1. What is the wavelength of radio waves whose frequency is 100.3 MHz? Radio waves travel at the speed of light. Be careful of the correct metric unit prefix.
2. What is the frequency of a photon whose wavelength is 6350 Å (6.35×10^{-07} m)?
3. At 0.00° C, sound travels at 331.0 m/s. What is the frequency of a sound whose wavelength is 2.00 m at 0.00° C?
4. The sound of an explosion is heard 7.25 s after the explosion is seen. If the temperature of the air is 21.0° C, How far from the observer did the explosion take place?
5. A student shouts in a canyon. 8.00 s after the shout, the student hears an echo from one of the walls. Assuming that the speed of sound is 336 m/s, how far is the wall from the student?
6. The frequency produced by a certain tuning fork is 440.0 Hz. What is the wavelength of this sound in air when the temperature is 25.0° C?
7. The frequency produced by a certain tuning fork is 540.0 Hz. What is the wavelength of this sound in air when the temperature is 30.0° C?
8. Two strings are played together and produce beats with a frequency of 4 Hz. If the frequency of one string is raised to 305 Hz and the resulting beat frequency is 6 Hz, what is the frequency of the other string?
9. A police car pursuing a perpetrator sounds a siren at 305 Hz. The police car is moving north at 38.0 m/s and the other car is moving north at 36.0 m/s. What frequency is heard by the bad guy if the speed of sound in air is 345 m/s?
10. Two cars are approaching each other. Each car has a speed of 12.5 m/s relative to the ground. What frequency is heard by the second car if the first car sounds a horn at 256 Hz? The temperature of the air is 10.0° C.
11. What frequency is heard by a stationary observer from a horn sounding at 528 Hz if the horn is on a train moving away from the observer at 25.0 m/s. The temperature of the air is 23.5° C.

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12. A sound wave in air has a frequency of 262 Hz and travels with a speed of 343 m/s. How far apart are the wave crests (compressions)?
13. (*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 is the range of wavelengths of these signals? On FM, the frequencies range from 88.0 MHz to 108 MHz (megahertz) and travel at the same speed; what is the range of their wavelengths?
14. A cord of mass 0.65 kg is stretched between two supports 28 m apart. If the tension in the cord is 150 N, how long will it take a pulse to travel from one support to the other?
15. A ski gondola is connected to the top of a hill by a steel cable of length 620 m and diameter 1.5 cm. As the gondola comes to the end of its run, it bumps into the terminal and sends a wave pulse along the cable. It is observed that it took 16 s for the pulse to return. (a) What is the speed of the pulse? (b) What is the tension in the cable?

16. 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.

17. An earthquake-produced surface wave can be approximated by a sinusoidal transverse wave. Assuming a frequency of 0.50 Hz (typical of earthquakes, which actually include a mixture of frequencies), what amplitude is needed so that objects begin to leave contact with the ground? [Hint: Set the acceleration $a > g$]

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18. A fisherman notices that wave crests pass the bow of his anchored boat every 3.0 s. He measures the distance between two crests to be 6.5 m. How fast are the waves traveling?