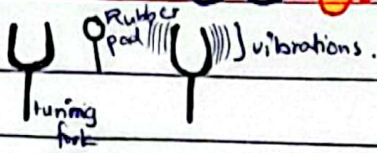


# SOUND

## ONE PAGE NOTES

Date: .....

• sound is produced by vibrating bodies



• sound waves are mechanical waves, need medium for propagation.



• The bell will be heard in air but not in vacuum.

• sound waves are longitudinal in nature.

→ form compressions and rarefactions such as formed in spring.



**Characteristics:** \* Amplitude of loudness  
\* Area of loudness.

• loudness: distinguishes b/w loud & faint sounds. Distance  $\propto \frac{1}{\text{loudness}}$

• Pitch: distinguishes b/w shrill & grave sound. shrill = high pitch = high frequency  
grave = low pitch = low frequency

Quality: distinguishes b/w two sounds with same pitch and loudness.

Intensity:  $I = \frac{E}{A \cdot t}$  " sound energy passing through unit area in one second"

UNIT:  $\frac{J}{s \cdot m^2} = \frac{J}{s \cdot m^2}$   
 $\frac{J}{s} = W, \frac{W}{m^2} = \frac{J \cdot m^{-2}}{s}$

• sound intensity level.

can't hear  $< 10^{-12} \text{ Wm}^{-2}$  →  $1 \text{ Wm}^{-2}$   $<$  can't hear  
FASI: faintest audible sound  
LASI: loudest audible sound

• If  $I = 10 I_0$

$$\log\left(\frac{I}{I_0}\right) \Rightarrow \log\left(\frac{10 I_0}{I_0}\right) \Rightarrow \log 10 = 1$$

**Reflection of sound (Echo)**

Every echo is reflection of sound but every reflection of sound is not echo.

when is reflected the sound, echo

when time taken to feel the sound being reflected is 0.1s and distance b/w you and the surface is 17m and  $V$  of sound is  $340 \text{ ms}^{-1}$ , the reflection is the echo.

speed of sound.

• speed in solids ↑  
• speed in gases ↓

$$v = f \lambda$$

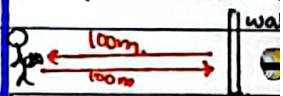
speed of sound at different temperatures:

$$v = v_0 + 0.6t \text{ } ^\circ\text{C}$$

Speed of sound at  $0^\circ\text{C}$  is  $336 \text{ ms}^{-1}$

to find: For example:  $v = 336 + 0.6(32) = 336 + 19.2 = 355.2 \text{ ms}^{-1}$   
Q: what is the speed of sound at  $32^\circ\text{C}$ ?  
speed of sound at  $32^\circ\text{C}$  will be  $355.2 \text{ ms}^{-1}$

Experiment: Pg: 28



suppose distance is 100m & time taken is 0.5s.

$$v = \frac{s}{t} = \frac{100}{0.5} = 200 \text{ ms}^{-1}$$

**NOISE POLLUTION**

→ Any non-rhythmic sound.

The level of noise recommended in most countries is usually 85-90dB.

**Acoustic protection:**

To prevent too much reflection of sound porous material is used to absorb the sound. e.g carpet.

**Audible frequency Range.**

20Hz and 20,000Hz.

Human ear can only hear sounds which lie b/w these frequencies.

**Ultra-sound**

• sound of frequency higher than 20kHz which are inaudible to normal human ear are called ultrasonic or ultrasound waves.

(less) infrasonic  $< 20 \text{ Hz}$  →  $20,000 \text{ Hz} <$  (more) ultrasonic.

uses of ultrasonic waves. (Summarized)

It is used in many fields of sound and technology such as medical engineering etc. In medical it is used to diagnose and treat different ailments. Ultrasound is used to locate underwater depths or for locating objects lying deep in the ocean floor. The technique is called SONAR, an acronym for Sound navigation & Ranging.

**SLO corner:-**