

Unit 13 Lesson 3 Worksheet Bank – Properties of Sound Waves

1. The piano string tuned to middle C vibrates with a frequency of 264 Hz. Assuming the speed of sound in air is 343 m/s, find the wavelength of the sound waves produced by the string. [1.30 m]
2. A piano emits frequencies that range from a low of about 28 Hz to a high of about 4200 Hz. Find the range of wavelengths in air attained by this instrument when the speed of sound in air is 340 m/s. [0.081 m – 12.14 m]
3. A tuning fork produces a sound with a frequency of 256 Hz and a wavelength in air of 1.35 m.
 - a. What value does this give for the speed of sound in air? [345.6 m/s]
 - b. What would be the wavelength of the wave produced by this tuning fork in water in which sound travels at 1500 m/s? [5.86 m]
4. If you hear a higher pitch from a trumpet than from a saxophone, how do the frequencies of the sound waves from the trumpet compare with those from the saxophone?
5. Dolphins can produce sound waves with frequencies ranging from 0.25 kHz – 220 kHz, but only those at the upper end of the spectrum are used in echolocation. Explain why high-frequency waves work better than low-frequency waves.
6. Sound pulses emitted by a dolphin travel through 20° C ocean water at a rate of 1450 m/s. In 20° C air, these pulses would travel 342.9 m/s. how can you account for this difference in speed?
7. Opera singers have been known to set crystal goblets in vibration with their powerful voices. In fact, an amplified human voice can shatter the glass, but only at certain fundamental frequencies. Speculate about why only certain fundamental frequencies will break the glass.
8. Electric guitars, which use electric amplifiers to magnify their sound, can have a variety of shapes, but acoustic guitars must have an hourglass shape. Explain why.
9. What are the first three harmonics in a 2.45 m long pipe that is open at both ends? [70.41 Hz, 140.82 Hz, 211.22 Hz] What are the first three harmonics of this pipe when one end of the pipe is closed? [35.20 Hz, 105.61 Hz, 176.02 Hz] Assume that the speed of sound in air is 345 m/s for both of these situations.