Chapter 33   Longitudinal Waves (Examples) (S17)

Example 1: Find the speed of sound in aluminum (B = 7.14 x 10 ^{10} N/m^2 and r = 2700 kg/m^3).

Example 2: A hammer strikes the end of a steel (B = 6.40 x 10 ^{10} N/m^2 and r = 7860 kg/m^3) rail. A person at the other end of the rail hears the sound through the rail first and then 3.14 seconds later hears it through the air (speed of sound in air is 343 m/s). How long is the rail?

Example 3: If earthquake waves travel at 7470 m/s and the Earth's crust has a density of 2510 kg/m^3, What is the bulk modulus of the Earth's crust?

Example 4: If the human ear can just barely hear a sound whose pressure amplitude is 2.9 x 10 $^{-5}$ N/m^2, what is the displacement amplitude for a 1000 Hz sound at the threshold of hearing?

Example 5: By what factor does the intensity of a sound wave change if your double the receiver's distance from a point source?

Example 6: You are 5 m from a point source and b = 100 dB. How far from the source would you have to be for b = 50 dB?

Example 7: 1000 Hz train whistle is moving at 30 m/s toward a stationary observer. What is the observed frequency?

Example 8: 1000 Hz train whistle is moving at 30 m/s away from a stationary observer. What is the observed frequency?

Example 9: 1000 Hz train whistle is stationary and the observer is moving away at 30 m/s. What is the observed frequency?

Example 10: 1000 Hz train whistle is stationary and the observer is moving away at 30 m/s. There is a 40 m/s wind blowing from the observer to the train. What is the observed frequency?

Example 11: 1000 Hz train whistle is moving west at 30 m/s and the observer is moving east at 15 m/s. The distance between the whistle and the observer is increasing and there is a 40 m/s wind blowing from the east to west. What is the observed frequency?