# UPSC Notes [GS-I]

## Topic: Earthquake - Body Waves, Causes & Types [Geography Notes for UPSC]

### Earthquake

- All natural earthquakes occur in the lithosphere.
- Seismic waves studies offer a full picture of the layered interior.
- An earthquake is, simply put, shaking of the earth’s crust.
- It is caused due to the energy release, which triggers waves that travel in all directions.
- The emanation of energy occurs along a fault.
- A fault is a sharp break in the crustal rocks.
- Rocks along a fault generally move in opposing directions.

### Types of Earthquakes

- **Tectonic earthquakes**: These are produced due to sliding of rocks along a fault plane.
- **Volcanic earthquake**: These are confined to areas of active volcanoes.
- **Collapse earthquake**: The roofs of underground mines collapse causing minor tremors in the areas of intense mining activity.
- **Explosion earthquakes**: These occur due to the explosion of chemical or nuclear devices.
- **Reservoir-induced earthquakes**: These occur in the areas of large reservoirs.

### Causes of Earthquakes

- It is caused due to the discharge of energy from faults and cracks in the crust of the earth.
- A fault in the crust of Earth is essentially a sharp break in crustal rocks.
- This energy release produces waves which travel in all directions.
- The point where energy is released is called the focus or hypocentre. It is generally located at the depth of 60 km.

- This causes a release of energy, and the energy waves travel in all directions.
- The point where the energy is released is called the focus of an earthquake or hypocentre.
- The point on the surface of the earth which is vertically above the focus is called epicentre. It is the first place to experience the waves.

### Body Waves

- https://byjus.com
Earthquake waves are of two types — body waves and surface waves.

P- Waves

- P-waves are also known as the Primary waves. They are the first waves to arrive at the surface.
- The characteristics of P-waves are like sound waves. They travel through all three mediums- solid, liquid and gas.
- These waves have a tendency to vibrate parallel to the direction of wave propagation. This causes density differences in the material through which they travel.
- These waves are responsible for elongating and squeezing of material.

S- Waves

- S- Waves arrive after some time after the happening of Earthquake and they are called secondary waves.
- A significant characteristic of these S-waves is that they travel only through a solid medium.
- The direction of vibration of these S – wave is perpendicular to the direction of wave propagation, thereby creating crests and troughs in the material of their transmission.

Shadow Zone
The shadow zone is the zone of the earth from angular distances of 104 to 140 degrees from a given earthquake that does not receive any direct P waves.

The shadow zone results from P waves being refracted by the liquid core and S waves being stopped completely by the liquid core.

A zone between 105° and 145° from the epicentre was recognised as the shadow zone for both the waves types.

The entire zone beyond 105° does not receive S-waves.

The shadow zone of S-wave is larger than that of the P-waves.

The shadow zone of P-waves appears as a band around the earth between 105° and 145° away from the epicentre.

**Effects of earthquake**

The following are the immediate hazardous effects of Earthquake:

- Shaking of ground
- Disparity in ground settlement
Natural disasters like Tsunami, land slide, mud slides and avalanches
- Soil liquefaction
- Ground lurching and displacement
- Floods and fires
- Infrastructure collapse.

**Measurement**

All earthquakes are different in their intensity and magnitude. The instrument for measurement of the vibrations is known as Seismograph.

**Magnitude scale**
- Richter scale is used to measure the Magnitude of the earthquake
- The energy released during a quake is expressed in absolute numbers of 0-10.

**Intensity scale**
- The mercalli scale is used to measure the intensity of an earthquake
- It measures the visible damage caused due to the quake.
- It is expressed in the range of 1-12.