

Read all questions carefully. Show all work and equations used. Circle your answers. Staple questions to your work.

- 1.) A fisherman notices that wave crest pass the bow of his anchored boat every 3.0 s. He measures the distance between two crests to be 8.5 m. How fast are the waves traveling?
  
- 2.) Am radio signals have frequencies between 550 kHz and 1600 kHz and travel with a speed of  $3.00 \times 10^8$  m/s. What are the wavelengths of (a) the 550 kHz signal? (b) the 1066 kHz signal? On FM, the frequencies range from 88 MHz to 108 MHz and travel the same speed; what are the wavelength of (c) the 88 MHz signal? (d) the 108 MHz signal?
  
- 3.) A sailor strikes the side of his ship just below the surface of the sea. He hears the echo of the wave reflected off the sea floor directly below 3.0 s later. How deep is the ocean at this point?
  
- 4.) If a tuning fork puts out a tone at 440 Hz, what is its wavelength in air at 25°C? Keep in mind that sound in air travels at 331 m/s at STP and changes by 0.60 m/s per change of 1 degree Celsius.

- 5.) By what percentage does the speed of sound change when the air temperature rises from  $0^{\circ}\text{C}$  to  $30^{\circ}\text{C}$ ?
- 6.) A B-string from a guitar is fixed at both ends under tension with a vibrating length of 33 cm. It oscillates at its fundamental frequency of 246 Hz. What are the wavelengths on the string, and in the air at room temperature?
- 7.) A sound wave of wavelength 0.70-m is produced for 0.50 s. The temperature is  $25^{\circ}\text{C}$ . (a) What is the frequency of the wave? (b) How many complete waves are emitted in this time interval? (c) After 0.50 s, how far is the wave from the source of the sound?
- 8.) A source, moving at 50 m/s, emits sound waves that travel 100 m/s at 1000 Hz. (a) Calculate the wavelength a listener observes if he is at rest. (b) If the source is moving towards the observer, what frequency and wavelength does he observe? (c) If the source is moving away from the observer, what frequency and wavelength does he observe?