

Honors Physics: Sound Class Examples

Sections Covered – Physics

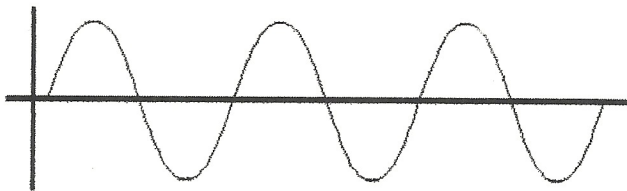
- Chapters 14 and 15

Topics Covered:

- Nature of Sound Waves
- Speed of Sound/Quality of Sound
- Sound Intensity/Decibels
- Doppler Effect
- Sound Interference
- Standing Waves
- Musical Instruments

Two Types of Waves:

Transverse:



Longitudinal:



Sound Intensity and Decibels:

Example 1

You and a friend are watching fireworks that are launching from an observatory. You are standing right in front of _____ (150.0 m away) and your friend is at _____ (700.0 m away). The sound intensity at your friend's location is 0.0200 W/m^2 .

- What is the power of the fireworks?
- What is the sound intensity at your location?



$$A.) \quad I = \frac{P}{A}$$

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

$$P = I \cdot 4\pi r^2$$

$$P = (0.0200) \cdot 4\pi (700)^2$$

$$P = 123,150 \text{ W}$$

$$B.) \quad I = \frac{P}{4\pi r^2}$$

$$I = \frac{123,150}{4\pi (150)^2}$$

$$I = 0.436 \text{ W/m}^2$$



Example 2

A violin has a sound level of 60 dB. What is the intensity of the sound?

$$60 = 10 \cdot \log_{10} \left(\frac{I}{I_0} \right)$$

$$6 = \log_{10} \left(\frac{I}{1.0 \times 10^{-12}} \right)$$

$$10^6 = \frac{I}{1.0 \times 10^{-12}}$$

$$1 \times 10^6 = \frac{I}{1.0 \times 10^{-12}}$$

$$I = 1.0 \times 10^{-6} \text{ W/m}^2$$