

PHYSICS 1020

Homework #2

(Due Feb. 6, 2012)

1. (Giancoli 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?
2. (Giancoli 11-39.) Calculate the speed of longitudinal waves in (a) water, (b) granite, and (c) steel.
3. (Giancoli 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.
4. (Giancoli 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?
5. The Virginia earthquake of 2011 was measured to have an intensity of 5.8 on the moment magnitude scale. (a) What was the total energy of this earthquake, in joules? (b) This amount of energy is equivalent to how many tons of TNT? (1 ton of TNT = 4.184×10^9 joules.)
6. (Giancoli 11-52.) If a violin string vibrates at 440 Hz as its fundamental frequency, what are the frequencies of the first four harmonics?