

## Planets of the Solar System

### What is a Planet?

A **planet** is a celestial body that:

- Revolves around a star (Sun)
- Moves in an **elliptical orbit**
- Does not emit its own light

All **8 planets** revolve around the Sun **counter-clockwise** (as seen from above the Sun's north pole).

### Classification of Planets

<b>Basis</b>	<b>Inner Planets</b>	<b>Outer Planets</b>
Other name	Terrestrial planets	Jovian / Gas Giants
Position	Between Sun and Asteroid Belt	Beyond the Asteroid Belt
Composition	Rock & metals	Hydrogen, helium & ices
Density	High	Low
Atmosphere	Thin or moderate	Thick
Moons	Few or none	Many

MERCURY



VENUS



EARTH



MARS



## INNER PLANETS

The inner planets are closer to the sun. These planets have rocky surfaces, and they are smaller in size.

JUPITER



SATURN



URANUS



NEPTUNE



## OUTER PLANETS

The outer planets are further from the sun. They are made up of gas and have rings. These planets are larger in size.

## Inner Planets (Terrestrial Planets)

### Members

- **Mercury**
- **Venus**
- **Earth**
- **Mars**

### Key Features

- Made of **silicates + iron & nickel core**
- Smaller but **denser**
- Solid rocky surface
- Impact craters, volcanoes, and rift valleys are common
- Venus, Earth & Mars have atmospheres

### Mercury

- Closest planet to the Sun
- Almost **no atmosphere**
- **Extreme temperature variation**
  - Day: +427°C
  - Night: -173°C
- Heavily cratered → **geologically inactive**
- Smaller than moons **Ganymede & Titan**, but more massive
- **MESSENGER mission** found:
  - Evidence of volcanism
  - **Water ice at the poles**

Seen only near the horizon during sunrise/sunset

### Venus

- **Brightest planet** (highest albedo)
- Called **Morning Star / Evening Star**
- Thick atmosphere: **96% CO<sub>2</sub>**
- **The hottest planet** due to the extreme greenhouse effect
- Atmospheric pressure = **92 times Earth's**
- **Retrograde rotation** (clockwise)
- One day (243 Earth days) > one year (224 days)

Known as **Earth's twin** (size & mass similar, conditions opposite)

### Earth

- Densest planet in the Solar System
- Only known planet supporting life
- One moon
- Axial tilt: **23.5°** → seasons
- Balanced atmosphere & liquid water

### Mars

- Known as the **Red Planet** (iron oxide)
- Thin atmosphere (≈96% CO<sub>2</sub>)
- Lost magnetosphere → atmosphere stripped by solar wind
- Evidence of **past liquid water**
- Water is now locked in **polar ice caps**
- Largest volcano: **Olympus Mons**
- Largest canyon: **Valles Marineris**
- Two moons: **Phobos & Deimos**
- Seasons similar to Earth

Methane presence suggests an **active geological or biological source**

### The Moon (Earth's Satellite)

#### Key Facts

- Diameter = ¼ of Earth
- Distance from Earth ≈ 3,84,400 km
- **Tidally locked** → only one side visible
- Stabilises Earth's axial tilt

#### Formation

- **Giant Impact Theory** ("Big Splat")
- A Mars-sized body collided with early Earth

#### Important Discoveries

- **Luna-2 (1959)** → first object to reach the Moon
- **Apollo-11 (1969)** → first humans on Moon
- **Chandrayaan-1 (2009)** → water at lunar poles

### Outer Planets

#### Members

- **Jupiter**
- **Saturn**
- **Uranus**
- **Neptune**
- (Pluto → dwarf planet)

### General Features

- Composed mainly of **hydrogen & helium**
- No solid surface
- Thick atmospheres
- Strong magnetospheres
- Rings & numerous moons
- Account for **99% of planetary mass**

### Gas Giants vs Ice Giants

Type	Planets	Composition
Gas Giants	Jupiter, Saturn	Hydrogen & Helium
Ice Giants	Uranus, Neptune	Water, ammonia, methane

### Why are Inner Planets Rocky & Outer Planets are Gaseous?

- Inner planets formed **close to the Sun**
- High temperature → gases could not condense
- Strong **solar wind** blew away gases
- Smaller gravity → could not retain gases
- Outer planets formed farther → cooler → gases condensed & retained

### Jupiter

- Largest planet
- Rapid rotation → **equatorial bulge**
- No solid surface
- Four Galilean moons:
  - **Io, Europa, Ganymede, Callisto**
- **Ganymede** → largest moon in the Solar System
- Latest mission: **Juno**

### Saturn

- Least dense planet → **can float on water**
- Prominent ring system
- Moon **Titan**:
  - Nitrogen-rich atmosphere
  - Only the moon with a dense atmosphere

### Uranus

- Rotates on its **side**

- Axis almost parallel to orbital plane
- **Retrograde rotation**
- Extreme seasons

### Neptune

- Strongest winds in the Solar System (~2100 km/h)
- Ice giant
- Twin of Uranus

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