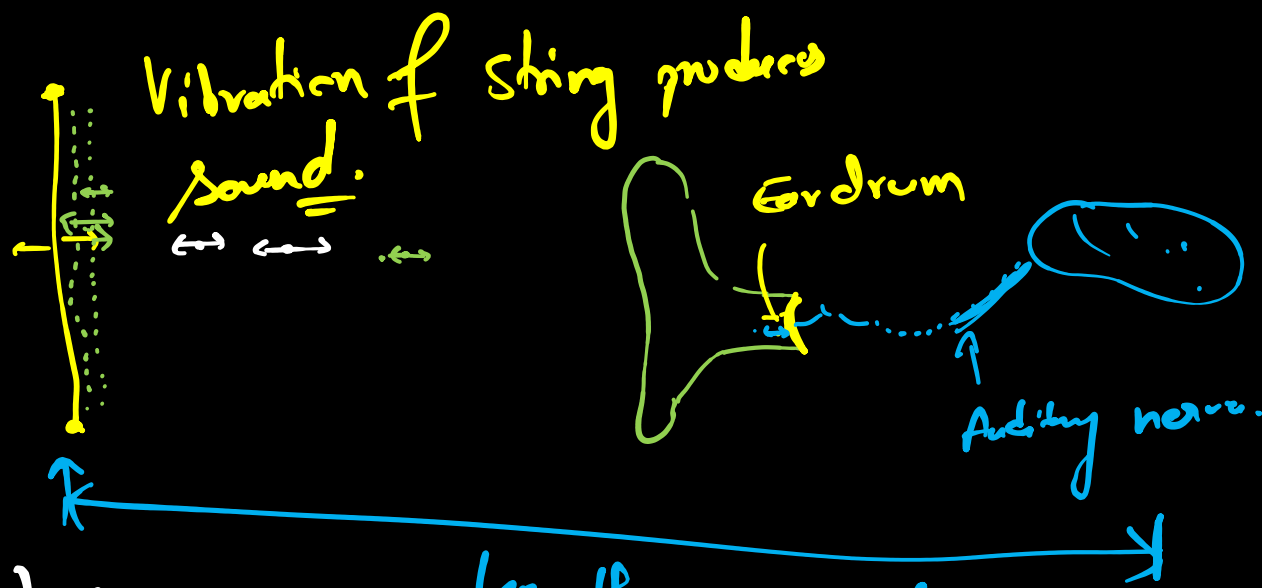
Sound

Sound

⇒ "Form of energy that produces the sensation of hearing in our ears".

* Sound is produced by vibrations

* Vibration travels from one place to other place in the form of wave (mechanical waves)



Experiments to demonstrate that Sound is produced by Vibration.

Exp 1: Stretch a string by holding one end between the teeth and other hand in one hand. Pluck it by other hand.

Exp 2: If the string of Sitar (or guitar) is plucked, the string starts vibrating and its sound is heard.

On blowing a whistle, air inside whistle starts vibrating and a sound is heard.

* We can conclude that sound is produced when a body vibrates. As it stops vibration, the production of sound is ceases.

A vibrating body is a source of sound

Sound is a form of energy

⇒ Mechanical energy is required to start vibration in a body.

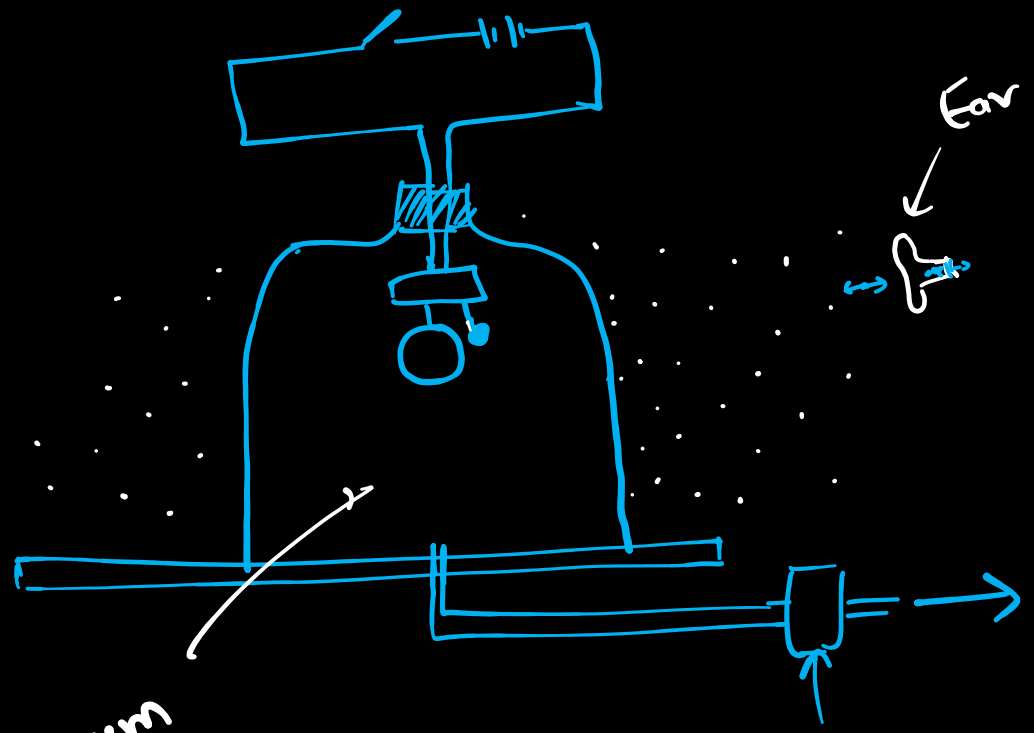
↳ (Sound is produced)

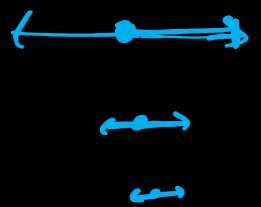
↳ Vibration of the body is transmitted in a medium in the form of waves from that point to the next and so on.

↳ The waves on reaching our ears, produce vibration in the ear-drum, which are perceived as sound by our brain.

Hence, Sound is a form of energy

Sound Propagation requires a material medium



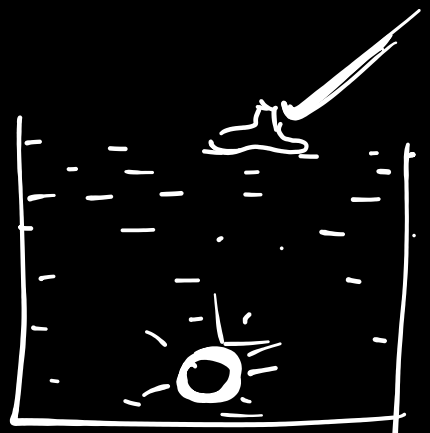


Bell-jar Experiment

↳ Proves that Sound requires a material medium to propagate.

Material medium

- Gas ✓ — slowest
- Liquid ✓ — faster
- Solid ✓ — fastest



Speed of sound is different in various mediums.

Speed ⇒ Solid > Liquid > Gas

Fact Box.

Speed of Sound

- ⇒ in air = ~332 ms⁻¹
- ⇒ in water = 1450 ms⁻¹
- ⇒ in steel = 5100 ms⁻¹

⇒ A material medium is necessary for the propagation of sound from one place to other.

Properties of the medium

(i) The medium must be elastic (Vibration)
↳ particles should come back to initial position.

(ii) The medium should be frictionless.
So that there is no loss of energy in propagation.

(iii) The medium should have inertia (some mass)

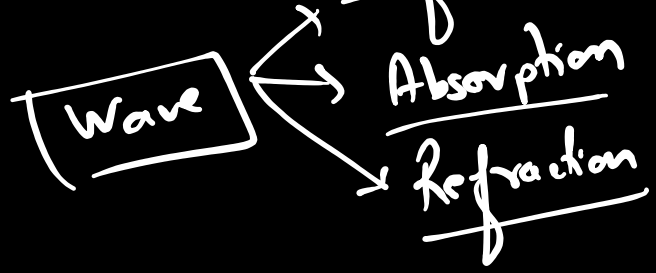
Photon (mass less particles)

⇒ Sound cannot travel in vacuum. (Light can travel in vacuum)

⇒ Sound can travel in gas, liquid, solid.

⇒ Solid surface can reflect sound waves. (eg. echo)

⇒ Soft and spongy object can absorb sound waves.



Propagation of sound in a medium.

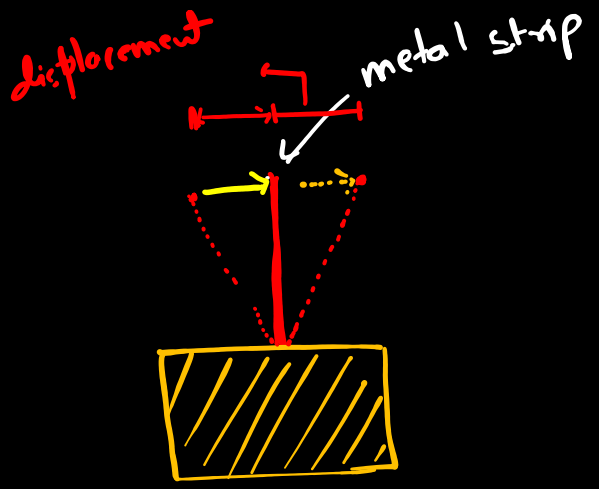
→ When the source of sound vibrates

↓

Creates a periodic disturbance in the medium near it.

↓

. The disturbance travels in the medium in the form of wave.

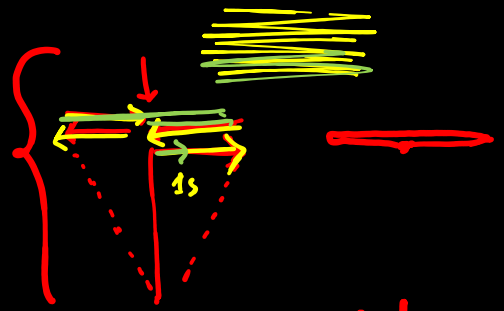


Mean position
or
Resting position

⇒ to and fro motion
⇒ Back and forth

} Oscillation

eg: motion of Pendulum



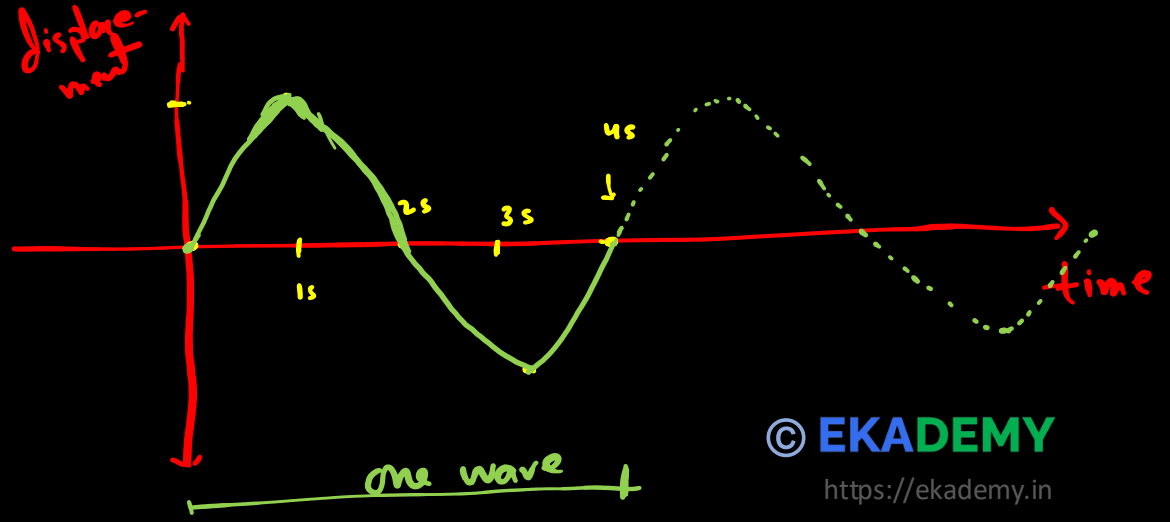
one complete oscillation

↓

[one compression and one rarefaction]

↓ constitutes

one wave



Types of waves

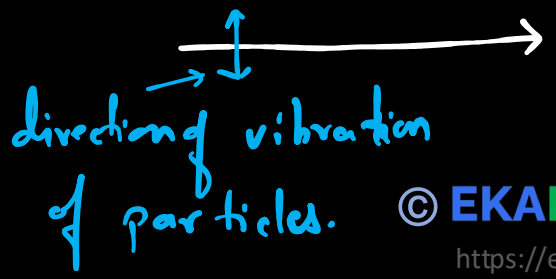
Longitudinal waves

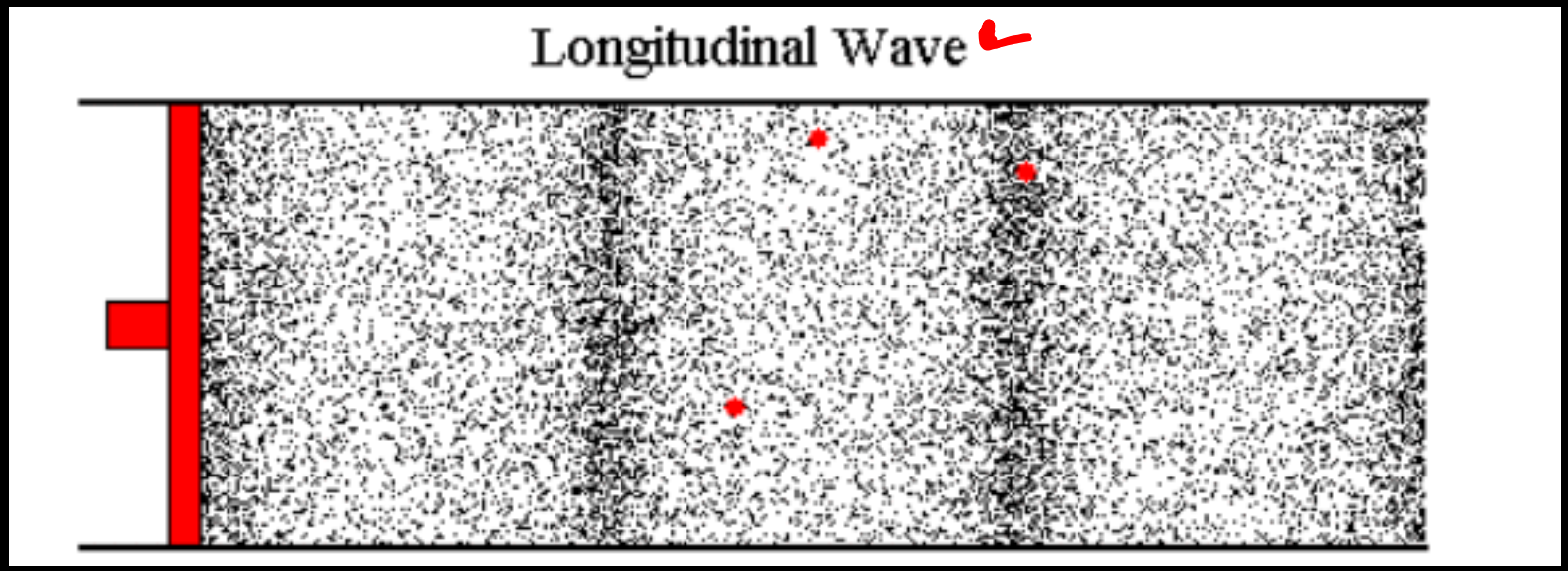
- Sound waves are Longitudinal waves
- The wave in which the particles of medium vibrate about their mean position parallel to the direction of propagation of wave.

→ direction of propagation
↔ direction of vibration of particles

Transverse waves

- Water waves.
- The wave in which the particles of medium vibrates about their mean position perpendicular to the direction of propagation of waves.





motion of wave
vibration of particles