to several hundred miles wide. Most asteroids orbit our Sun, a star, in a region of space between the orbits of Mars and Jupiter known as the **Asteroid Belt**.

Meteoroids

Meteoroids are little chunks of rock and debris in space. They become **meteors** or **shooting stars** when they fall through the earth's atmosphere, leaving a bright trail as they are heated by the friction of the atmosphere. Most of them break up in the atmosphere before they can strike the surface as **meteorites**.



Do You Know?

A **crater** is a depression which may be formed either by falling of a large meteor on the surface of the earth or by the volcanic eruption. Meteor crater of North Arizona (USA) is nearly one mile across, 2.4 miles in circumference and more that 550 feet deep.

Comets

Comets are the small bodies with a head and long luminous tail. They are made up of dust and frozen gases. They appear in the sky after a long period. A comet, known as Hailey's comet, appears in the sky after every 76 year interval.



Comet Hyakutake reached the closest point to earth in its path through the inner Solar System on March 25, 1996



Keywords

- **astronomers:** scientists who study celestial bodies.
- **cluster:** a group of the similar elements gathered closely in a bunch.
- **crescent shape:** a single curve that is broad in the centre and tapers to a point at each end.
- **furnace:** an enclosed chamber in which material can be heated at very high temperatures.
- **gravitational force:** a force that attracts any object with mass.
- **self-luminous:** objects having property of emitting light.
- **spherical:** a shape slightly flattened at the top.



Something To Know

A. Tick (✓) the correct option.

1. What do we call a huge cluster of billions of stars?

(a) asteroids

(b) meteors

(c) galaxy

(d) universe

2. Which one of the following is the hottest planet?

(a) Mercury

(b) Venus

(c) Mars

(d) Jupiter

3. Which is the most distant planet from the Sun?

(a) Uranus

(b) Neptune

(c) Saturn

(d) Jupiter

4. The planet which does not have any satellite is –

(a) Venus

(b) Mars

(c) Neptune

(d) Earth

5. Which planet has two satellites?

(a) Mercury

(b) Venus

(c) Earth

(d) Mars

B. Fill in the blanks.

1. The vast limitless space which includes all celestial bodies is called _____.

2. The distance between celestial bodies is measured in a unit called _____.

3. _____ always indicates the north direction.

4. All the planets of our solar system revolve round the Sun in their fixed paths called _____.

5. _____ is the third nearest planet to the Sun.

C. Match the following:

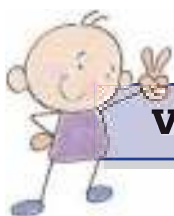
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|------------------------------------|------------------|
| 1. Great Bear | a. Nebula |
| 2. Head of solar system | b. Mars |
| 3. A giant cloud of gases and dust | c. Sun |
| 4. Shape of the earth | d. Constellation |
| 5. Red Planet | e. Spherical |

D. Answer the following questions in brief.

1. What are celestial bodies?
2. Why do stars look very small in the sky?
3. What is 'Saptarishi Mandal'?
4. Name the planets which are gaseous bodies.
5. Which planet is the closest to Neptune?

E. Answer the following questions.

1. Describe the formation of solar system.
2. State three features which make the earth a unique planet.
3. Mention three main characteristics of a satellite.
4. Give a brief description on the Phases of Moon with the help of a diagram.
5. Write a short note on the other celestial bodies (asteroids, meteoroids and comets) in the solar system.



Value Based Question

Indian Space Research Organisation (ISRO) was established in 1969. It was the same year when humans set foot on the moon for the first time. ISRO launched Chandrayaan-1 on October 22, 2008 from Sriharikota. It showed India's ability to do meaningful science at low cost, its leadership in a cooperative space venture and the capacity to develop essential technology within stipulated time. With this success, India became the fifth country to put a spacecraft into an orbit around the moon after the United States, Soviet Russia, Japan and China.

1. What is meant by 'meaningful science'?
2. Mention any two inventions to distinguish between 'science' and 'meaningful science'.
3. Explain the values and life skills which helped India to attain success in space.



Map Skill

On the outline map of India, show the location of Indian space research centres.



Something To Do

1. Prepare a model (working or static) of the Solar System.
2. When was Mars Orbiter Mission (MOM) launched by India? What are its achievements and why it is so important for us?



3. Collect pictures related to the landing of man on the moon and make a scrap file. You may also collect information about dates on which certain celestial bodies like Mars were seen from the earth.

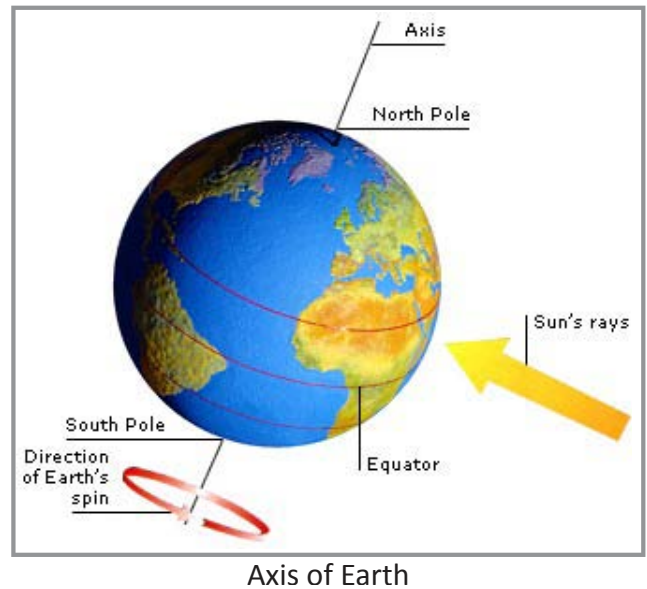
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Representation of the Earth

With the availability of actual photographs and pictures, it has become clear that the earth is spherical in shape. In order to study the details about the earth, it is represented in different ways. The most popular ones are the representations in the form of a globe and a map. Let us study more about them.

GLOBE

A **globe** represents the three-dimensional view of the earth. It shows the shape of the oceans and the continents correctly. It also shows their correct relation to one another as they are on the earth. Similarly, the distances based on scale and directions of places are fairly correct on the globe. A globe gives us a better idea of parallels (latitudes) and meridians (longitudes), as it is three-dimensional. It helps us to understand how day and night occur and how seasons are caused. Only a globe gives us an idea about the tilt of the earth's axis.



With all these advantages, the globe has certain limitations also. It is difficult to carry the globe around. Although inflated globes made of plastic are also available, yet, inflating and fixing at the axis takes lot of time.

Globe cannot be used if we want to study a specific part of the earth. It does not show details, such as towns, villages, roads and railways, etc., of a country. If we want to study a country, a state or a district, a map is more useful.

MAP

A **map** is a representation of the earth or a part of it, drawn on a flat surface as per the scale. A map is a two-dimensional representation of the earth. Although, a map does not give us an idea of the true shape of the earth yet it has some advantages. Map is useful for showing large areas as well as very small areas. Very minute details can also be shown on a map. For example, a map can show