Planet System

Planets

Mercury, Venus, Earth and Mars are called Inner Planets. Jupiter, Saturn, Uranus and Neptune are called Outer Planets. Planets look like stars but they don't twinkle because they don't have light of their own. They simply reflect the sunlight that falls on them.

Big Bang theory

The Big Bang theory is an effort to explain what happened at the very beginning of our universe. Discoveries in astronomy and physics have shown beyond a reasonable doubt that our universe did in fact have a beginning. Prior to that moment there was nothing; during and after that moment there was something: our universe. The big bang theory is an effort to explain what happened during and after that moment.

According to the standard theory, our universe sprang into existence as "singularity" around 13.7 billion years ago. What is a "singularity" and where does it come from? Well, to be honest, we don't know for sure. Singularities are zones which defy our current understanding of physics. They are thought to exist at the core of "black holes." Black holes are areas of intense gravitational pressure. The pressure is thought to be so intense that finite matter is actually squished into infinite density (a mathematical concept which truly boggles the mind). These zones of infinite density are called "singularities." Our universe is thought to have begun as an infinitesimally small, infinitely hot, infinitely dense, something - a singularity. Where did it come from? We don't know. Why did it appear? We don't know.

After its initial appearance, it apparently inflated (the "Big Bang"), expanded and cooled, going from very, very small and very, very hot, to the size and temperature of our current universe. It continues to expand and cool to this day and we are inside of it: incredible creatures living on a unique planet, circling a beautiful star clustered together with several hundred billion other stars in a galaxy soaring through the cosmos, all of which is inside of an expanding universe that began as an infinitesimal singularity which appeared out of nowhere for reasons unknown. This is the Big Bang theory.

Universe

- Pythagoras, who was an Ionian Greek philosopher and mathematician, first used the term “COSMOS” for the order of the Universe.
- Cosmology is the discipline that describes the large scale properties of the universe as a whole.
- The distance covered by light in one year is known as “Light Year.” The Velocity of light is 300,000 km/s.

- The distance between the Sun and the Earth is known as “Astronomical Unit.” One astronomical unit is (roughly) equal to 149.6 million kilometers.
- Wilkinson Microwave Anisotropy Probe (WMAP) is an Explorer Mission of National Aeronautics and Space Administration (NASA). It is launched for the study and measurement of cosmology.
- Professor Sir Fred Hoyle, who was an English astronomer, coined the term “Big Bang” to explain a scientific theory on the creation of cosmos.
- Galaxy is a huge collection of stellar and interstellar matter, which are bound together by its own gravity in the Space. There are several galaxies in the universe, for example, Milky Way.
- The name galaxy where we live is ‘Milky Way.’
- The largest galaxy is ‘Andromeda Galaxy.’ It is also the closest to Milky Way. Milky Way is the second largest galaxy.
- The radius of Milky Way is about 50,000 light years.
- The Solar System is a part of Milky Way.
- The Sun takes 225 million light years to complete one circuit.
- The collapsed stars, which are immeasurably dense and having huge gravitational force (even light cannot escape rather get absorbed) are known as “Black Holes.”
- Quasar is a massive and extremely remote celestial object that keeps emitting remarkably large amounts of energy. Typically, it has a star like image, which can be seen through the telescope.
- Constellation is a group of stars being arranged in a pictorial configuration. It was basically observed by the ancient astronomers. For example, Sirius (Canis Major), Canopus (Carina), Turus (Bootes), etc.
- Atacama Large Millimeter Array (ALMA) is the British Astronomy center, located at Chajnantor (at an altitude of about 5,000 meters), in the Atacama Desert of northern Chile.
- Edwin Hubble, who was an American astronomer, first studied galaxies in detail. Based on Shape, Edwin classified galaxies as Elliptical, Spiral, and Barred Spiral.
- At the end of life-cycle, when a star loses its light and the density increases (very high), by this time, it is largely composed of neutrons and hence known as ‘Neutron Star.’
- Most likely, the rotating neutron star emits intermittent radio signals, is known as ‘Pulsar.’
- A star with low temperature and small mass (glowing feebly) is known as ‘Red Dwarf.’
- A star that suddenly increases its brightness (greatly) because of a catastrophic explosion and ejects most of its mass is known as ‘Supernova.’
- Satellites (or Moons) are the bodies that keep revolving around their respective planets. For example, Moon revolves around the Earth, etc.

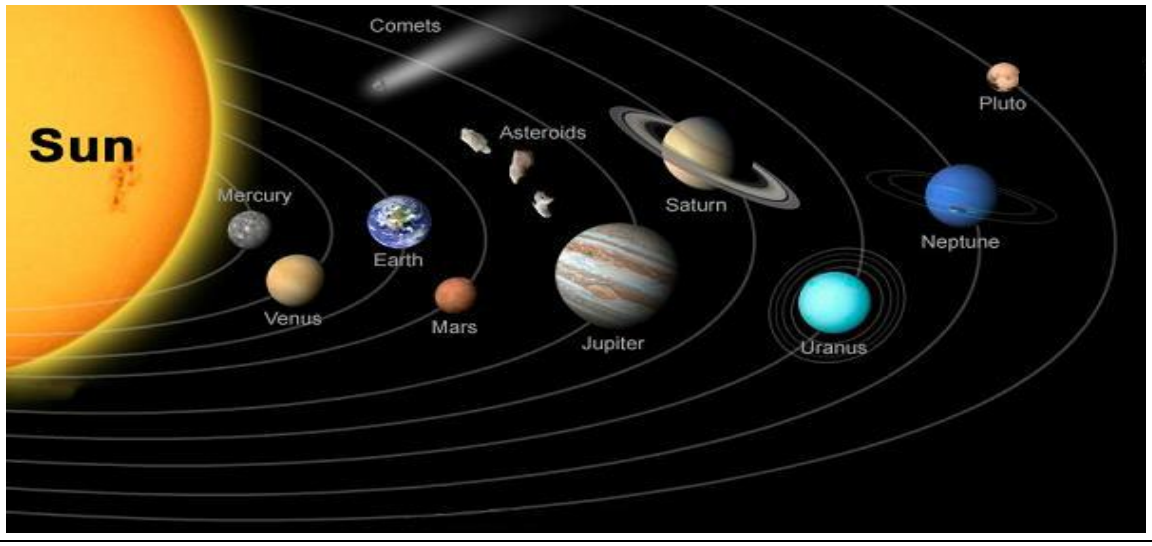
- The Sun is the closest star to the Earth (at the distance of about 149,600,000 km).
- Located at the distance of about 4.24 light-years, Proxima Centauri is the second closest star to the Earth.
- The Sun is made up of extremely hot gasses and its glowing surface is known as the 'Photosphere.' The layer immediately above the photosphere is known as 'Chromosphere' (sphere of color).
- The Chromosphere is 10,000 km thick transparent shell of plasma.
- The Outermost layer of the Sun is known as the 'Corona.'
- Temperature of the outer surface is 6,0000 C and interior temperature is 15,000,0000 C.
- The rotation period of the Sun is 25 days, 9 hours, and 7 minutes.
- The traveling speed of the Sun's Rays is 30,000 m/s.
- The time taken by Sun's Rays to reach the Earth is 8 minutes and 16.6 seconds.
- The Sun is largely composed (chemically) of Hydrogen (71%), Helium (26.5%), and some other elements (2.5%).
- Sometimes, in the photosphere, some patches of gas, which is cooler that its surrounding (gas) are known as the 'Sunspots.'
- The Planets are the celestial bodies that revolve around the Sun as well as (at the same time) rotate on their imaginary axis.

Facts about the Planets

- Mercury's craters are named after famous artists, musicians and authors.
- Venus is the hottest planet in the solar system.
- Earth's atmosphere protects us from meteoroids and radiation from the Sun.
- There have been more missions to Mars than any other planet.
- Jupiter has more than double the mass of all the other planets combined.
- Saturn has more moons than any other planet in the Solar System.
- Uranus has only been visited by a single spacecraft, Voyager 2.
- It takes like more than 4 hours for light to reach Neptune from the Sun.
- Only 8 planets have been discovered in our solar system but there is compelling evidence for a 9th planet.
- With the exception of Neptune and Uranus the other 6 planets can be seen unaided and all 8 are visible with a small telescope or binoculars.
- Together the planets make up 0.14% of the solar systems mass, 99% of which is the gas giants (Jupiter, Saturn, Uranus and Neptune).
- Except for the Earth, the planets are named after gods from Roman and Greek mythology.

Basics of solar system

- There are eight planets namely (arranged in the order of increasing distance from the Sun) –
  - Mercury
  - Venus
  - Earth
  - Mars
  - Jupiter
  - Saturn
  - Uranus
  - Neptune
- The largest planet is Jupiter and Mercury is the smallest planet of the system.



Mercury

- Mercury is the nearest to the Sun.
- Mercury takes 58.65 Earth days to complete its rotation (on its axis) and takes 88 days to complete its one revolution (i.e. in its orbit around the Sun).
- Mercury is the fastest planet and it has no moon (satellite).

Venus

- Venus, which is also popular as an evening star and morning star, is the brightest celestial body in the universe after Sun and Moon.
- Venus is the Hottest Planet of the solar system. It is closest to the Earth.
- Venus takes 243 Earth days to complete its rotation (on its axis) and takes 224.7 days to complete its one revolution (i.e. in its orbit around the Sun).
- Venus has no satellite and it spins in the opposite direction of the Earth's spin.
- Venus is named after the Roman goddess of Beauty.

Earth, Jupiter, Saturn and Uranus

Earth

- Earth is the third planet from the Sun.
- By the time, Earth is the only planet where life exists.
- Earth takes 23 hours, 56 minutes, and 40 seconds to complete its rotation (on its axis) and takes 365.26 days to complete its one revolution (i.e. in its orbit around the Sun).
- Mass of the Earth is 5.98 x 1024 kg and its diameter is 12,756 km.
- Escape Velocity of the Earth is 11,200 m/s.
- Obliquity (i.e. tilt of axis degrees) of the Earth is 23.40.
- Mean density of the Earth is 5.514 g/cm3 and the surface is 510,072,000 km2.
- Mean surface temperature of the Earth is 281 K; the mean maximum surface temperature is 310 K and the mean minimum surface temperature is 260 K.
- The major atmospheric components of the Earth are Nitrogen (78%), Oxygen (20.95%), Argon (0.930%), and Carbon Dioxide (0.039%).

Mars

- Mars is known as the 'Red Planet' of the solar system.
- Mars takes 24 hours, 37 minutes, and 30 seconds to complete its rotation (on its axis) and takes 687 days to complete its one revolution (i.e. in its orbit around the Sun).
- Mars has two satellites namely Phobos (means fear) and Deimos (means terror).

Jupiter

- Jupiter takes 9 hours, 50 minutes, and 30 seconds to complete its rotation (on its axis) and takes 12 earth years to complete its one revolution (i.e. in its orbit around the Sun).
- Jupiter has 63 natural satellites/moon, significant of them are Europa, Ganymede, Callisto, etc. Among all, Ganymede is the largest satellite in the whole solar system.

Saturn

- Saturn is the largest planet after Jupiter in the solar system.
- Saturn is popular for its spectacular rings system.
- The rings system of Saturn is made up of a variety of separate particles that rotate in circular orbits independently.
- Saturn takes 10 hours and 14 minutes to complete its rotation (on its axis) and takes 30 years to complete its one revolution (i.e. in its orbit around the Sun).
- Saturn has total 47 satellites/moons; among them, Titan is the biggest satellite.

Uranus

- Uranus is first identified as planet by William Herschel in 1781.
- Like Saturn, Uranus also has a system of five faint rings.
- Uranus takes 16 hours to complete its rotation (on its axis) and takes 84 years to complete its one revolution (i.e. in its orbit around the Sun).

Uranus has 27 satellites; significant of them are Miranda, Ariel, Umbriel, Titania, etc.

Neptune

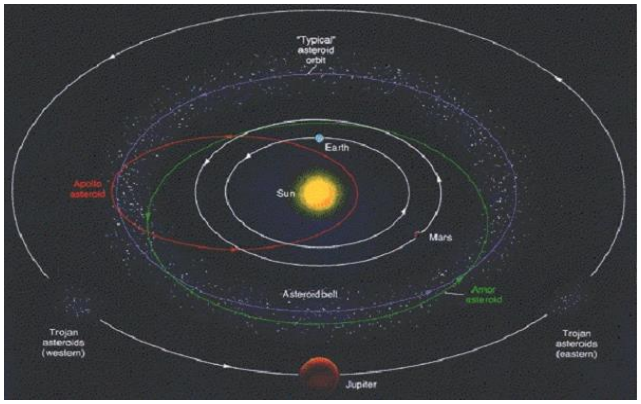
- Neptune is the farthest planet which appears greenish through a telescope.
- Neptune is discovered by Berlin scientist J. G. Galle in 1846.
- Neptune takes 18 hours to complete its rotation (on its axis) and takes 165 years to complete its one revolution (i.e. in its orbit around the Sun).
- Neptune has 13 satellites/moons; significant of them are 'Triton' and 'Nereid.'
- Until 2006, there were nine planets (including Pluto), but in 2006, the ninth planet Pluto is categorized as the dwarf planet by International Astronomical Union (IAU).

Pluto

- Pluto is a dwarf planet. A dwarf planet travels around, or orbits, the sun just like other planets. But it is much smaller.
- Clyde Tombaugh discovered Pluto in 1930. He was an astronomer from the United States. An astronomer is a scientist who studies stars and other objects in space. Venetia Burney named Pluto that same year. She was an 11-year-old girl from England.
- Pluto is not very big. It is only half as wide as the United States. Pluto is smaller than Earth's moon. This dwarf planet takes 248 Earth years to go around the sun. If you lived on Pluto, you would have to wait 248 Earth years to celebrate your first birthday. One day on Pluto is about 6 1/2 days on Earth.
- Pluto is about 40 times farther from the sun than Earth is. Pluto is in an area of space called the Kuiper (KY-per) Belt. Thousands of small, icy objects like Pluto but smaller are in the Kuiper Belt.
- This dwarf planet has five moons. Its largest moon is named Charon (KAIR-ən). Charon is about half the size of Pluto. Pluto's four other moons are named Kerberos, Styx, Nix and Hydra.

Asteroids, Comets, Moon and Sun

Asteroids

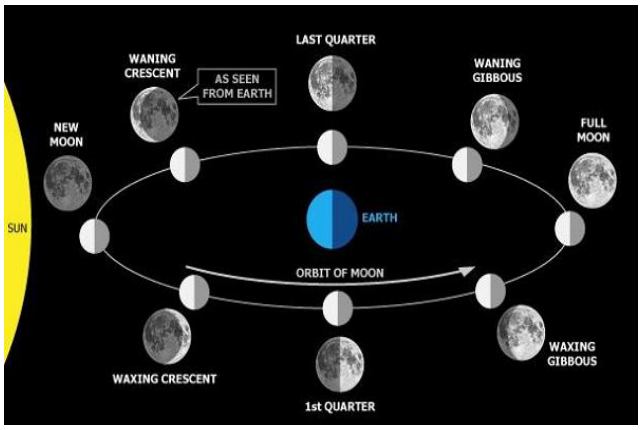


- Asteroids, also known as small planets or planetoids, are the rocky debris largely found between the planets Mars and Jupiter. These are too small to have their own atmosphere (as shown in the following image).
- The Asteroids revolve around the Sun, which varies from 3 to 10 years.
- By the time, more than 450,000 Asteroids are discovered; the largest Asteroid is Ceres, which diameter is about 1,025 km.

Comets

- Comets are the icy small Solar System body; normally while passing close to the Sun, heats up and starts to outgas, displaying a visible atmosphere (i.e. basically coma) along with a tail (as shown in the following image – in the insat view).

Moon

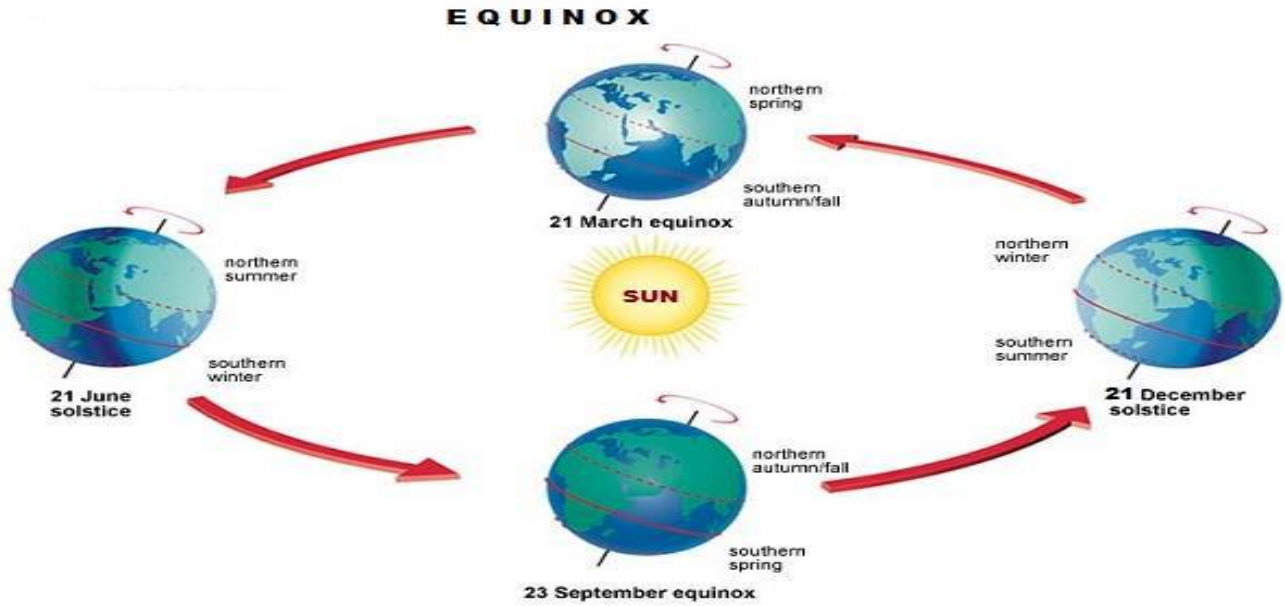


- Moon is the only known satellite of the Earth.
- Moons rotation time (on its axis) and revolution time (around the Earth) is same (i.e. 27 days, 7 hours, 43 minutes, and 11.47 seconds. This is the reason that we always see only one side of the Moon.
- Moon revolves around the Earth once in every 27.3 days, which is known as 'Sidereal Month;' however, it takes 29.5 days to return to the same point on the celestial sphere in reference to the Sun (due to revolution motion of the Earth around the Sun) and it is known as 'Synodic Month.'
- When two full Moons occur in the same month, it is known as 'Blue Moon.'
- A Full Moon is basically the lunar phase that occurs when the Moon is completely illuminated as seen from the Earth.

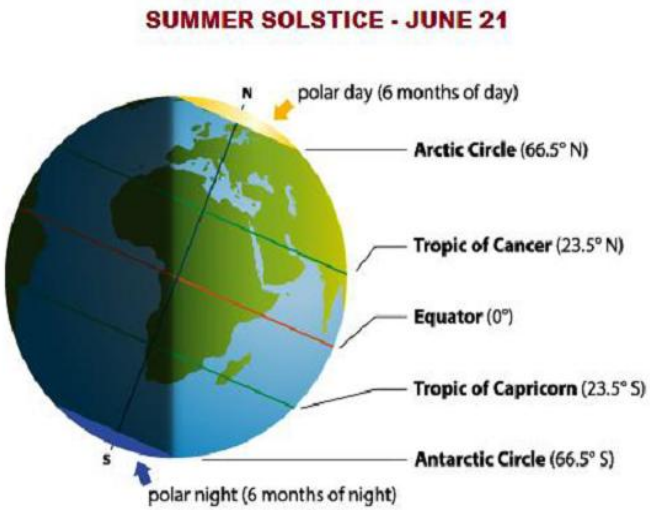
- As shown in the following image, the Lunar Phase or phase of the moon, is the shape of the illuminated portion of the Moon that is visible from the Earth. As Moon revolves, the lunar phases change cyclically and we can see from the full moon (full visible) to the new moon (not at all visible).

Rotation and Revolution of Earth

Earth movements



- The Earth's rotation on its axis causes day and night.
- The Earth's revolution (in its orbit around the Sun) causes change in seasons.
- When nights and days are equal is known as 'Equinoxes.' During the equinox's time, the Sun shines exactly over the equator.
- March 21 (of every year) is known as the vernal (spring) equinox and September 23 (of every year) is known as the autumnal equinox.
- When the difference between the length of day and night is maximum is known as 'Solstice.'
- During the solstice time, the Sun shines over the tropics (either on Tropic of Cancer or Tropic Capricorn).
- 23.500 North represents 'Tropic of Cancer.' On June 21, the Sun shines over the Tropic of Cancer and it is known as the longest day of the year.
- June 21 is known as the Summer Solstice.
- 23.500 South represents 'Tropic of Capricorn.' On December 21, the Sun shines over the Tropic of Capricorn and it is known as the longest night of the year.



- December 21 is known as Winter Solstice.
- When light of a celestial body is obscured by another celestial body, the situation is known as 'Eclipse.'
- When the Earth comes between the Sun and the Moon, it is known as "Lunar Eclipse."
- When the Moon come between the Sun and the Earth, it is known as "Solar Eclipse."