\bigcirc Introduction

The space including, the celestial bodies and galaxies is called universe. There are millions of galaxies in this universe and each galaxy has billions of stars. Like living things, these stars also have life cycle, take birth and die. The name of our galaxy is Akash-Ganga. Each galaxy consist of stars, the planet, satellites, asteroid, comets, and meteoroids. They are also known as celestial bodies or heavenly bodies. In this chapter, we will discuss about these heavenly bodies.

Stars

Starsarethe heavenly bodies having light of their own. They continuously emit heat and light. They mostly consist of hydrogen gas. Like Sun, they produce energy by the process of nuclear fusion. In this reaction, the hydrogen present inside the stars are converted into the helium molecules after fusion, with the release of large amount of energy in the form of heat and light. The Sun is also a star, which is nearest to us. It appears much bigger and brighter as compared to other stars. This is because, it is much nearer to us. The intensity of sunlight is very high during the day time. The stars are much bigger as compared to the Sun. Also they emit the light of much higher intensity than the Sun. The nearest star to the earth other than the Sun is Proximo centauri. There are about 10,000 billion stars in this universe. As the Earth moves from east to west, the stars seem to move from east to west too. But there is one star, which appears to be stationary when observed from the pole, it is known as Pole star or Dhruva tara. The pole star appears stationary, because it lies on the axis of rotation of the earth. As the pole star lies on the north pole, it is not visible from the south pole of the earth.

We know that the distance of these stars is very far from the earth, so they cannot be measured with the help of smaller units, such as km. We have to use the larger unit, i.e. light year. One light year is the distance traveled by the light in one year. One light year is equivalent to 9.46 x 10¹² km. It is obtained by multiplying the speed of light with the number of seconds in one year. The light from the Sun takes 8 minutes to reach the earth. The next nearest star, Proxima centauri is 4.3 light year away from the earth. Hence, if a star is nlight years from earth, means that the light takes n years to reach the earth.

It is found that most of the stars and planets are made up of certain types of gases. These gases are found in large quantity and are lighter in nature, and helps in the formation of stars and planets. Which one of the following is the main gas that helps in the formation of stars and planets?

(a) Hydrogen (c) Carbon (e) None of these Answer: (a) Explanation Scientific research have shown that, the main gas which is present in almost all the stars is hydrogen.

(b) Helium (d) Nitrogen



The stars are at very large distance from the earth. It takes many years even by the light to reach earth from the stars. Can you name the star which in nearest to the earth other than Sun?

(a) Sirius (c) Arcturus (b) Canopus(d) Proxima-Centuari

(e) None of these **Answer: (d)**

Explanation

The nearest star other than Sun, is Proxima centuari.

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Galaxy

Galaxy in which our earth lies is known as Milky Way. All the stars that we see at the night in the sky is just a small part of our milky way. The milkyway is a spiral galaxy and the Sun is located at about 30,000 light years, from the nucleus of the galaxy. It lies on Orion arm of the galaxy.

Like all galaxies, the milky way is held together by gravity. This gravity also holds the stars, gas and dust in orbit around the center of the galaxy. Just as the planets orbit around the Sun, the Sun orbits around the center of the milky way. It takes about 225 million years to complete one revolution around the Milky Way by the Sun.

Commonly Asked

There are thousands of galaxies in this universe. Each galaxy has millions of stars, as well as, planets and other celestial bodies. What is the name of galaxy in which earth is present?

(a) Orion(c) Milky wayAnswer: (c)Explanation

(b) Epic (d) Helene

(e) None of these

The name of galaxy in which our solar system is Milky Way.

As the planets revolve around Sun in a fixed orbit, the Sun also revolves around the centre of the Milky Way. The period of revolution of the planets and that of the Sun are different. They take certain fixed period of time to complete one revolution around its orbit. The time taken by the Sun to complete one revolution around the centre of the Milky Way is _____.

(a) 100 million years	(b) 155 million years			
(c) 225 million years	(d) 275 million years	(e) None of these		
Answer: (c)				
Explanation				
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The time taken by the Sun to complete one revolution around the centre of Milky Way is 225 years.



Constellations

Thousands of stars appear in the sky during the night. Some of these stars form a pattern in a group, which have recognizable shape. This group of stars is called constellation. At present there are about 88 constellations. Each constellation has been given a name according to its shape. Some of the important constellations are Ursa Major, Ursa Minor, Orion, Leo Major and Cassiopeia.

Ursa Major: It is also known as Great Bear or Saptarishi. It consists of seven bright stars, which appear in the shape of a bear. It is visible during the summer season in the early part of the night and can be seen clearly during the month of April in the northern part of the sky. It also helps us to locate the position of the pole star in the sky. At night it appears to move from east to west as the pole star remains fixed in its position.

Orion: This constellation is also known as hunter. The Indian name is Mriga. It consists of seven or eight bright stars. The orientation of stars in Orion is similar to the figure of hunter. This constellation is visible in the sky during the winter season in the late evening. One of the brightest stars in the sky at night is the Sinus, which is very close to the Orion constellation.

Leo Major: This constellation mainly consists of 9 or 10 stars. Its orientation is similar to that of lion, hence its name is Leo. It is visible during the summer in the early part of night.

Cassiopeia: It mainly consists of five stars, which are arranged in the form of letter W or M depending on its position in the sky. It is supposed to represent an ancient queen named Cassiopeia. It is visible during the winter in the early part of the night.



Constellation is formed by the group of stars forming different pattern. These groups are named according to the shape of pattern they resemble. Which one of the following is also the name of the constellation Ursa Major?

(a) Mriga(c) Night Queen(e) None of theseAnswer: (d)

(b) Leo (d) Saptarishi



Each constellation is made up of different number of stars arranged in different pattern. Orion is one of the constellations. The number of stars of which Orion is made up of is_____. (a) 5 or 6 (b) 7 or 8

(a) 5 or 6
(b) 7 or
(c) 9 or 10
(d) 100
(e) None of these
Answer: (b)
Explanation
The number of stars in Orion is 7 to 8.



Life of Star

The stars are formed from the existing gas and dust in the outer space. This gas and dust is called interstellar matter. When these lumps of gases and dust cross the spiral arm of the galaxy, they start to form clumps. The gravitational force within cause them to contract, forming protostar. When the temperature at the centre of the protostar reaches several million degree Celsius, fusion reaction begins. The energy released by this reaction prevents the protostarto contract, and hence a star is born.

These stars are mainly made up of hydrogen gas. A hydrogen atom consists of electron and proton. Its nucleus does not contain neutron. The gravitational force within the star compress the matter at the centre causing the proton within the nucleus to collide. The hydrogen nuclei combines together to form bigger nuclei called helium nuclei, releasing large amount of energy. This energy helps stars to twinkle at the night. The light released by the stars is of different colours. The difference in the colours of the stars is due to the difference of their temperature.

The core of the star is made up of hot and compressed helium. When the temperature at the core reaches up to 200 million degree Celsius, the helium in the nucleus began to react with itself and forms heavier elements, such as, carbon. Nitrogen or Oxygen. They produce energy that stop the star from contracting. The outer layer becomes so large, the star starts loosing it. This stage of the star is called planetary nebula. At this stage, it becomes blue white star, where the temperature of the core rises, causing the layer surrounding the core to expand. Such stars are called White Dwarf. It is made up of ice, carbon and oxygen. After this, it starts to cool over a period of thousand million years and becomes black hole. In this way, the life of a star ends.

Commonly Asked

There are various stages of the life of the stars. During these phases, the stars undergo various changes in its feature. The second stage of the life of the star is called:

(a) Shooting star (c) Protostar (e) None of these

Answer: (c)

(b) White dwarf (d) Black hole

When we study the life of the star from its birth to death, we find that at some stage it expands due to high inner temperature and at other stage in starts contracting due to loss of heat from its core. The stage of stars life, when it starts loosing its outer layer due to its large size as a result of expansion, is called____.

(a) Fusion(c) Planetary Neubia(e) None of theseAnswer: (c)

(b) Breaking crest(d) Planetary star



Solar System

The family of eight planets along with the Sun is called so/or system. In solar system, the Sun is at the nucleus, and all the other planets revolve around it in a fixed orbit. There are many small celestial bodies such as Asteroid, Comets and Meteoroids. The eight planets are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. The ninth planet Pluto has just been removed from the family of the solar system. The smaller heavenly bodies, which revolves around the planets, as the planets revolve around the Sun, is called satellites. Asteroids are small rocky bodies, which revolve around the Sun between the orbits of the planets Mars and Jupiter. The gravitational force of the Sun keeps the solar system together, and controls the movement of planets and other members of the solar system.

The Jupiter is the biggest planet and Mercury the smallest planet. The nearest planet is the Mercury and the farthest planet is Neptune. The planets do not have the light of their own. However, they shine because they reflect the light of the Sun falling on them. The best way to differentiate between the planet and stars is that, the stars have the light of their own and hence they twinkle, and the planets do not have the light of their own so do not twinkle. Also the planets keep changing their position with respect to stars in the night. Each planet has its own orbit, along which it revolves around the Sun. The first four planets Mercury, Venus, Earth and Mars are called the inner planets. The rest of the planet are called the outer planets. The four outer planets are mainly made up of hydrogen and helium gas. The inner planets are made up of rocks and metals.



Name of planets	Diameter of planets	Distance from sun	Period of revolution	Period of rotation								
(1) Mercury 4880km		58 10 ⁶ km	88 days	58 days								
(2) Venus	12100 km	108 10 ⁶ km	225 days	243 days								
(3) Earth	12760km	150 10 ⁶ km	365.25 days	24 hours								
(4) Mars	6780km	228 10 ⁶ km	687 days	24 hours37 minutes								
(5) Jupiter	142800km	778 10 ⁶ km	11.75 years	9 hours 50 minutes								
(6) Saturn	120000km	1427 10 ⁶ km	29.05 years	10 hours 14 minutes								
(7) Uranus	50800km	2870 10 ⁶ km	84 years	10 hours 49 minutes								
(8) Neptune	48600km	4504 10 ⁶ km	165 years	16 hours 3 minutes								

Some Facts about the Planets

Mercury

This planet is nearest to the Sun, therefore, it is hottest of all planets. It is also the smallest planet of the solar system. It is made up of rocks and has craters on its surface. It is known as the morning stars, as it can be seen only in the morning. It has no natural satellites and is also known as Budh graha.

Venus

This is the closest planet to the earth. Its axis of rotation is opposite to that of the Earth. The Earth rotates from west to east, whereas Venus rotates from east to west. Hence, the Sun rises in the west and set in the east on Venus. The atmosphere of Venus mainly consists of carbon dioxide gas, so it is the brightest planet in our solar system. It is also the hottest planet in our solar system, as the large amount of carbon dioxide gas in its atmosphere traps the heat from the sunlight. It has no natural satellite. There is no life on the surface of the Venus, as there is no water and air.

Earth

This is the third planet of our solar system and the only planet where life exists. The major factors responsible for supporting life on earth are:

(i) The temperature of the earth is optimum for the existence of lives.

(ii) The presence of life gases and water on the surface of earth helps the life to flourish.

(iii) Earth also has a protective layer of ozone, which protects harmful ultraviolet radiations coming from the Sun, to reach surface.

The atmosphere of earth consists of mainly Nitrogen (78%), Oxygen (21%), Carbon dioxide (0.3%) and remaining are the mixture of other gases. It takes almost 24 hours to complete one rotation around its own axis, and 365 days and 6 hours, to complete one revolution around the Sun. Certain consequence, such as causing of days and nights, is due to rotation of earth on its own axis. The change of season is due to the revolution of earth around the Sun. It has one natural satellites called Moon.

Mars

This is the fourth planet of the solar system and also known as the red planet. It is far from the Sun, so is very cold. This planet is very similar to the earth, though its mass is smaller than that of the earth. It has rocks on its surface and atmosphere mainly consists of carbon dioxide gas, with small amount of nitrogen, oxygen, noble gases and water vapour. It is estimated that in near future the lives may be possible on the surface of the Mars, if its atmospheric condition changes. It has two natural satellites, Phobos and Deimos.

🕷 🔰 Jupiter

This is the fifth planet of our solar system, and the biggest of all. The mass of Jupiter is more than the combined mass of the remaining planets. Its diameter is 11 times and mass 318 times, than that of the earth. It is so large that, about 1300 earth can be placed inside it. This planet mainly consists of hydrogen and helium gases. Its atmosphere also contains poisonous gases like methane and ammonia. It has 28 natural satellites. It is also known as Brihaspati graha. The four main satellites of the Jupiter are Amalthea, Lo, Europa, Ganymede and Callisto.

Saturn

This is the sixth and the second largest planet of our solar system. Its atmosphere mainly consists of hydrogen and helium and density is less than any other planets, including water. It has a colourful ring around it. The rings of Saturn is made up of tiny particles. Its surface temperature is very low, so no life is possible on the Saturn. It has 30 natural satellites. Some of the natural satellites are Atlas, Calypso, Dione, Enceladus, Helene, Janus, etc.

🕴 Uranus

This planet is the seventh member of our solar system. It was discovered with the help of telescope. It is the third biggest planet of our solar system. It rotates from east to west on its axis. It is mainly made up of hydrogen and helium. It has 21 satellites. Some of them are Miranda, Ariel, Umbriel, Titania and Oberon.

Neptune

This is the eighth planet of our solar system. It was also discovered with telescope. It is mainly made up of liquid, frozen hydrogen and helium gas. It has 8 natural satellites. Some of them are Ring, Nereid, Proteus, Triton, Larrisa etc. Triton is the biggest satellite of Neptune.

Commonly Asked

All the planets have their own natural satellites revolving around them in fixed orbit. Phobos and Diemos are also the natural satellite of one of the planets. Name the planet.

(a) Mercury(c) Mars(e) None of theseAnswer: (c)

(b) Venus (d) Jupiter

(b) Uranus

(d) Saturn



We are familiar with the planets since early days. But in those days not much information was available about these planets. Some of the planets, which are far away from the earth came into light only after the invention of telescope. Which was the first planet to be discovered by the telescope?

(a) Venus (c) Pluto

(e) None of these

Answers: (b)

Explanation

The first planet to be discovered with the help of telescope is Uranus.



Artificial Satellites

Satellites are the objects orbiting a planet. For example the Moon, which is a natural satellite. Artificial satellites are those which are put into orbit by man. The first artificial satellite was Sputnik 1, launched by the Soviet Union in 1957. At present there are thousands of satellites orbiting the Earth at various heights. Satellites are of different types. The communication satellites is used to relay telephone, messages, radio and television signals. It is such a satellite, which have made it possible for us to see on TV, live cricket and tennis matches being played in any parts of the world. Earlier one had to wait till the recorded version or for the news in the paper. Some artificial satellites carry instruments, that gather and send back information about the earth and its surroundings. This information is of immense value for weather forecasts, scientists, military planners, farmers and fishermen, just to name a few. Satellites can provide ecologists with detailed images of every square meters of the earth's surface for study.





Today we can easily access any part of the world on our computer, sitting at our home, through internet. This was not possible in the early part of 19th century. It made possible only after artificial satellites are launched into the space. The first artificial satellite launched into the space by any nation was_

(a) Sputnik 1 (c) INSAT-A1 (b) INSAT-A (d) INSAT-A2

(e) None of these

Answer: (a) **Explanation**

The first artificial satellites was launched by USSR in the space. It was Sputnik I.



- (a) Communication satellites (c) Polar satellites Answer: (b)
- (b) Geostationary satellites
- (d) Geosynchronous satellites (e) None of these

Explanation

The satellites, which is used for weather forecasting is Geostationary satellites.

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Asteroids

The asteroids are the small heavenly bodies that revolve around the Sun, between the orbit of Mars and Jupiter. They are also called small planets and are made up of rocks of various sizes. The biggest asteroids is hundred kilometers in diameter, whereas the smallest ones are only few hundred meters in diameter. There are millions of such small and big asteroids orbiting the Sun. Sometime these asteroids collide with each other, break into small pieces and form meteoroids. The largest asteroid by far is 1 Ceres. Its diameter has been 974 km and has contained about 25% of the mass of all the asteroids combined together. The next largest is 2 Pallas, 10 Hygiea and 4 Vesta, which are between 400 to 550 km in diameter. All the others are less than 340 km.

Comets

These are the small celestial bodies, which revolves around the Sun. They are made up of gas and dust. As they come near the Sun, a long tail start glowing and becomes visible to us. This tail is visible because of the Sun light falling on it. It spreads millions of km. Thus, comets are collections of gas and dust, which appears as a bright ball of light in the sky with long glowing tail. They are generally smaller than the asteroids and are also considered as the member of the solar system, revolving around the Sun as the planet. They take very long period to revolve around the Sun. For example, the Hally's Comets takes almost 76 years to complete on revolution. It was last seen in 1986 and is expected to be visible in year 2062. The famous Bayeux Tapestry is 1066, depicts the Hally Comets. As of today 878 comets have been discovered and their orbits are roughly calculated. Of these 184 are periodic comets having period less than200 years. Others are also periodic, but their orbits have not been well defined. The comets are also called dirty snowballs or icy mud balls, as they are the mixture of ice and dust.

Meteors

These are the celestial bodies, formed by the disintegration of comets and asteroids, whose size varies from tiny grains to big boulders of several hundred tons. They revolve around the Sun in their orbits. As they revolve around the Sun, they are considered as the member of the solar system. When these meteoroid enter the earth atmosphere, they become a burning ball of fire and are called the meteors or shooting stars. They are seen as a bright streaks of light in the night, for a moment across the sky. The main difference between the star and the shooting star is that, the stars have their own light, but the shooting stars produce light by burning of its particles. Most of them burn completely on entering the earth atmosphere. Those, who do not burn completely and land on the earth surface, are called meteorites. The meteorites are mainly made up of rocks and metals. Every year, thousands of meteorites fall on the earth surfaces at different places.

Commonly Asked



There are millions of celestial bodies in the solar system. The small celestial bodies which revolve between the orbit of Mars and Jupiter are called asteroid. What is the name of the largest asteroid?

(a) Vesta
(b) Pallas
(c) Ceres
(d) Hygiea
(e) None of these
Answer: (c)
Explanation
The name of largest asteroid is Cores

The name of largest asteroid is Ceres.

The periods of the comets are not found to be same. They vary between 100 to 1000 years. How many comets are there, whose period are less than 200 years?

(a) 124	(b) 154
(c) 164	(d) 184
(e) None of these	
Answer: (d)	
Explanation	
The number of comets who	ose period is less than 200 years is 184.



- It is believed that the Sun loses around 4 million tones of weight every second.
- The universe expands from the Earth, since at least 10 billion light years and are still expanding.
- The distance between one edge to the other edge of the milky way is about 100,000 light years.
- If the Sun becomes a black hole, it would be only few Km across, but it might swallow the Earth.
- The planet would explode, if the gravity do not hold the materials together.

SUMMARY



- The stars are the celestial bodies, which have the light of their own.
- Stars also have a definite life span.
- The distance of stars is measured in light years.
- Stars appear to move from east to west.
- Constellations are the groups of stars, which form a definite pattern.
- Asteroids, comets and meteors are the small heavenly bodies, which revolve between the orbits of Mars and Jupiter.
- The natural satellites of the earth is moon.
- Venus is the brightest planet.
- Pluto is no more considered to be a planet.
- Artificial satellites are used for telecommunications and weather forecasting purpose.

Self Evaluation



- 1. There are billions of stars in this universe. All of them are at large distance from us. These distance cannot be measured in smaller units, such as, kilometer or meter. It can be measured in light years. What is the distance of nearest stars from the earth?
 - (a) 1.5 light years

(b) 2.3 light years

(c) 3.4 light years(e) None of these

(d) 4.3 light years

2. Match the following table:

Constellations	Common Name
(1) Ursa major	(A) Queen C
(2) Orion	(B) Lion
(3) Leo major	(C) Mriga
(4) Cassiopeia	(D) Saptarishi
(a) 1-B, 2-C, 3-D, 4-A	(b) 1-D, 2-C, 3-B, 4-A
(c) 1-A, 2-D, 3-B, 4-C	(d) 1-D, 2-A, 3-B, 4-C
(e) None of these	

The constellation is made up of different number of stars. The number of stars, which the Cassiopeia is made up of is: (a) 5 (b) 7

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(c) 9	(d) 11	(e) None of these

4. Identify which one of the following is asteroids:





(e) None of these



5. Identify the planets which have almost same duration of rotation about its own axis as that of earth.

(a) Venus

(b) Mercury

(c) Mars

(d) Uranus

(e) None of these

6. The planets have their own natural satellites which revolve around the planet in its axis, as the planet revolves around the Sun. The different planets have different number of natural satellites. The number of natural satellites Jupiter has:

- (a) 1 (b) 11 (c) 17 (d) 28
- (e) None of these

7. Match the planet with their natural satellites in the table given below:

Name of planets	Name of satellites	
(1) Neptune	(A) Moon	
(2) Uranus	(B) Helene	
(3) Saturn	(C) Oberon	
(4) Earth	(D) Triton	
(a) 1-C, 2-D, 3-A, 4-B		(b) 1-B, 2-D, 3-A, 4-B
(c) 1-D, 2-C, 3-B, 4-A		(d) 1-A, 2-B, 3-D, 4-C
(e) None of these		

8. Identify the given planet in the figure below:



(a) Saturn

- (c) Neptune
- (e) None of these

(b) Uranus (d) Venus

9. Some of the planets are nearer to the Sun. The Sun light can reach these planets. Some of the planets are so far that the Suns light cannot reach there. They are divided into two groups as inner and outer planets. Which among the given planets are inner planets?

(A) Mars	(B) Saturn	(C) Uranus	(D) Orion	(E) Helene
(G) Sirus	(H) Mercury			
(a) A,D,G	(b) A,E,H		

(c) A, C, E	(d) A, H
(e) None of these	



Answers – Self Evaluation Test																		
1.	D	2.	В	3.	Α	4.	D	5.	С	6.	D	7.	С	8.	Α	9.	D	10. B