

PHYSICS 1020

Homework #2

(Due Feb. 8, 2010)

11-38. (a) AM radio signals have frequencies between 550 kHz and 1600 kHz (kilohertz) and travel with a speed of 3.00×10^8 m/s. What are the wavelengths of these signals? (b) On FM, the frequencies range from 88.0 MHz to 108 MHz (megahertz) and travel at the same speed; what are their wavelengths?

11-39. Calculate the speed of longitudinal waves in (a) water, (b) granite, and (c) steel.

11-44. P and S waves from an earthquake travel at different speeds, and this difference helps in locating the earthquake “epicenter” (where the disturbance took place). (a) Assuming typical speeds of 8.5 km/s and 5.5 km/s for P and S waves, respectively, how far away did the earthquake occur if a particular seismic station detects the arrival of these two types of waves 2.0 min apart? (b) Is one seismic station sufficient to determine the position of the epicenter? Explain.

11-47. The intensity of an earthquake wave passing through the Earth is measured to be 2.0×10^6 W/m² at a distance of 48 km from the source. (a) What was its intensity when it passed a point only 1.0 km from the source? (b) At what rate did energy pass through an area of 5.0 m² at 1.0 km?

11-52. If a violin string vibrates at 440 Hz as its fundamental frequency, what are the frequencies of the first four harmonics?