

Tides UPSC

The term "tide" refers to the daily or twice-daily cyclic rise and fall of the sea level, primarily caused by the moon's and sun's gravitational pull. Surges are water movement brought on by weather conditions. Due to the significant fluctuations in frequency, size, and height of tides, studying them requires a tremendous deal of geographical and temporal complexity.

- The main drivers of tides are, to a large degree, the moon's gravitational pull and, to a lesser extent, the sun's gravitational pull.
- A further aspect is a centrifugal force, which works in opposition to the earth's gravitational attraction.
- All these elements must be in harmony for tides to occur.

Types of Tides

Based on types, tides can be divided into three categories:

Based on Frequency

Based on frequency, tides are further divided into three types, namely:

Semi-Diurnal Tides

- Two almost identical high tides and two low tides occur twice daily during a semi-diurnal tidal cycle.
- Around 12 hours and 25 minutes pass between high and low tides.
- Most semi-diurnal tides can be found in the Indian Ocean.
- Some of the coasts where semidiurnal tides frequently occur include the Bay of Bengal and the Eastern African Coast.

Diurnal Tides

- In total, it occurs four times per day. Two tides are produced by the sun and two by the moon.
- Due to the Sun's complimentary relationship with the moon, spring tide is quite high.
- Syzygy is the nearly straight-line alignment of three celestial bodies in a gravitational system, such as the sun, moon, and earth, during a solar or lunar eclipse.
- Syzygy comes in two forms: opposition and conjunction.

Mixed Tides

- The mixed tidal cycle, often known as the "mixed tide," is a tidal cycle that has two unequal high and low tides.
- Both semi-diurnal and nocturnal oscillations occur during this tidal cycle.
- It is widely noticed in the Caribbean Sea and the Gulf of Mexico. The coast of southeast Brazil also experiences varying tides.

Based on the Position of Earth, the Sun, and the Moon

Based on the position of Earth, the Sun, and the Moon, tides are further divided into two types, namely:

Spring Tides

- Spring tides form when the sun and moon are aligned, dragging the water's surface in the same direction.
- A spring tide happens when low tides are lower due to higher high tides. In a lunar month, it takes place twice.
- King Tide is another name for spring tides.

Neap Tides

- Neap tides occur seven days following the spring tide.
- The most striking characteristic is that the sun and moon are at a straight angle to one another.
- This tide occurs during the first and last quarters of the moon.
- The sun's gravitational attraction and the associated oceanic bulge cancel out the moon's gravitational pull.
- Additionally, compared to spring tides, neap tides have "lower" high tides and "higher" low tides.

Stages of Tides Formation

The four stages of the tide are listed below.

- **Flood Tide:** The sea level will rise over the course of many hours.
- **High Tide:** This is the time of day when the water is at its highest.
- **Ebb Tide:** The sea level continues to drop over several hours during an ebb tide.
- **Low Tide:** When the seawater level stops falling.

Characteristics of Tides

Tides have the following characteristics:

- On broad continental shelves, the tidal bulges are higher.
- Tidal currents are not particularly strong in the open ocean.
- Tides grow low when they reach the mid-oceanic islands.
- A coastline's bays and estuaries can impact the tides' strength.
- Bays with a funnel shape significantly alter tidal magnitudes. The Bay of Fundy, for instance, has the largest tidal range.
- However, as the Earth spins, the huge continents on the planet prevent the tidal bulges from travelling westward.
- Oceans and places have very different tidal patterns from one another.

Mechanism of Tides: How do Tides Work?

The tides' mechanism can be comprehended by comprehending the Sun's and Moon's gravitational pull. Depending on their mass and the distance between them, these bodies are pulled apart by gravity due to the Sun's greater distance from Earth than the Moon. As a result, the Earth is subject to less of the Sun's gravitational force than the moon. As a result, the moon controls the tide's height.

- Although it is commonly believed that only water bodies are drawn by gravity, this is untrue.
- Both land and ocean masses are drawn inward by gravitation.
- Gravitation has a greater impact on bodies of water since the relative pull of the land is weaker than that of water.
- It should be noted that the relative positions of the Moon, Sun, and Earth affect the size of the ant tide.

Significance of Tides

The significance of tides are discussed below:

- They can change the landforms of the planet.
- Although they have the power to destroy beaches, they also help to form creeks and inlets.

- Tides increase the sea level, which exposes a significant portion of the ocean to erosion.
- The lower flood plains of the river are helped by strong tides.
- It is beneficial for tidal ports with shallow water, which makes it difficult for large ships to arrive. A very prospective source of tidal energy is tide currents.
- The growth and maintenance of ecosystems like coral reefs and mangrove forests depend greatly on tides.

Tidal Bulge

There is one tidal bulge on the side of the earth closest to the moon. The second tidal bulge is visible on the side of the earth opposite the moon, which is furthest away. These bulges in the tide are high tides. Under the influence of the gravitational pull, the ocean's water is drawn towards the moon. A tidal bulge results from that.

