

Chapter :-star and solar system

Learning materials:

Objects: Objects, such as the stars, the planets, the moon and many other objects, in the sky are called celestial objects.

- **Phases of the Moon:** The various shapes of the bright part of the moon as seen during a month are called phases of moon.

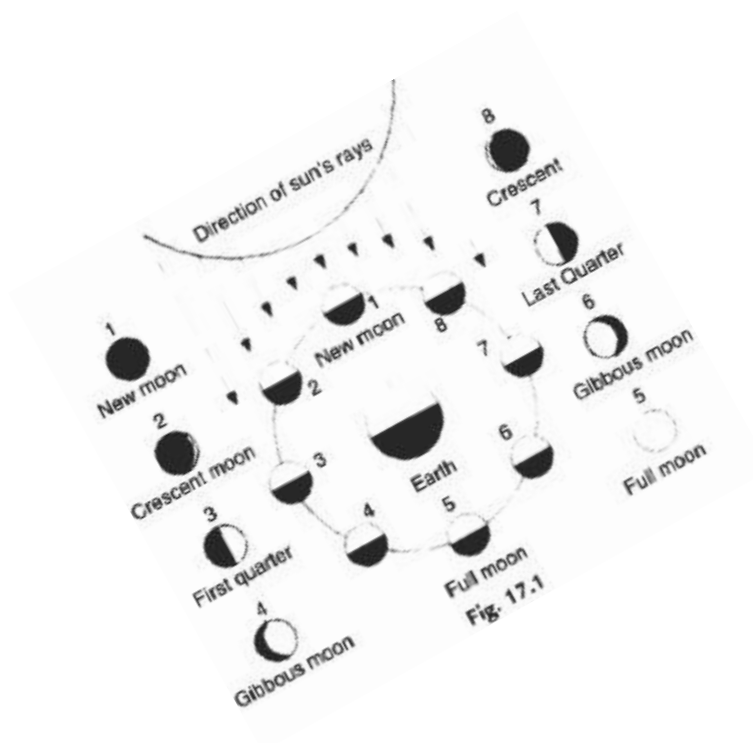
The moon revolves round the earth. It also revolves round the sun along with the earth. The various stages of the moon during a month are shown in Fig. 17.1.

In position 1, the part of the moon facing earth does not receive light from the sun.

Hence it appears dark. The other part of the moon that is facing away from earth is lit by the sun light. This position of moon, when it appears dark on earth is known as new moon.

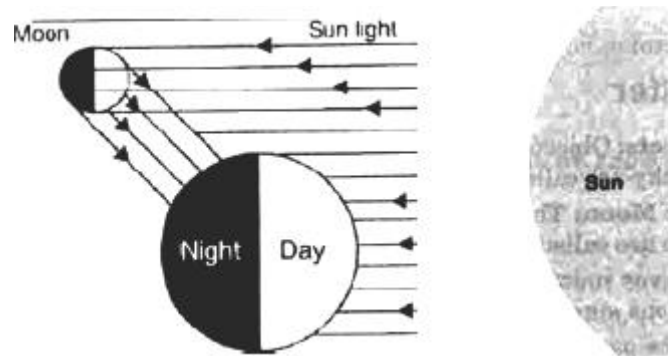
In position 2, 3 and 4, we see the moon not as a full disc but as a crescent. Position 2 of the moon is known as crescent moon, Position 3 as first quarter and position 4 as Gibbous (bright part is greater than a semicircle) moon.

In position 5, the Sun's rays fall directly on the part of the moon facing earth. In this position we see the moon as a full disc of light. This position of moon is known as full moon.



Between the positions 1 and 5, the bright portion of moon increases. It is called waxing phase of the moon. We have "Amavasya" at position 1, and "Purnima" at position 5. During positions 6, 7, 8 and 1, the moon wanes, that is the bright portion of moon becomes smaller and smaller.

- The time period between one full moon to the next full moon is slightly longer than 29 days. In many calendars this period is called a month.
- **How we see the moon:** We see only that part of the moon from which the light of the sun is reflected towards us.



* Moon is visible due to reflected sunlight

- The moon completes one rotation on its axis as it completes one revolution around the earth.
- The moon has dusty and barren surface with craters, steep and high mountains. The moon has no atmosphere and no water.
- On July 21, 1969 (Indian time), Neil Armstrong landed on the moon for the first time. He was followed by Edwin Aldrin.
- Stars emit light of their own. Sun is also a star.
- The stars appear to move from east to west because of the rotation of the earth. We know that our earth rotates about its axis from west to east. Therefore, the stars appear to move in the direction, opposite to rotation of earth, i.e. from east to west.
- Light year: Distances between the stars and earth are so big that it is difficult to measure these distances in kilometers. For this we need a bigger unit. This unit is light year. A light year is the distance travelled by light in one year. The speed of light is 300,000 km/s. If we multiply this speed of light by the number of seconds in one year, we get the distance of about 9,460,800,000,000 kilometres. This distance is one light year.

The distance between the sun and the earth is about 150,000,000 (15 crore) kilometres. Light takes about 8.3 minutes to reach earth from the sun.

- Constellation: The stars forming a group that has a recognisable shape of animals, human beings or other objects is called a constellation.

These constellations appear to move from east to west. The shape of all constellations seen in the sky always remain the same.

Each constellation has been given the name of an animal or object with which it resembles.

Some constellations are shown in star map

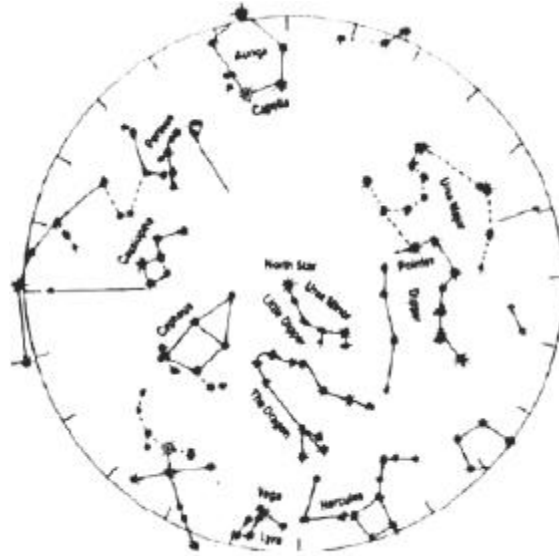


Fig. 17.3

- Some of the famous constellations are:

Ursa Major: It can be seen during summer time in the early part of the night. It is also known as saptnrish.

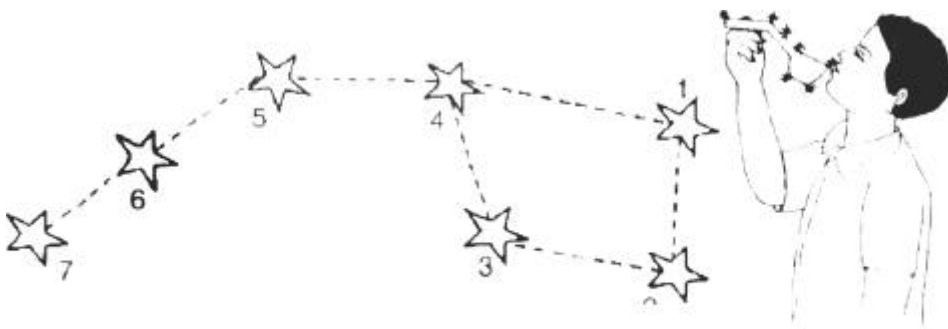


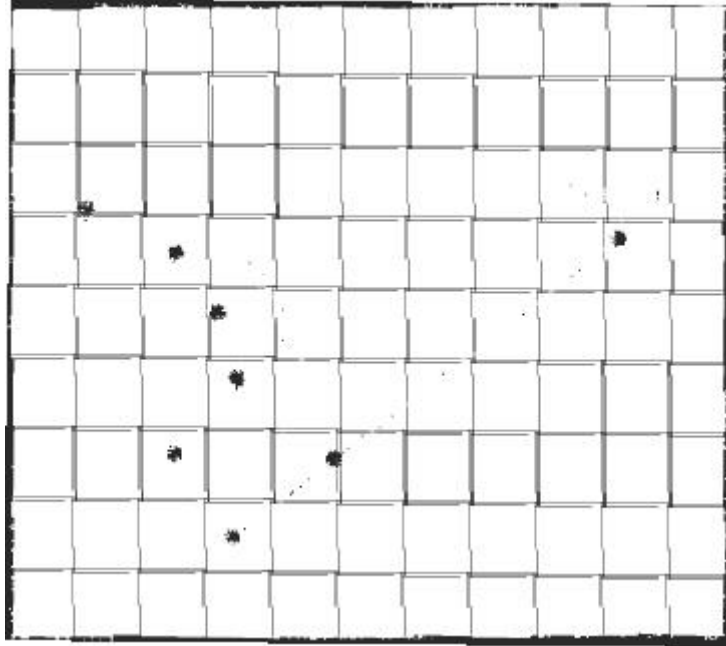
Fig. 17.4 Ursa Major.

Fig. 17.5 Dipper used to drink water.

'Great Bear' or 'Big Dipper'. The name 'Big Dipper' has been derived from the word 'Dipper'. Dipper was used in olden days for drinking water as shown in Fig. 17

Ursa Major consists of a groups of seven stars. Three stars appear to form the handle of the dipper and four stars form its bowl . It appears to move from east to west in the sky.

Pole Star: To locate Pole star, look at the two stars at the end of Ursa Major as shown in Fig. 17.6. Imagine a straight line passing through these two stars. Extend this imaginary line towards the north direction (Fig. 17.6). On this line you can locate a star which is not too bright and around which there are no stars. It is the Pole Star. The pole star always appears to remain at the same position in the sky.



Locating the Pole star in the sky.

The stars of Ursa Major appear to revolve around the Pole star. The Pole star is not visible from the southern hemisphere.

Orion: Orion can be seen during winter in the late evening. It has seven or eight bright stars. Orion is also called the Hunter or Kalpurush. The three middle stars represent the belt of the Hunter. The four bright stars appear to be arranged in the form of a quadrilateral.



Orion appears like a hunter.

The brightest star located close to Orion constellation is called Sirius.

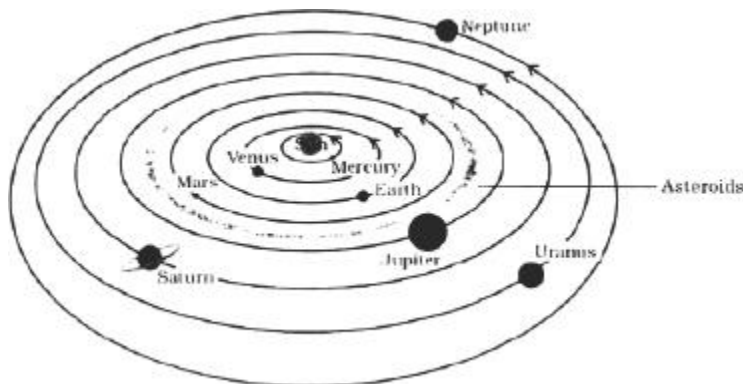
Cassiopeia: This constellation is visible during winter in the northern sky. It looks like a distorted letter W or M.

- **The Solar System:** The sun and the celestial bodies such as planets, comets, asteroids and meteors which revolve around the sun form the solar system.

The sun is the nearest star which is the main source of heat and light for all the planets.

The planets do not emit light from their own like stars. They reflect the sunlight that fall on them. Planets do not twinkle like stars.

A planet has a definite path in which it revolves around the sun. This path is known as an orbit.



The solar system (not to scale)

Period of Revolution: The time taken by a planet to complete one revolution around the sun is called its period of revolution.

Satellite: The body revolving around a planet is called a satellite. Moon is the natural satellite of the earth.

Different Planets: The solar system consists of eight planets revolving around the sun in their orbits as shown in Fig. The arrangement of planets in fig. is with respect to the position of the sun, i.e. in order of distance from the sun.

Mercury (Budh): It is the smallest planet and nearest to the sun. Mercury has no satellite of its own.

Venus (Shukra): It is nearest to the earth and is the brightest planet in the night sky. Venus has no moon or satellite of its own. It rotates from east to west while the earth rotates from west to east.

Comet: A comet appears as a bright head with a long tail. They revolve around the sun in highly elliptical orbits. The tail of a comet is always directed away from the sun.

Meteors and Meteorites: Sometimes we see bright streaks of light in the sky. These are commonly known as shooting stars, although they are not stars. Actually, these are small objects which glow due to friction when they enter the earth's atmosphere. These are called meteors. Meteors glow and evaporate quickly before reaching the Earth's surface. The bodies that reach the earth are called as meteorites.

Artificial Satellites: They are man-made and launched from the earth. They revolve around the earth much closer than the moon. Aryabhata was the first Indian satellite. Artificial satellites are used for weather forecasting, education, long distance communication and remote sensing.

- **The Earth (Prithvi):** It is the fifth largest planet and third in order of distance from the sun. It is the only planet of the solar system known to support life, because it has atmosphere, water, suitable temperature and a blanket of ozone. The earth has one natural satellite called the moon. The axis of rotation of the earth is tilted to the plane of its orbit. The tilt is responsible for the change of seasons on the earth.

- **Mars (Mangal):** It is the first outside the orbit of the earth. It is also known as red planet. It has two satellites.

- **Jupiter (Brihaspati):** It is the largest planet of the solar system. It has a large number of satellites (moons).

- **Saturn (Shani):** It appears yellowish in colour. It has beautiful rings. Saturn has a large number of satellites. It is least dense among all the planets.
- **Uranus (Indra):** Like Venus, Uranus also rotates from east to west. It has highly tilted rotational axis. So in its orbital motion Uranus appears to roll on its side.
- **Neptune (Varun):** It is the outermost planet of the solar system. It has two moons.

Asteroids: A large number of small objects that revolve around the sun between Mars and Jupiter are called asteroids.
