① **Body Waves** → Body waves are generated due to the release of energy at the focus and moves in all directions travelling through the body of the earth. Hence, the name Body Waves. There are two types of Body Waves

(i) P-Waves ⇓

are also called PRIMARY & LONGITUDINAL waves, wherein particles move both to and fro from the line of propagation of the rays. The P-Waves are Similar to Sound Waves. They travel through Gaseous, Liquid & Solid Materials. P-waves moves Faster and are the first to arrive at the surface. P-waves travel with Fastest speed through Solid ~~Liquid~~ materials, but in liquid their speed is slowed down.

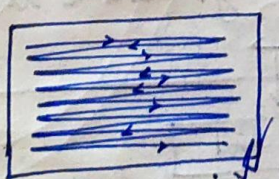


Figure: P-Waves → travels from the line of propagation of the ray.

(ii) S-Waves ⇓

are also called TRANSVERSE & SECONDARY waves, wherein the particles moves at right angles to the rays. The S-waves are Similar to Light waves & water ripples. They can travel only through the Solid materials. It has helped scientists to understand the Structure of the interior of the Earth. S-waves arrives at the surface with Some time lag.

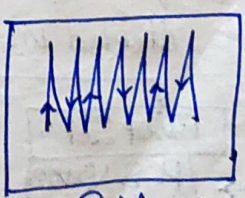
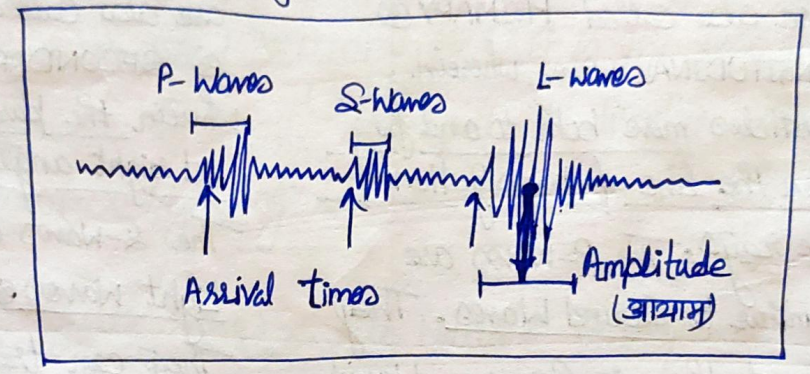


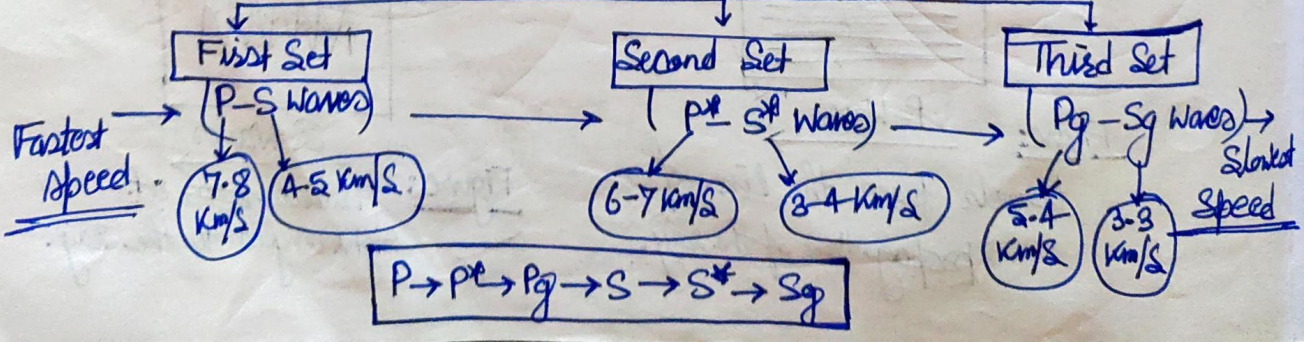
Figure: S-Waves → travels ~~from~~ at right angles to the ray.

② Surface Waves (L-Waves) are also called LONG PERIOD Waves. The surface waves are the last to report on Seismograph which affect only the surface of the Earth and Cover longest distances of all Seismic Waves. Though their speed is slower than the P & S waves but these are most violent & destructive. They cause displacement of rocks, and hence the Collapse of structures occurs.

Figure: P, S, L Waves



Detailed Study of Seismic waves of different Epicentres all over the World have revealed the fact that there are extra sets of Seismic waves which are similar to P & S waves but with slower rate of velocity which is caused by the density of rocks. On the basis of velocity, Seismic waves are divided in three sets of waves →



→ Propagation of Earthquake Waves & Shadow Zone →

- * → page no (4)
- Different types of Earthquake waves travel in different manners (P, S, L). As they move or propagate, they cause vibration in the body of the rocks through which they pass.

P-Waves vibrates parallel to the direction of the wave. This exerts pressure on the material in the direction of the propagation. As a result, it creates density differences in the material leading to stretching & squeezing of the material. (खिंचाव व घनत्व)

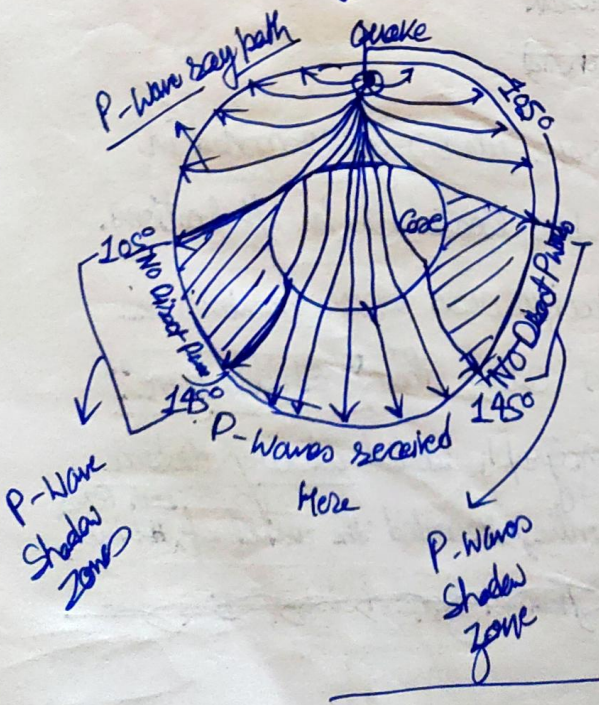
S-Waves vibrates perpendicular to the direction of propagation of the wave in the vertical plane. Hence, they create Troughs and Crests in the material through which they pass. (उभार व गर्त)

- Shadow Zone → Earthquake waves get recorded in Seismographs located at far off locations. However, there exist some specific areas where the waves are not reported. Such a zone is called the "Shadow Zone".

It was observed that Seismograph located at any distance within 105° from the Epicentre, recorded the arrival of both P & S Waves, but not that of S Waves. Thus a zone between 105° ~~and not that of S Waves. Thus a zone between 105°~~

However, the Seismographs located beyond 145° from Epicentre, recorded the arrival of P-Waves, but not that of S-Waves. Thus a zone between 105° & 145° from epicentre was identified as the Shadow Zone for both types of Waves. The entire zone beyond 105° doesn't receive S-Waves. The shadow zone of S-Waves is much 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 epicentre. The Shadow zone of S-Waves is not only larger in extent but it is also a little over 40% of the Earth Surface. Here is the figure of P & S-waves Shadow zones

P-Wave Shadow Zone



S-Wave Shadow Zone