

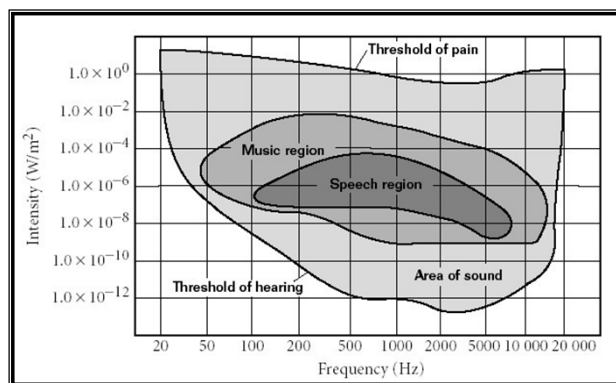
# SOUND

# Intensity

1

## Audible Range

- Whether we can hear a sound or not depends on the frequency and intensity of the sound.



2

## Sound Level

- Relative pressure of a sound determined by the pressure of the sound and the threshold of hearing.
- Depends on the amplitude of the wave
- Measured in decibels (dB)
- 0db is the lowest level sound that people can hear
- $0\text{dB} = 2 \times 10^{-5} \text{ N/m}^2$
- $20\text{dB} = 2 \times 10^{-4} \text{ N/m}^2$
- $40\text{dB} = 2 \times 10^{-3} \text{ N/m}^2$
- Every 20db is a 10x difference in pressure

Units of  
Pressure =  $\frac{F}{A}$

3

## Intensity

- Rate at which the energy of the sound wave strikes a unit area
- The higher the intensity, the louder the sound.

Where P is the power in watts and R is the distance from the source.

4

## Sample Problem

- Calculate the intensity of an electric guitar's amplifier at a distance of 5.0m if its power output is 100 W.

5

## Sample Problem #2

- Calculate the power of a sound with an intensity of  $0.0089 \text{ W/m}^2$  at a distance of 25.0m.

6

## Forced Vibrations and Resonance

- Forced Vibrations
  - The forced transfer of a vibration to other media (Ex: guitar)
- Resonance
  - Occurs when the forced vibration matches the natural frequency of an object
- Resonance can produce a standing wave, creating a louder noise or other results...

<https://www.youtube.com/watch?v=uVvnw3Mfxkl>

<https://www.youtube.com/watch?v=rRZT7xO5KN4>

<https://www.youtube.com/watch?v=H8Yd0QkM>