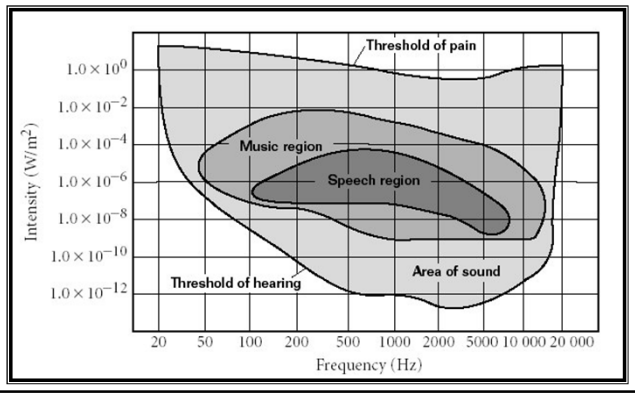
SOUND
Intensity

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
- 0dB = $2x10^{-5}$ N/m^2
  20dB = $2x10^{-4}$ N/m^2
  40dB = $2x10^{-3}$ N/m^2
  Units of Pressure = $\frac{F}{A}$
- Every 20db is a 10x difference in pressure

3

Intensity

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

$$I = \frac{P}{4\pi R^2}$$

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

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Sample Problem

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

$$I = \frac{P}{4\pi R^2}$$

$$I = \frac{100}{4\pi(5)^2}$$

$$I = \frac{100}{314.15}$$

$$I = 0.318\,\frac{W}{m^2}$$

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Sample Problem #2

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

$$\mathrm{I} = \frac{P}{[4\pi(R)^2]}$$

$$0.0089 = \frac{P}{[4\pi(25)^2]}$$

$$0.0089 = \frac{P}{[7854]}$$

$$P = 69.9\,W$$

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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=uVvnw3MfxkI
https://www.youtube.com/watch?v=rRZT7xO5KN4
https://www.youtube.com/watch?v=sHPX8X10QkM

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