Sound Problems Practice

January 25, 2012

Table 15-1
Speed of Sound in Various Media

Medium	m/s
Air (0°)	331
Air (20°)	343
Helium (0°)	972
Water (25°)	1493
Seawater (25°)	1533
Copper (25°)	3560
Iron (25°)	5130

1. Find the frequency of a sound wave moving through iron at 25°C with a wavelength of 1.25 m.

$\lambda = 1.25\,m$

$V = 5130\,m/s$

$f = ?$

$V = f\lambda$

$f = 4104\,Hz$

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Sound with a frequency of 2 kHz travels through water at 25°C. Find the sound's wavelength in water.
Do not confuse sound waves moving through water with surface waves moving through water.

$f = 2000\,Hz$

$v = 1493\,m/s$

$\lambda = ?$

$V = f\lambda$

$\lambda = .74\,m$

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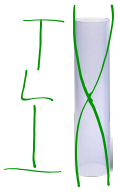
1. The lowest note on an organ is 16.4 Hz.
   a. What is the shortest open organ pipe that will resonate at this frequency?
   b. What is the pitch if the same organ pipe is closed?



$f = 16.4\,Hz$

$V = 341\,m/s$

$\lambda = 20.79\,m$

$\lambda = \frac{2}{1}(L)$

$L = 10.4\,m$

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b. What is the pitch if the **same organ pipe** is closed?

$L = 10.4\,m$

$V = 341\,m/s$

$f = ?$

$\lambda = \frac{4}{1}(L)$

$= 41.6\,m$

$8.2\,Hz$

A guitar string is 65.0 cm long and is tuned to produce a lowest frequency of 196 Hz.
What is the speed of the wave on the string?
What are the next two higher resonant frequencies for this string?

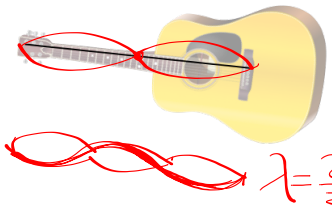
$V = \sqrt{\frac{T}{m/L}}$ $\lambda = 1.3\,m$ $L = .65\,m$ $f = 196\,Hz$

$V = f\lambda$

$V = 196(1.3) = 254\,m/s$

A guitar string is 65.0 cm long and is tuned to produce a lowest frequency of 196 Hz.
What is the speed of the wave on the string? $254.8\,m/s$
What are the next two higher resonant frequencies for this string?

$.65 = \lambda$ $\lambda = \frac{2}{2}(L)$



$\lambda = \frac{2}{3}(.65)$