



*What is the
significance of
a space suit?*

*Why do the
stars twinkle?*

*Why and how
is space walk
done?*

09

Space and Satellites

Students' Learning Outcomes

After studying this chapter, the students will be able to:

1. Define the term 'space' and emphasize the need to explore it.
2. Recognize the role of NASA (National Aeronautics and Space Administration) in space exploration.
3. Define the term 'satellite' and describe its importance.
4. Describe the natural satellites of the planets of the solar system.
5. Define artificial satellites and explain their importance in exploring the Earth and space.
6. Recognize the key milestones in space technology.
7. Describe the uses of various satellites in space i.e. geostationary, weather, communication and Global Positioning System (GPS).

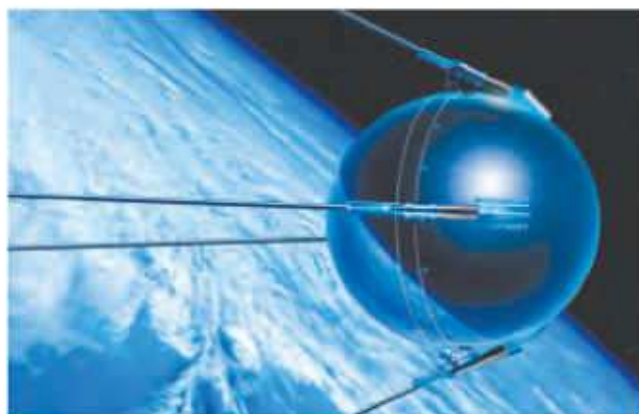
A space scene is shown in the following photograph. Can you recognize the various objects in it? Make a list.



When we look up at the sky on a clear night, we see countless tiny lights commonly known as stars. But scientifically, they are not all stars. Infact they include galaxies, stars, planets, Moon and some other objects. All these objects are called heavenly bodies. These heavenly bodies are a part of the vast space around us which is collectively known as the universe. Different countries have sent artificial satellites and other bodies in space for research and surveillance purpose.

Space Exploration

After seeing the heavenly bodies one becomes curious to know the realities of the Earth and space. The invention of a rocket made it possible to travel beyond our atmosphere into the vast space. We also could know how our Earth and solar system came into existence. The space age began on October 4, 1957 when Soviet Union launched Sputnik-1 in the orbit of the Earth.



Sputnik-1

This was followed by United States of America and some other countries who launched many other spacecrafts. They are monitoring the weather conditions, long range radio and television transmission, precise navigation and exploration of the Earth resources.

The Role of NASA

National Aeronautics and Space Administration (NASA) is an American Agency. It is responsible for space exploration and aviation.

As a result of its space activities, man stepped onto the Moon on 20th July, 1969. Moreover, NASA has sent spacecrafts to the other planets of the solar system for investigation purposes as well. The instruments and devices installed on them send us valuable information regarding their environment.



Human first step on the Moon

While in space, need was felt to perform experiments in a gravity free environment. For that purpose, NASA launched a space station called Skylab on May 14, 1973 which remained moving around the Earth about six months.



Skylab

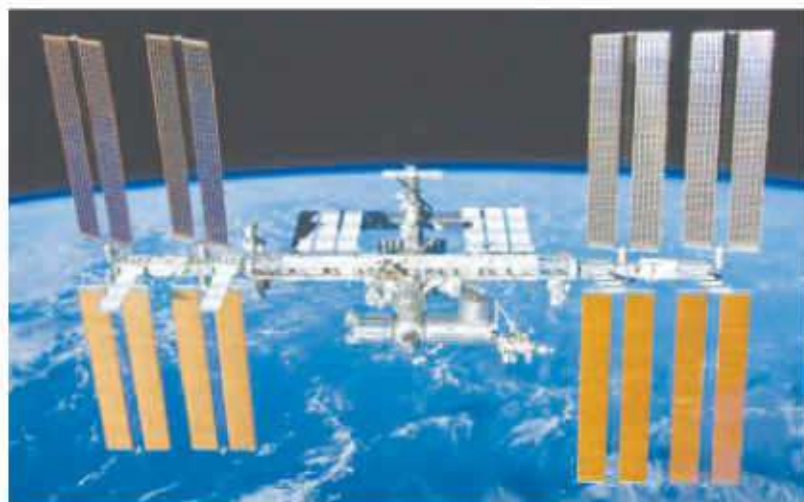
For your information!

MIR, the Russian Space Station orbited the Earth for 15 years at a height of 300 km. The scientists performed many fascinating experiments in it.



centres of Russia, Japan, Canada and Europe. Its size is greater than a foot-ball ground. It has been orbiting the Earth at a height of 400 km for the last 20 years. It completes its one revolution around the Earth in 90 minutes. The scientists from all over the world visit this space station and many of them stay in it for several months. Space shuttles are used to commute from this station. More than 250 scientists have benefitted for their research

work in its specific and gravity free environment.



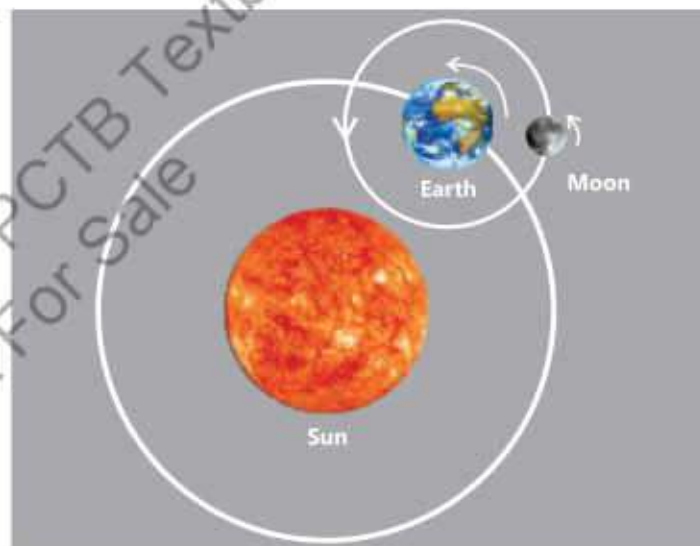
International Space Station

Interesting information

Soviet Union sent Sputnik-2 in space on 3rd November, 1957 that carried first living thing, a dog named Laika.

Satellite

An object moving around a very big heavenly body due to its gravity is called a satellite. The Moon revolves around the Earth. It is a natural satellite of the Earth.



The Moons of other Planets

The Moon is the only natural satellite of the Earth. Likewise some other planets have their moons.

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Sr. No.	Planet	Moons
1	Mars	2
2	Jupiter	79
3	Saturn	82

Sr. No.	Planet	Moons
4	Uranus	27
5	Neptune	14

Try it out

Very fascinating moons of Jupiter and Saturn can be seen by using even a moderate power handy telescope. Seek help from the internet for location in the sky.

Do you know?

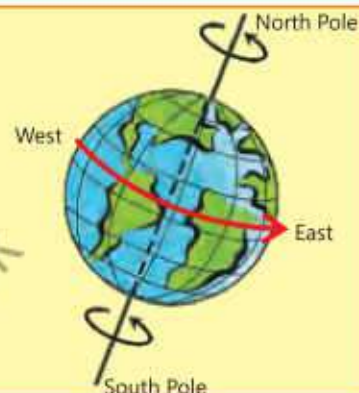
The bright object that we see on the horizon just before sunrise or after sunset is the planet Venus. It is also called morning star.

Activity 9.1

Students should find the names of moons of some planets using the internet or library.

Do you know?

The Earth rotates about its axis from the west to east. Hence, the Sun, Moon and stars appear to move from east to west.

**Artificial Satellites**

The spaceships which are made by humans to revolve around the Earth are called artificial satellites. These are sent into space by a rocket and are given a right speed for their height. The higher the satellite, the slower is its speed and longer is the time required to complete its one orbit.

Do you know?

Hundreds of satellites have been sent into space. We can see some of them like moving stars in a clear night sky.

Interesting Information

A satellite carrying Hubble space radio telescope uses radio signals for space exploration and sends informations to us.



Importance of Artificial Satellites

Can you tell, what benefits we get from artificial satellites? Radio, television transmission and information by internet reach in each part of the world because of artificial satellites. We can make contact at far off places by telephone. We can correctly locate our position anywhere in the world. We can know about changes in the weather much earlier. This helps us to deal with floods, storms, forest fires and other disasters effectively.

Uses of Various Satellites

Geostationary Satellites

The satellites revolving in the orbits around the Earth with the same speed as that of the Earth are known as geo-stationary satellites. They orbit at a height of about 36,000 km and are positioned directly above the Equator. They appear stationary at one place all the time when viewed from the Earth. These are commonly used for communication purposes and transmit TV signals across the world.



Geostationary Satellite

Interesting Information

The Earth rotates about its axis with a speed of 1,470 kilometres per hour over the Equator.

For your information!

For a satellite to stay in a particular orbit, it must be travelling at a specific speed. The lower the height, the faster it moves.

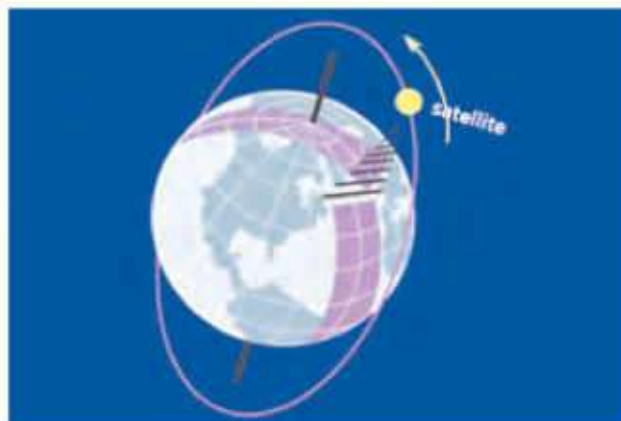
Do you know?

The whole Earth can be covered by just three geo-stationary satellites for global transmission of radio and TV programmes.



Weather Information

For weather information, Polar Orbiting Satellites are used. They pass the Earth from north pole to the south pole. They are used to survey the Earth. As the Earth spins under their orbits, the entire Earth can be seen through them. In addition to weather conditions these satellites are also used to survey the Earth, for navigation and observing other satellites.



Polar Satellite

Communication Satellites

These satellites help to transmit signals of Radio, T.V and mobile phones from one place to another. There are over 200 Earth based stations for transmitting and receiving information through these satellites. You can also pick up the signals directly from these satellites through dish antennas.



Communication Satellite

Do you know?

The study of the Earth from orbiting satellites is known as remote sensing.

Point to Ponder!

Moon is a natural satellite of the Earth. Why is it not used for telecommunication?

Global Positioning System

Global Positioning System is a process to know the location at a place. Commonly it is known as GPS. It is established by twenty four satellites at a height of 400 km orbiting the Earth in six sets of orbits. Four signals are received at any moment by a receiver or cell phone from satellites located at different places. The cell phone receiver works out the exact position of its location. The motorists use this system not only to tell where they are, but also to select the best route to their destination.

Do you know?

An aeroplane pilot, sailor or a desert hiker can now use a pocket size instrument or cell phone to find his position on the Earth within 10 metre accuracy.

KEY MILESTONES IN SPACE TECHNOLOGY

1.	October 4, 1957	Soviet Union launches 1st ever Sputnik -1.
2.	January 31, 1958	United States of America launches Explorer 1 to explore Van Allen radiation belt.
3.	April 12, 1961	Soviet Cosmonaut Yuri Gagarin becomes the first human to enter space and return safely.
4.	July 20, 1969	Neil Armstrong became the first man to walk on the Moon in Apollo-11 mission.
5.	March, 1994	Completion of "Global Positioning System" (GPS).

6.	November 20, 1998	First piece of the International Space Station is launched.
7.	August 6, 2012	Unmanned spacecraft, a robotic rover "Curiosity" landed on Mars. It was launched on November 26, 2011 and reached at Mars on August 6, 2012 to explore the environment of the Mars.

Key Points

1. Space is the unlimited expanse in which all heavenly bodies such as Moon, Earth, Sun, stars and galaxies are located.
2. NASA is an American agency responsible for space exploration and aviation.
3. Satellite is an object which revolves around another big object due to its gravity.
4. Artificial satellites are the objects put into orbits around the Earth by human beings.
5. Geo-stationary satellites keep pace with the Earth and complete one orbit in one day.
6. Satellites are used for very useful purposes such as communication, navigation, TV display the world over, survey, weather monitoring and spying, etc.
7. International Space Station is a human made huge laboratory orbiting in space around the Earth.



Weblinks: Use the following weblinks to enhance your knowledge about the topics in this chapter.

Space	https://kids.nationalgeographic.com/explore/space/
GPS	https://www.nationalgeographic.org/encyclopedia/gps/

Exercise

1. Tick (✓) the correct answer.

i. Countless shining lights seen at night on the sky are:

- (a) stars (b) moons
(c) planets (d) different heavenly bodies

ii. How long does it take for a geo-stationary satellite to complete one orbit?

- (a) one day (b) one week
(c) one month (d) one year

iii. First man to step on the Moon?

- (a) Edwin Aldrin (b) Neil Armstrong
(c) Yuri Gagarin (d) Alan Shepard

iv. The system locates the position of an object on the Earth's surface is:

- (a) GRS (b) GMS
(c) GPS (d) PGS

v. The first artificial satellite was sent into space in:

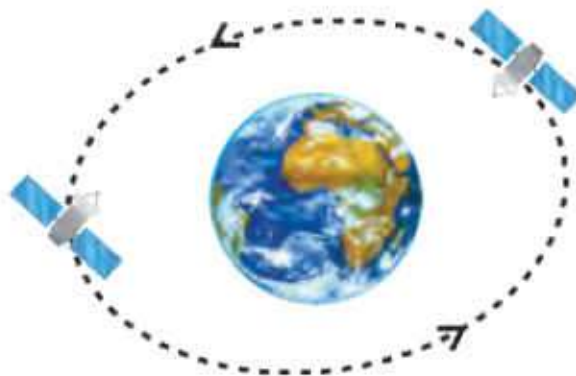
- (a) 1945 (b) 1957
(c) 1969 (d) 1973

2. Write short answers.

- i. Write five benefits which we get from artificial satellites.
- ii. Moon is the natural satellite of the Earth. Is the Earth also a satellite of some bigger object? What is that object?
- iii. Why does a geo-stationary satellite appear to be stationary?
- iv. Why do the astronauts wear space dress? What are its benefits?
- v. Why can a telescope installed on a satellite take clearer photographs than from the Earth surface?

3. Constructed Response Questions:

- i. What provides the force needed to keep artificial satellites moving around the Earth? Indicate its direction on the two satellites shown in the given figure.
- ii. Astronauts have to face a lot of problems in space. Can you name some of these problems?
- iii. How do the astronauts breathe in your opinion?
- iv. Why cannot you pour water in a glass in space?

**4. Investigate:**

Investigate in library or through internet what types of experiments are performed in the space station that cannot be done while living on the Earth's surface.

5. Project:

Find out from the library or internet, the first five astronauts who visited the space. Which country do they belong? What were the dates of their missions and how long did they stay in space?