

1

THE EARTH - A LIVING PLANET

1.1 INTRODUCTION

As the sun fades into the evening sky, we get a glimpse of twinkling star - an endless stretch of starry sky. Have you tried counting them? I am sure you cannot count beyond 3000 stars. However, the astronomers with the help of telescope have seen several millions of them. The stars are countless. They form groups or clusters. These clusters of stars are called galaxies. The sun is the member of the galaxy - Milky Way. It is the head of its family - the solar system. Our earth and moon are the members of this solar system. In this lesson, we will only concentrate only on some of the important features of the Universe, the Milky Way, the Sun and the members of the solar system, which interest us as inhabitant of the planet earth.

1.2 OBJECTIVES

After studying this lesson you will be able to:

- recognise the relationship between the Milky Way, the Universe and the Sun;
 - infer that the universe is limitless in terms of space and time.
 - discuss the limitations of conventional units of measurement to measure heavenly distance and the significance of light year;
 - explain the importance of the sun for sustaining life on the earth;
 - describe the important characteristics of the sun.
 - identify the position of the earth and other planets on a diagram of the solar system;
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- compare the characteristics of the planets including their dimensions and the varying periods of their revolution around the sun with the help of the given information;
- explain the uniqueness of the planet earth vis-a-vis the human beings;
- differentiate between planets and satellites;
- state the benefits of artificial satellites to the human beings.

1.3 THE UNIVERSE

The clusters of several millions stars is called the *galaxies*. Out of the six billion stars in the sky, our sun is just one of them. The galaxy in which our sun is located is called Milky-Way or *Akashganga*. On a dark night, you will see a band of misty light stretching across the clear sky, this is Milky-Way or *Akashganga*. Infact, what we see is only the outer part of the *Akashganga*. No wonder, people call it *Akashganga*, which means white river of light. Actually *Akashganga* is a disc-shaped collection of stars. Its centre is at an unestimable distance from us. Besides, the sun, star nearest to the earth, is Proxima Centauri. It is at a distance of about, 40, 000, 000, 000 kilometres from the earth.

I am sure, nobody feels comfortable to read such large figures. This is because a kilometre is comparatively a small unit for measuring such long distances. There are some known stars which are still thousands of times further away from the Proxima Centauri. How do we measure such distances? Astronomers use light year as a unit for measuring distances in space. Light year is a distance that light travels in one year. The velocity of light is about 300, 000 kilometres per second. Thus the light year is equal to $3, 00, 000 \times 60 \text{ (seconds)} \times 60 \text{ (minutes)} \times 24 \text{ (hours)} \times 365 \text{ (days)} = 94, 60, 80, 00, 000 \text{ kilometres}$.

Our galaxy is close to 1, 00, 000 light years in diameter and its thickness is twenty thousands light years at the centre. The sun is at a distance of about thirty thousands light years from its centre. We have mentioned earlier that Milky Way is not the only galaxy in the universe. Astronomers have discovered millions of similar galaxies.

There are 20 or 25 galaxies close to our galaxy. Each galaxy is again a cluster of billion of stars. The galaxy closest to our Milky Way is Andromeda. If we see Adromeda with the help of a telescope, it will appear as a shining cloud of gas. A powerful telescope, shows several stars distinctly. Andromeda is at a distance of 20, 00, 000, 000 light years from the earth.

The galaxies are rushing away from each other at a tremendous speed. Hence, it is said that the universe is continuously expanding or in otherwords is always changing. The age of stars is counted in billion years. These stars are born, live, grow old and finally die. That is why we say that the universe is infinite in terms of time and space.

- * A galaxy is a cluster of billions of stars.
- * Light year is the distance that light travels in one year at velocity of 300 000 kilometres per second.
- * The universe is the aggregate of all the matter, energy, galaxies and space.

INTEXT QUESTIONS 1.1

1. What is a galaxy?

 2. Name the galaxy nearest to Milky Way?

 3. What is a light year?

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1.4 THE SUN

The sun is the head of the solar system. All the members of the solar system planets, their satellites, planetoids, meteoroids and comets revolve around it. All the planets, their satellites put together, are still much smaller than the sun. The sun is 1.3 million times bigger than the earth. The sun contains almost 99 percent of all the matter of the solar system. As its size is very big, it has an immense gravitational force, which keeps the widely scattered family members of the solar system revolving around it. The sun is like other stars. All the other stars are at a much greater distance from us than the sun, they look like a small speck of light. The sun is much nearer to the earth, even though the average distance between the sun and the earth is 150 million kilometres. Sunrays take about eight minutes to reach the earth. Let us look at the table 1.1 to understand the fact about the Sun, the Earth and the Moon.

The sun is the only source of energy on earth. The coal, petroleum and hydro-electricity are the indirect forms of solar energy. Where does the sun get its energy from? The sun is like a huge nuclear furnace. It comprises mainly of hydrogen and helium. Besides these gases, there are other elements also. The temperature at the centre of the sun, reaches upto 15 million degree celcius, due to the immense weight of its matter and force of gravitation. At this high temperature, hydrogen particles collide and fuse to produce helium

Table 1.1 Some Facts about the Sun, the Earth and the Moon

| Item | The Earth (Planet) | The Moon (Satellite) | The Sun (Star) |
|--|-----------------------------------|--|------------------------|
| Equatorial diameter | 12757 km. | 3476 km. | 13,52,000 km (rounded) |
| Distance from the Earth in kilometre | — | 3, 84,000 | 150 million km |
| Distance from the earth in terms of light | — | 1. 25 sec. | 8 min. 19 sec. |
| Volume (with earth as one unit) | 1 | 1/49 | 13,00,000 |
| Surface temperature | 15°C | Day time 100° to 127° C Night: -150°C to -183°C | 6000°C (Outer layer) |
| Revolution time | 365 days, 5hr 48 min. and 46 sec. | 29 ½ days (with reference to the sun) | 225 million years |
| Rotation Time | 23 hr. 56 min. 4 sec. | 29 ½ days (24 hours) (with reference to the sun) | About 25 days |
| Average Speed of Revolution | About 30 km/sec. | 1 km/sec. | 250 km/sec. |
| Age | 4600 million years | 4600 million years | 5000 million years |
| Major Gases Present | Nitrogen and Oxygen | Nil | Hydrogen & Helium |
| Brightness if full Moon = 1 unit | Nil | 1 | 5,00,000 |
| Distance in terms of a rocket flying @ 12 km per second. | — | 9 hours | 5 months |

particles. (Fig. 1.1). It produces enormous amount of energy. It is just like explosion of thousands of hydrogen bombs. In this process about 4.25 million tons of hydrogen is converted into helium in only one second. The sun has huge amount of fuel in the form of hydrogen. Hence it would continue to supply the energy to the earth for million and million of years. But a day will come, when the sun will complete its life span and die like other stars.

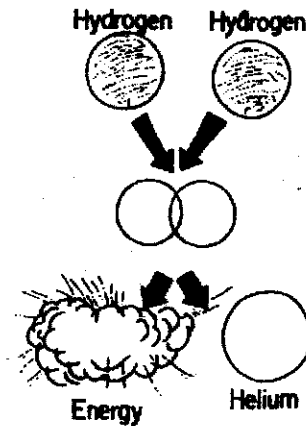


Fig. 1.1 Collision of Hydrogen particles and fusion with Hydrogen particles which produce enormous amount of energy

INTEXT QUESTIONS 1.2

1. What is the average distance between the sun and the earth?

2. What is the temperature at the centre of the Sun?

3. What are the indirect forms of solar energy?

1.5 THE SOLAR SYSTEM

The sun and its companion celestial bodies—the planets, their satellites, planetoids, comets, and meteoroids constitute the solar system. Besides them, the planetary dust and the clusters of gases are also the part of the solar system.

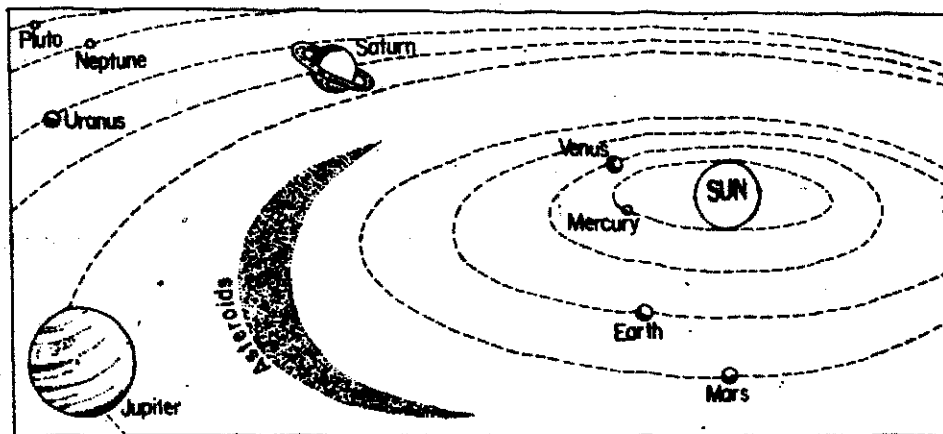


Fig. 1.2 Member of the Solar System

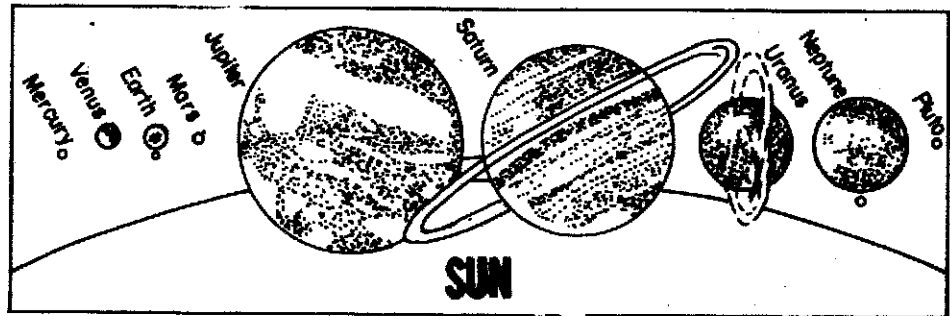


Fig. 1.3 Relative Size of the Planet

(a) Planets

Planets are the large sized celestial bodies. They revolve around the sun on their orbits. Planets have no light of their own. They are opaque bodies and reflect the sun's light. They rotate on their own axes. There are nine planets in the solar system. These are, in order of their distance from the sun — Mercury, Venus, Earth, Mars, Jupiter, Saturn, Neptune and Pluto. As the distance increases between the planets and the sun the duration of the revolution also increases (fig. 1.4).

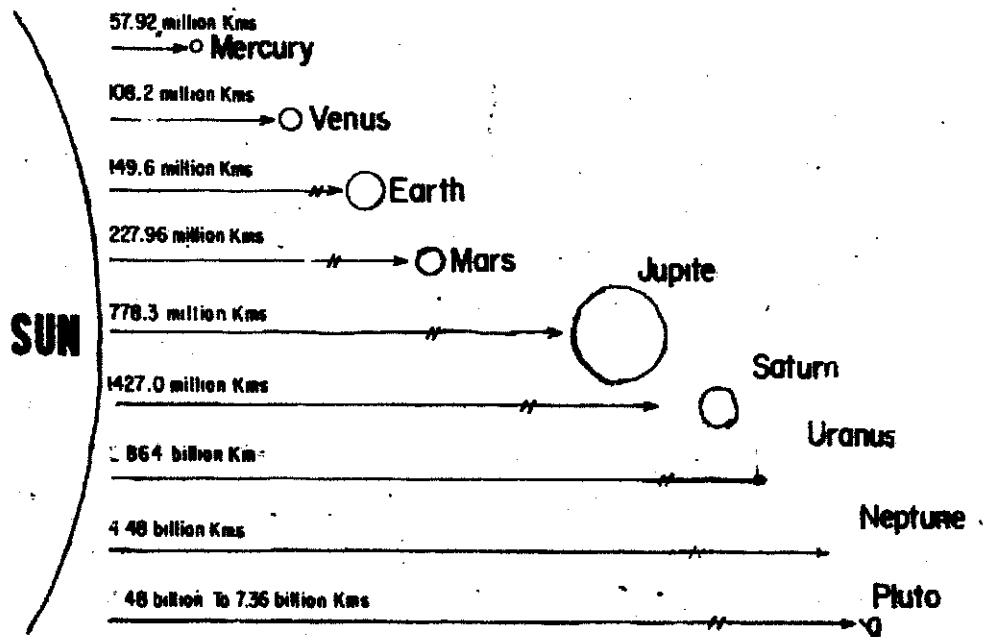


Fig. 1.4 Distance of the Planets from the Sun

Some planets, like Mercury, Venus and Mars are solid like our Earth. These are called terrestrial planets. Some planets are made of gases. They are called gaseous planets. Jupiter, Saturn, Uranus and Neptune are gaseous planets. Pluto is a unique planet. It seems that it is made of ice. Planets closer to the sun are very hot while those further away are very cold. Hence, there is no life on any other planet except our earth.

Only Mercury, Venus, Mars, Jupiter and Saturn are visible to the naked eyes in the night. Uranus, Neptune and Pluto can be seen only with the help of a telescope. Four planets of solar system have rings around them. Planets with rings are Jupiter, Saturn, Uranus and Neptune. Venus and Uranus rotate on their axes in opposite direction than other planets.

Look at the table 1.2 for some very interesting information about the planets.

Table 1.2 Characteristics of Planets

| Planet | Average distance from the Sun (in millions (km.)) | Diameter (in k.m.) | Duration of rotation | Duration of revolution | Number of satellites | Average temperatures | Speed of revolution km/sec. | Date of discovery in |
|---------|---|--------------------|----------------------------|------------------------|----------------------|--|-----------------------------|----------------------|
| Mercury | 57.9 | 4,878 | 59 days | 88 days | - | 430°C (part facing Sun) -170° C (Part not facing Sun) | 47.9 | Prehistoric times |
| Venus | 108.2 | 12,100 | 243 days | 225 days | - | 470°C | 35.0 | Prehistoric times. |
| Earth | 149.6 | 12,757 | 23 hours 56 min and 4 Sec. | 365.3 days | 1 | 15° C variable average | 29.8 | prehistoric times. |
| Mars | 227.9 | 6,787 | 24 hours 36 minutes | 687 days | 2 | -50° C variable average | 24.1 | Prehistoric times. |
| Jupiter | 778.3 | 142,800 | 9 hours 54 minutes | 11.86 Years | 16 | -130° C above the clouds. | 13.1 | Prehistoric times. |
| Saturn | 1427.0 | 1,20,600 | 10 hours 42 minutes | 20.46 Years | 20 | -185° C above the clouds. | 9.6 | Prehistoric times. |
| Uranus | 2870.0 | 51,800 | 15 hours 36 minutes | 84 Years | 15 | -215° C above the clouds. | 6.8 | 1781 A.D. |
| Neptune | 4497.0 | 48,600 | 17 hours 54 minutes | 165 Years | 8 | -200° C above the clouds. | 5.4 | 1846 A.D. |
| Pluto | 590.0 | 3,000 | 6.4 days | 248 Years | 1 | -230° C | 4.7 | 1930 A.D. |

(b) Planetoids or Asteroids

Planetoids or Asteroids are small solid celestial bodies. They are in a belt between Mars and Jupiter and revolve around the sun. Most of the planetoids are small in size. About one million planetoids are of one kilometre or a little more in diameter. Ceres is the largest planetoids. It has a diameter of 1003 kilometres. Small planetoids have irregular shapes. Some are spheroids, some are long, some are cylindrical while some planetoids are bean-shaped. Some small and stray planetoids fall as meteorites on the surfaces of earth.

(c) Natural Satellites

Natural satellites are those celestial bodies which revolve around the planets and follow them in their revolution around the sun. The satellites like planets are opaque bodies with no light of their own. They also receive their light and heat from the sun. The moon is a satellite of the earth. Except Mercury and Venus, other planets have one or more satellites. The number of satellites of each planet is given in the table 1.2. According to the latest information (1997), there are 63 satellites in the solar system. Seven satellites of the solar system are bigger in size than pluto. Out of these seven, two are even bigger than Mercury. Our moon is the only satellite where human beings have left their footmarks. Scientist and astronomers have either seen other satellites with the help of telescopes or have taken their photographs from spaceships.

(d) Comets

Comets are those celestial bodies, which have a head shaped like a star and a long luminous tail. Sometimes, they are seen in the sky during nights with their bizarre shapes. Comets produce a spectacular sight in the sky at night.

Comets revolve around the sun in highly elliptical orbits. Comets are of two types. First are those, which are seen again and again after a certain period of time. Second are those, which are seen only once. They never return again. Hailley's comet is of first type. We view it after about every 76 years. Hailley's comet was seen in 1910 and after that it was sighted again in 1986. Most of the comets are named after their discoverers. Hailley's comet is named after the famous astronomer Edmund Hailley. A comet was seen in 1996. It was named Hale-Bopp after their discoverer Dr. Allen Hale and Thomas Bopp of U.S.A.

- * Solar system is the group of the sun, planets, their satellites, planetoids, comets, meteoroids, interplanetary dust and gases.
- * Planets are celestial bodies comparatively of large size, which revolve around the sun in definite orbits.
- * Planetoids are small celestial bodies. They revolve around the sun in a belt between Mars and Jupiter.
- * Comets are those celestial bodies, which have a head, shaped like stars and long luminous tail.

INTEXT QUESTIONS 1.3

1. Which is the biggest planet in the solar system?

 2. Name the planet, which has a diameter almost equal to the diameter of the Earth

 3. In which year the planet Uranus was discovered? _____
(a) 1846 A.D. (b) 1781 A.D. (c) 1930 A.D.
 4. Which is the nearest planet of the sun? _____
(a) Pluto (b) Mercury (c) Saturn
 5. How many planetoids have a diameter of about one kilometre. _____
(a) One lakh (b) One million (c) Two and half lakhs.
 6. Tick (✓) the correct answers -
(a) Mercury has three satellites.
(b) Mars has two satellites.
(c) Jupiter has no satellites.
(d) Moon is the satellite of our earth.
 7. How many satellites are there in the solar system according to the latest information?

 8. When was Halley's comet last seen? _____
(a) 1910 A.D. (b) 1986 A.D. (c) 1890 A.D..
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1.6 THE EARTH - SHAPE AND SIZE**(a) Shape**

Today, we are certain that the Earth is spherical in shape. There are pictures taken from the outer space that confirm that the earth is almost spherical. Not only this, man has himself seen the earth from the moon. But in ancient times, people believed that the earth was flat. It was much later such belief was proved wrong by astronomers.

Renowned Indian astronomer Arya Bhatt of fifth century A.D. proved that the earth is a sphere even without the help of modern and advanced tools, Arya Bhatta also proved for the first time that the earth rotates on its axis. He wrote in his book named *Arya Bhattiya*, "A man sitting in a boat, when proceeds further with the current, then it seems to him that the stationary trees, rocks, mountains etc are moving in the opposite direction. In the same way the stationary stars seems to be moving in the opposite direction when seen from the rotating earth" Another Indian astronomer Varahamihir also proved that the earth is a sphere.

The actual measurements of the earth's dimensions have however, proved that the earth is not a perfect sphere, bulging slightly at the equator and flattened at the poles. Therefore its polar diameter is shorter than its equatorial diameter by about 43 kilometres. There is no such object similar to the shape of the earth. Hence the shape of the earth is called 'Geoid' means that the shape of the earth is similar to the earth only. These minor differences can not be truly represented on a small scale globe. Therefore, for all practical purposes the earth is considered to be spherical in shape.

(b) Size

In the solar system our earth is bigger than some planets and also smaller than some other planets. Mercury, Venus, Mars and Pluto are smaller than our earth. But Jupiter, Saturn, Uranus and Neptune are much bigger than the earth. Study the Table No. 1.3 carefully and find out the important dimensions of the earth.

Table No. 1.3 Important Dimension of the Earth.

| | |
|--|--|
| Equatorial Diameter | 12757 kilometres |
| Polar Diameter | 12714 km. |
| Equatorial Circumference | 40, 075 km |
| Polar Circumference | 40, 024 km |
| Total Surface Area | 51, 09, 00, 000 sq. km |
| Time Taken to complete One Rotation | 23 hours, 56 minutes 4 seconds |
| Time Taken to complete One Revolution | 365 days 5 hours 48 minutes, 46 seconds |

INTEXT QUESTIONS 1.4

- (1) Write the names of two Indian astronomers who were first to prove that the earth is spherical in shape.
 (a) _____ (b) _____
 - (2) What is the difference between the polar diameter of the earth and its equatorial diameter.

 - (3) Why is the shape of the earth called Geoid?

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1.7 THE EARTH - A LIVING PLANET

We have seen that in this endless expanse of the universe, our earth is like an insignificant tiny speck. In spite of its insignificant size, the earth is a unique planet not only in solar system, but also in the whole universe. It is the only known planet, where life exists. Animal, plants, micro - organisms and numerous other living beings live on our earth. Why does life exist only on the earth and not on any other celestial body of the universe? Let us examine the factors which have made life possible on our earth.

(a) The distance of the earth from the sun.

The amount of energy received from the sun by our earth and other planets depends upon their distance from the sun. Mercury and Venus are very close to the sun. Therefore, they are very hot, even lead can melt there. In contrast to these planets, there are some other planets, which are too far away from the sun. So they are very cold and even liquids and gases are in a frozen state. But our earth is at an optimum distance from the sun. As a result the earth has an average temperature of 15°C . The range of temperature is such that water is found in solid, liquid and gaseous state (vapour) on our earth. Water is a prerequisite for all forms of life. Life originated and developed in the water. Therefore, plants grow and animals live here.

(b) The existence of three realms on the earth.

The earth is the only known planet in the universe where three realms - atmosphere, hydrosphere and lithosphere exist. Mercury, Venus and Mars have lithosphere and atmosphere, but there is no hydrosphere. Jupiter, Saturn etc. are gaseous planets, where there is neither lithosphere nor hydrosphere. Hence there is no life on these planets.

(c) The right mixture of gases in the Earth's atmosphere.

Earth's atmosphere has an ideal mixture of nitrogen and oxygen together with a little of carbon dioxide and ozone. Non availability of oxygen to our body even for a fraction of second makes us restless. The atmosphere of Venus and Mars mainly consist of carbon dioxide. On Jupiter, the principal gases are hydrogen and helium.

(d) The presence of ozone layer in our atmosphere

Ozone layer is responsible for absorbing a large proportion of the sun's ultraviolet radiation. Without this absorption, the earth would be subjected to a degree of ultra-violet radiation which is lethal to plants and animals.

(e) The ideal duration of day and night

The average duration of day and night on the earth is of 12 hours each. A single night on meucury is as long as 30 earth nights. On Venus, the night is still longer. It is about 122 earth night long. On the other hand, in Jupiter and Saturn, the duration of a night would hardly be of five hours each:

Due to these favourable conditions, there are about 14 lakhs species of animals and about 5 lakhs species of plants on our earth. Certain plants and animals which are found on our earth today, were not there when the life began on it. Many plants and animals are extinct now, but new ones have taken their place. Some plants and animals have changed their forms with the changes in the environment. The evolution of life has been a continuous process on the earth.

INTEXT QUESTIONS 1.5

1. Why is our earth a unique planet in the solar system?

 2. What is the average temperature of our Earth?

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1.8 THE MOON - EARTH'S NEAREST NEIGHBOUR

We all are familiar with the waxing and waning of the moon. A full moon on clear night is a beautiful sight. Among the glittering heavenly bodies, the moon appears to be the biggest one. This is because the moon is nearest to the earth than any other heavenly body. The average distance between the moon and the earth is 3, 84, 000 kilometres. The moon rays reach the earth within 1.25 seconds. Moon is the only natural satellite of the earth.

The moon is much smaller than the earth. Its diametre is 3476 kilometres, which is about one fourth of the earth's diametre. The moon and sun appears from earth to be equal in size. But this is not true. The sun is very much

bigger than the moon. Why is it so? This is because the moon is 400 times smaller than the sun but it is 400 times closer to the earth than the sun. Hence to the human eye, the two appears to be of same size. The moon rotates on its own axis and revolves around the earth completing one rotation and revolution simultaneously in $29\frac{1}{2}$ days (with reference to the sun). The periods of moon's rotation and revolution being equal, we always see the same face of the moon. Its other face always remains invisible to us. The other face of the moon, for the first time, was photographd by Russian space ship — Luna -3 in 1959.

The moon is an opaque body and does not posses its own light. It reflects the light of the sun.

The apparent shape of the moon as visible to the naked eye, changes from night to night. Its revolution from New Moon (*Amavasiya*) to Full Moon (*Purnima*) the visible illuminated portion increases and the Moon is, said to wax. This is '*shukla paksha*'. From Full Moon to New Moon, the illuminated portion decreases and the Moon is said to wane. This is *krishna paksha*.

Moon is the only heavenly body where humans set foot. Neil Armstrong was the first human to set foot on the Moon on July 20, 1969. There were six successful manned lunar landings. Till now 12 astronauts have landed on the Moon, 45 spacecrafts from U.S.A. and 22 from Russia have orbited the Moon.

The data collected by manned and unmanned orbiting laboratories show that the surface of the Moon is irregular, covered by a multitude of stones, pebbles and rocks, all enveloped by a layer of dust.

There is no fossil life, no living organisms and no organic material. The Moon is a desolated place, barren of life.

Radioactive dating of moon rocks have revealed that the moon is as old as the earth. The age of the earth is 4.6 billion years. Like the earth quakes, the moon is also rocked by moon quakes. There is no atmosphere on the moon. In the absence of the atmosphere nothing is audible in it. Talking on the moon is possible only through gestures.

There is a great difference between the day and night temperatures. The maximum temperature of the moon on its day side reaches to 134°C . On the moon's night side the temperature drops to about -170°C . It is so hot during the day that everything may be scorched, and in the night it is so cold that everything freezes.

There is neither air nor water on the moon. Hence no plants and animals can survive there. A man weighting 60 kilograms on the earth will be of 10 kg only on the moon. This is due to the difference in the gravitational force of the earth and the moon. The gravitaitonal force on the moon is one sixth that of the earth. Hence a man on the moon can jump six times longer and higher than on the earth.

INTEXT QUESTIONS 1.6

1. Which celestial body is nearest to the earth and what is the distance between them?

 2. Who was the first person to land on the moon?

 3. What is the *krishna paksha* (waning) of the moon?

 4. How much time does the ray of the moon take to reach the earth?

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1.9 ARTIFICIAL SATELLITES

Suppose you are sitting on the terrace of your house and reading a book. While reading you fell asleep with the book lying open on your lap. You should not be surprised if this picture of you with your open page of the book is published in the newspaper next day. Yes, now the space has its own eye to watch everything on the earth. These are the eyes of the cameras fitted with powerful lenses, on artificial satellites. They are so powerful that they can also read the minute print of your book. The erstwhile USSR launched its first artificial satellite named Sputnik on 4th October, 1957. This was the first human-made space vehicle that revolved around the earth. After this, human beings never looked back in the discovery of space. Women have also not lagged behind in the exploration of space. Valentina Tereshkova was the first woman astronaut to travel in the space.

On July 20, 1969, spaceship Apollo-11 took Neil Armstrong of U.S.A. to the moon. He was the first human being to set foot on Moon. "It was one small step for a man, but a giant leap for mankind" Since many spaceships have reached close to planets like Jupiter, Saturn, Uranus, Neptune and Pluto, they have sent valuable information about these planets. These days (1997), a spaceship Ulysses and Galileo are exploring the unknown facets of the sun and Jupiter respectively.

Today, India is one of the leading countries in the field of space technology. On April 19, 1975 India launched its first artificial satellite Aryabhata in the space. After this Bhaskara and Apple were launched. A chain of communication satellites like INSAT - 1 and INSAT - 2 were also launched. India has also sent "Remote sensing satellites". Prominent among these are I.R.S. - 1 and I.R.S.P satellites.

Artificial satellites are generally of five types -1. Weather, 2. Communication 3. Navigation 4. Scientific and 5. Military satellites.

The artificial satellites are very useful to us. Artificial satellites have revolutionised the communication system. You can talk to any person in any corner of the world on telephone at a very low cost. Communication satellites have increased the reliability of the Telecommunication Department. Radio and television programmes have reached the far-flung corners of our country. They can also be viewed in any country of the world. Just like we can see the cricket, hockey matches being played in any country on your television set. Educational programmes are telecast for the students all over the country. In video teleconference programmes, you can ask questions and get their answers simultaneously. A correspondent can send the news directly to the news rooms through communication satellites. The latest information or forecast about the ever changing weather and other natural calamities can be received through artificial satellite.

Artificial satellite are also being used for the following :

1. Geologists use it to locate the reserves of mineral and underground water.
2. The oceanographers use it to map the areas of shoals of fish in the ocean water;
3. The archeologists use it to find the sites for excavation.
4. Satellite provide maps for urban planning and afforestation and for locating areas under prohibited crops.
5. Artificial satellites are also used for spying information. The information of India's nuclear explosion at Pokharan was received by USA. During the gulf war of 1991, USA used these satellites for spying and launching of missiles.

The life span of artificial satellites and spaceships are generally of six to seven years. After this they become useless and travel aimlessly in the space. Thousands of satellites and spaceships, their broken parts are revolving in the space. They in turn have become hazards for the new satellites and space ships. These inactive satellite and their broken pieces can fall on the earth and cause serious accidents.

INTEXT QUESTIONS 1.7

1. When was the spaceship launched?
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2. What are the four functions of the artificial satellites ?

3. Which type of the artificial satellites provide facilities for the telecast of matches?

4. Give an example of military spying carried through a satellite.

5. What is the life span of artificial satellite? .

WHAT YOU HAVE LEARNT

The Universe is limitless. There are millions of galaxies in the Universe. Every galaxy consists of billions of stars. Milky - way is our galaxy. The Sun is a small star of this galaxy. The Sun, with other member of the solar system, is revolving around the centre of the Milky - way.

The sun is the only source of light and energy for all the planets and satellites. The sun is like a huge nuclear furnace and produce enormous energy. The existence of life on the earth is due to the sun.

The sun is the head of the solar system. Planets, satellites, planetoids, comets etc are its members. All the nine planets and 63 satellites are revolving around the sun. Satellites also revolve around their planets. Planets close to the sun are hot while those farther away are cold. All planets are spherical in their shape. These planets rotate on their axes. The orbits of planets are elliptical.

The Earth is the most unique celestial body in the universe. It is unique because life is found only on this planet. Our Earth is a living planet.

The Moon is the natural satellite of the Earth. Besides rotation on its axis, it revolves around the Earth also. The moon receives its light from the sun. There is no atmosphere on the moon. Its surface is very uneven. The Moon is desolate, barren and lifeless.

A large number of artificial satellites are revolving around the earth. They have revolutionized the communications and weather forecasts. The information of natural calamities is received in advance by them.

TERMINAL QUESTIONS

1- Answer the following questions using one word or two or three sentences.

- (a) How energy is produced in the Sun?
- (b) Around which centre the sun is revolving?

2- Distinguish between :

- (a) planet and satellite
- (b) Artificial satellite and natural satellite.
- (c) Comet and planetoid.

3- Makeout correct pairs from the following two columns.

A**B**

- | | |
|---|----------------|
| (a) The nearest star to the Earth | (i) Pluto |
| (b) Generally farthest planet from the sun | (ii) The sun |
| (c) Brightest object in the sky after the Sun and the Moon. | (iii) The Moon |
| (d) Nearest celestial body to the Earth | (iv) Venus |
| | (v) Mercury |

4- Give a single term for each of the following :

- (i) The cluster of millions of stars
- (ii) The movement of the planets round the sun.
- (iii) The spinning planets on their axes.
- (iv) The distance which the light travels in a year at a velocity of 300, 000 kilometres per second.

5- Look at the table no. 1.3 and answer the following questions.

- (i) What is the difference between the polar and the equatorial diametres of the earth?
 - (ii) What is the length of the equatorial circumference of the earth?
 - (iii) What time does the earth take in completing one rotation on its axis?
 - (iv) How much time does the Earth take in completing one revolution round the Sun?
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- 6- Look at the table no 1.2 carefully and answer the following questions :
 - (i) Which planet takes the least time in completing one rotation on its axis?
 - (ii) Which planet was discovered last?
 - (iii) Which planet revolves round the sun in 84 years?
 - (iv) Which planet has the highest temperature?
 - (v) What is the distance between the earth and the Venus?
- 7- Life is found only on our planet among all the planets of the solar system. State any three factors.
- 8- State any five uses of the artificial satellites.
- 9- Give a description of planet Mercury on the basis of the following headings. (Distance from the Sun, Duration of rotation, Duration of revolution and temperature.)

CHECK YOUR ANSWERS

INTEXT QUESTIONS

1.1

- (1) Cluster of stars
- (2) Andromeda
- (3) Distance that light travels in one year at a velocity of 300, 000 kilometres per second.

1.2

- (1) 150 million kilometres
- (2) 15 million degree Celcius
- (3) Coal, Petroleum, and Hydroelectricity.

1.3

- (1) Jupiter (2) Venus (3) 1781 A.D (4) Mercury (5) One million
- (6) (b) and (d) (7) 63 (8) 1986 A.D

1.4

- (1) (a) Aryabhatta and (b) Varahamihir
- (1) 43 kilometres
- (2) There is no object whose shape is similar to that of the earth.

1.5

- (1) Only the earth has life. (2) 15° C

1.6

- (1) The Moon, 3, 84, 000 kilometres.
- (2) July 20, 1969, Neil Armstrong.
- (3) The duration in which the Moon's illuminated portion decreases.
- (4) One and 1/4 seconds or 1.25 seconds

1.7

- (1) October 4, 1957
- (2) Communication scientific research military spying navigation weather (any four points)
- (3) Communication satellites.
- (4) Information of Nuclear explosion at Pokharan received by the U.S.A.
- (5) About six or seven years.

TERMINAL QUESTIONS

- 1- (a) Atoms of hydrogen change into helium and huge amount of energy is produced.
(b) The centre of Milk -way.
- 2 (a) (i) Planets are generally bigger than the satellites,
(ii) Satellites revolve around planets.
(b) (i) Natural satellites were born with other members of solar system while artificial satellites are man made.
(ii) Artificial satellites revolves round the earth only, while natural satellites revolve round other planets also.
(c) (i) Comets are made of dust, gases and ice while planetoids are solid like rocks.
(ii) Comets have a head and tail while planetoids are spherical or cylendrical in shape.
- 3- (a) Sun (b) Pluto (c) Venus (d) Moon
- 4- (i) Galaxy
(ii) Revolution
(iii) Rotation
(iv) Light year
- 5- (i) 43 kilometres
(ii) 40075 kilometres
(iii) 23 hrs, 56 minutes, 4 sec.
(iv) 365 days, 5 hrs, 48 minutes, 46 seconds
- 6 (i) Jupiter
(ii) Pluto
(iii) Uranus
(iv) Venus
(v) About 41.4 million kilometres.
- 7- Refer to para 1.7 for the answer.
- 8- Refer to para 1.9 for the answer.
- 9- Refer to the data about Mercury given in table no 12