

Universe & Solar System

- Numerous stars and celestial bodies came into existence by a massive Explosion called the Big Bang.
- These Celestial bodies together are called the Universe.
- It is also referred to as the Cosmos.
- The stars that you see are so Far away that they appear to be small, but they are really huge in size.

Universe:

- The Universe is a vast Expanse of space.
- Most astronomers believe that the Universe came into existence after the Big Bang explosion that took Place about 15 billion years ago.
- The Universe consists of billions of galaxies, Stars, planets, comets, asteroids, Meteoroids and natural satellites.
- These are collectively called as celestial bodies, which are located far away from each Other.
- A Light year is the unit used to measure the distance between the Celestial bodies

Galaxy:

- A galaxy is a huge cluster of stars which are held together by gravitational force.
- Most of the galaxies are scattered in space, but some remain in groups.
- The Milky Way Galaxy was formed about 5 billion years After the Big Bang explosion.
- Our solar System is a part of the Milky Way galaxy.
- Andromeda galaxy is the nearest to the Earth apart from the ‘Magellanic Clouds’ Galaxy.

The Solar System:

- The word ‘solar’ is derived from the Roman word ‘sol’, which means ‘Sun God’.
- The solar system is believed to have formed about 4.5 billion years ago.

- The Solar system is a gravitationally bound System which comprises of the Sun, the eight planets, dwarf planets, satellites, Comets, asteroids and meteoroids.

The Sun:

- The Sun is at the Centre of the solar System.
- Each member of the solar system Revolves around the Sun.
- The Sun is so huge, that it accounts for 99.8 percent of the entire mass of the solar system.
- The sun is made up of extremely hot gases like Hydrogen and Helium.
- The Sun is a star.
- It is self-luminous; It gives light on its own.
- The surface Temperature of the Sun is about 6,000° C.
- It is the source of light and heat energy to the entire solar system.
- Sunlight takes about 8.3 minutes to reach the Earth.

Planets:

- The word 'planet' Means wanderer.
- There are eight planets in the solar system.
- They are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.
- All The planets rotate anti-clockwise (from West to east) on their own axes except Venus and Uranus.
- The elliptical path in which the planets move around the Sun is known as orbit.
- The eight planets revolve in their respective orbits because of the Gravitational pull of the Sun.
- They do not Move out of their paths or away from the solar system.
- The four planets nearer to the Sun are called Inner or Terrestrial Planets (Mercury, Venus, Earth and Mars).
- The inner Planets are comparatively smaller in size and are composed of rocks.
- The surface of Inner planets has mountains, volcanoes and Craters.

- The last four planets are called as Outer Planets or Jovian Planets (Jupiter, Saturn, Uranus, and Neptune).
- They are also Called Gaseous Giants.
- An asteroid belt is found between Mars and Jupiter.

Mercury (The Nearest Planet)

- Mercury is the Smallest and closest Planet to the Sun.
- It is named after the Roman deity ‘Mercury’, the Messenger to the Gods.
- It is an airless and waterless planet.
- It does not have an Atmosphere and so experiences extremes of temperature.
- It has no natural satellites.
- Mercury can be viewed in the morning and evening with the naked eye.

Venus (The Hottest Planet)

- Venus is the Second planet from the Sun.
- It is called the Earth’s twin, as it is almost the same size as the Earth.
- It has the longest rotation period (243 days) among the planets in the Solar System.
- It rotates in the opposite direction to all other planets, except Uranus.
- It has no natural satellites, like Mercury.
- It is named after the Roman goddess of Love and beauty.
- It is often visible in the Mornings and the evenings and so it is frequently called as the Morning Star and the Evening Star.
- After the Moon, it is the brightest natural object in the night sky.

Earth (The Living Planet):

- The Earth is the third planet From the Sun and the fifth largest Planet in the solar system.
- It is called the ‘blue planet’ or ‘watery planet’ because three-fourth of the Earth is covered by water.
- The Earth is the only planet in the solar system which is not named after any Greek or Roman deity.
- It Is the only planet known to support life.

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- Life is possible on Earth because of the presence of land, air and water.
- The polar Diameter of the Earth is 12,714 km and the equatorial diameter is 12,756 km.
- The Earth revolves around the Sun at a Speed of about 30 km per second.
- The Only natural satellite of the Earth is the Moon.

Mars (The Red Planet):

- Mars is the fourth Planet from the Sun and the second smallest planet in the solar system, After Mercury.
- It is named after the Roman God of war.
- It appears red in colour Due to the presence of iron oxide on its Surface.
- So, it is often described as the Red Planet.
- It has a thin atmosphere.
- It also has polar ice caps like the Earth.
- Mars has two natural satellites namely Phobos and Deimos.
- Many orbiters and Rovers have been launched to explore this Planet.

Jupiter (the Largest Planet):

- Jupiter is the Fifth planet from the Sun and the largest Planet in the solar System.
- It is named after the king of the Roman gods.
- It is the Third brightest object in the night sky, after moon and Venus.
- It is the fastest spinning planet in the solar System.
- It is called a gas giant planet.
- Its Atmosphere is mostly made up of Hydrogen and Helium like the Sun.
- It has the largest Number of natural satellites.
- Io, Europa, Ganymede and Callisto are a few large Satellites of Jupiter.

Saturn (The Ringed Planet):

- Saturn is the sixth planet from the Sun and the second largest planet in the solar System, after Jupiter.
- It is named after the Roman god of agriculture.
- Saturn has many Rings around it.
- These rings are huge and are mostly made up of ice, rocks and dust Particles.

- Saturn has 62 natural satellites around it.
- Titan, Saturn's largest moon, is the only satellite in the solar system that has clouds and a dense atmosphere composed of Nitrogen and methane.
- The specific gravity of Saturn is less than that of water.

Uranus (The Somersaulting Planet):

- Uranus is the Seventh planet from the Sun.
- It was the First to be discovered with a telescope by the astronomer William Herschel in 1781.
- It appears Green due to the presence of methane Gas.
- It is named after the Greek god of the sky.
- It rotates on its axis from east to West like Venus.
- Its axis is tilted so much that, it appears to orbit the Sun on its sides like a rolling ball.
- Uranus has 27 natural Satellites, of which Titania is the largest.

Neptune (The Coldest Planet):

- Neptune is the Eighth and the farthest planet From the Sun.
- There are strong Winds in this Planet.
- It is named After the Roman god of sea.
- Neptune has 14 natural satellites, the largest being Triton.
- Because of its Distance from the Sun, Neptune is one of the coldest planets in the solar system.
- The striking blue and white features of Neptune help to distinguish it from Uranus.

The Dwarf Planets:

- Dwarf planets are small celestial Bodies found beyond the planet Neptune.
- They are extremely cold and dark.
- They are almost spherical in shape, but unlike Planets they can share their orbit with other dwarf planets.
- The five dwarf Planets of the solar system are Pluto, Ceres, Eris, makemake and Haumea.

The Moon:

- Earth's Satellites are Celestial objects, which revolve around the Planets.
- The moon is the Earth's only satellite.
- It revolves around the Earth once in every 27 days and 8 hours.
- It takes about the same time for it to complete one rotation around its axis.
- It has no atmosphere.
- The surface of the Moon is characterized by craters created by the impact of meteors.
- The distance between the moon and the Earth is about 3, 84,400 km.
- The size of the moon is one-quarter of the Earth.
- The Moon is the only celestial body where humans have landed.

Asteroids:

- Asteroids are small solid objects that move around the Sun.
- They are found as a belt between Mars and Jupiter.
- They are too small to be called as planets.
- They are also known as Planetoids or Minor Planets.

Comets:

- A comet is a celestial object made up of a head and a tail.
- The head of a comet consists of solid particles held together by ice and the tail is made up of gases.
- Halley's Comet is the most famous comet which comes close to the Earth every 76 Years.
- It appeared in 1986 and will appear in 2061.

Meteors and Meteorites:

- A meteor is a stone like or metallic Body.
- When entering into the Earth's Atmosphere, most of them burn.
- As they often appear as streaks of light in the sky, they are also known as Shooting Stars.
- Meteors which strike the Earth's surface are called meteorites.

Motions of the Earth:

- Have you noticed the Sun in the morning, Afternoon or evening? Is it in the same Place throughout the day? No.
- It is seen in the east in the morning, overhead in the Afternoon and in the west in the evening.
- Have you ever thought of the reason behind It? This is because of the constant moving of the Earth around the Sun.
- It seems that the Sun is moving, but it is not so.
- This is similar to what you experience when you are travelling in a bus or train.
- When you look out of the window, the trees, lamp Posts and other objects seem to be moving, but actually it is you who are moving.
- To understand the motions of the Earth better, you need to be familiar with the shape and inclination of the Earth.

Shape and Inclination of the Earth:

- The Earth is spherical in shape.
- It Rotates on its axis, which is an imaginary Line that runs from the North Pole to the South Pole passing through the centre of the Earth.
- The Earth's axis is always tilted or inclined from the vertical by an angle of $23\frac{1}{2}^{\circ}$.
- It makes an angle of $66\frac{1}{2}^{\circ}$ with the plane of the Earth's orbit.

Rotation:

- It is the spinning Movement of the Earth on its axis.
- The Earth rotates from west to east (anti-clockwise) and takes 23 hours 56 minutes and 4.09 seconds to complete one rotation.
- The time taken by the Earth to complete one rotation is called a day.
- The rotation of the Earth causes Day and night.
- As the Earth is spherical in Shape, only one half of it is illuminated by the Sun at a time.
- The other half remains Dark.

- The illuminated portion of the Earth Experiences Day, whereas the darkened Part of the Earth experiences night.
- The Line which divides the surface of the Earth Into a lighted half and a dark half is called the Terminator Line.

Revolution:

- It is the movement of the Earth Around the Sun on its elliptical path.
- The Earth takes $365 \frac{1}{4}$ days to complete one Revolution.
- It revolves around the Sun at a Speed of 30 km per second.
- For the sake of convenience, we take it as 365 days and call it a year.
- The remaining quarter day is added once in every four years in the Month of February.
- That is why February has 29 days once in four years.
- It is called a Leap Year.
- The inclination of the Earth on its axis and its revolution around the Sun cause different seasons.
- The Northern Hemisphere is inclined Towards the Sun for six months from 21st March to 23rd September while the Southern Hemisphere is tilted away from the Sun.
- From Sep 23rd to March 21st the Southern hemisphere is inclined towards the Sun and the northern hemisphere Faces away from the Sun.
- The changing Position of the Earth in its orbit during revolution gives the impression that the Sun is continuously moving north and South of the equator.
- The equator faces the Sun directly on 21 March and 23 September.
- These two days are called Equinoxes, during which the day and Night are equal throughout the Earth.
- On 21st June, the Tropic of Cancer Faces the Sun.
- This is known as Summer Solstice.
- It is the longest day in the Northern Hemisphere and longest Night (shortest day) in the Southern Hemisphere.
- On 22nd December, the Tropic of Capricorn faces the Sun.

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- It is called as Winter Solstice.
- It is the longest day in the Southern Hemisphere and longest Night (shortest day) in the Northern Hemisphere.

