

Open Tube Harmonics

Name _____ Date _____

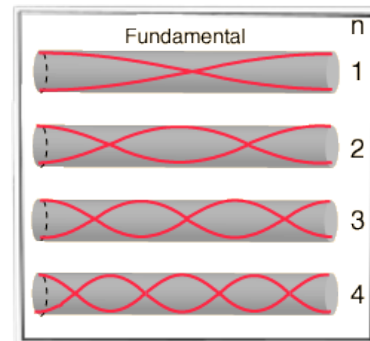
Purpose:

To measure the speed of sound at room temperature.

Theory:

A cylindrical air column with both ends open will vibrate with a fundamental mode such that the air column length is one half the wavelength of the sound wave. Each end of the column must be an antinode for the air motion since the ends are open to the atmosphere and cannot produce significant pressure changes. For the fundamental mode, there is one node at the center. The basic wave relationship leads to the frequency of the fundamental: $\lambda = (2/n) L$. The open air column can produce all harmonics. Open cylinders are employed musically in the flute, the recorder, and the open organ pipe.

<http://hyperphysics.phy-astr.gsu.edu/hbase/waves/opecol.html#c2>



Data:



Calculations:

	L_{tube} (cm)	d (cm)	T (s)	f (Hz)	L (m)	λ (m)	Speed (m/s)
1							
2							
$v_{\text{sound in air}} \approx 331.4 + 0.6T_C \text{ m/s}$					avg		
					actual		%

$$v = f\lambda$$

Conclusion (error analysis):

What was a possible source of error in this experiment?

Grade