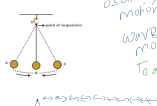


Sound

- ✓ Translational motion
 - ✓ Rotational motion \rightarrow earth revolves around sun
 - ✓ Vibrational motion. \rightarrow moon revolves around the earth.
- usually motion wave motion To and fro motion
- 

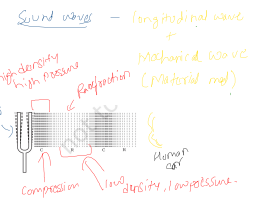
\rightarrow No particle of the medium actually displaces
 \rightarrow All particles of medium vibrate and transfer their energy to adjacent particle.

Based on vibration of particles:

- \rightarrow longitudinal = ∞ (string)
- \rightarrow Transverse = (Mexican wave)

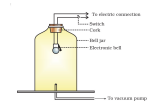
Based on medium on propagation

- Mechanical wave (Material medium is required)
 - Non mechanical wave (Material medium is not required)
- \rightarrow Solid, liquid, gas etc. \rightarrow They can even travel through vacuum.
- water waves, sound waves, light.
- \rightarrow Radiation Radio EM waves

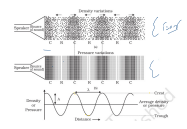


Collision b/w two particles (vibration) \Rightarrow wave Energy

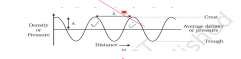
12.21 SOUND NEEDS MEDIUM TO TRAVEL



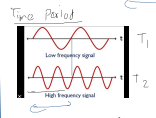
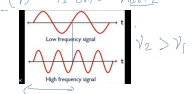
12.21.1 Characteristics of a wave



hill type structure - compression (Air particles crowded)
 valley type structure - rarefaction (not crowded)
 Peak of compression - crest
 Peak of rarefaction - trough

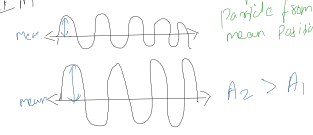


wavelength - (λ) m
 Frequency - (f) - SI unit - hertz

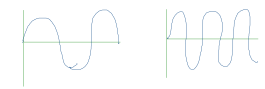


$$v \propto \frac{1}{T}$$

Amplitude (A) magnitude of the maximum displacement of a vibrating particle from its mean position.

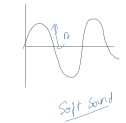


\swarrow low pitch sound



High pitch sound

Pitch - determines the shrillness of sound.
 loudness - depends upon amplitude. \uparrow frequency \uparrow pitch \uparrow
 Amplitude \uparrow loudness \uparrow



Speed of Sound

$$v = \frac{d}{t}$$

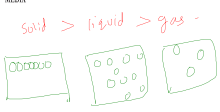
$$v = \lambda \times f$$

$$v = \lambda f$$

$$v = \lambda \nu$$

Speed = wavelength \times frequency

12.24 SPEED OF SOUND IN DIFFERENT MEDIA



\rightarrow sound speed increases with the temperature.

Reflection of Sound



Echo - Repetition of sound because of multiple reflections of sound.

Reverberation - The repeated reflection that results in the persistence of sound is called reverberation.

12.3.3 USES OF MULTIPLE REFLECTION OF SOUND

Range of Hearing -

audible range \rightarrow 20 Hz to $20\,000\text{ Hz}$
 $1\text{ kHz} = 1000\text{ Hz}$

\rightarrow Infrasonic sound or Infrasonic -

(Sound less than 20 Hz)

\rightarrow Ultrasonic sound or Ultrasound -

(Greater than $20\,000\text{ Hz}$)