VELOCITY OF SOUND
Experiment 8

INTRODUCTION:

Waves are a means of transferring energy from vibrations. Waves can be classified as ***transverse*** and ***longitudinal***. In transverse waves, the direction of vibration is perpendicular to the direction of motion of the wave. Whereas in longitudinal waves, the direction of vibration is parallel to the direction of motion of the waves. Light is the most common example of a transverse wave, while sound is the most common example of a **longitudinal** wave.

Sound waves need a medium (such as air) to travel. The speed of sound waves can be affected by several factors, such as the density of medium, the temperature, and humidity. Speed of sound waves is related to its wavelength and frequency by equations (1)

velocity = frequency x wavelength

$$v = f \times ? \qquad (1)$$

Sound waves that are produced near a column create waves that appear not to be moving at certain positions (nodes). These ***standing waves*** are actually waves that are reflected upon themselves and cause interference, creating nodes (N) and antinodes (A). The number of nodes created by these waves depends on the length of the column and the distance between them is ½ ? (see Fig 1).

If a tuning fork is struck near such a column, the loudness of its note can be greatly increased when the vibration in the air column matches the frequency of the fork. When this occurs, the air column is said to be in ***resonance***. The distance between the nodes in the wave can be detected by measuring several resonances.

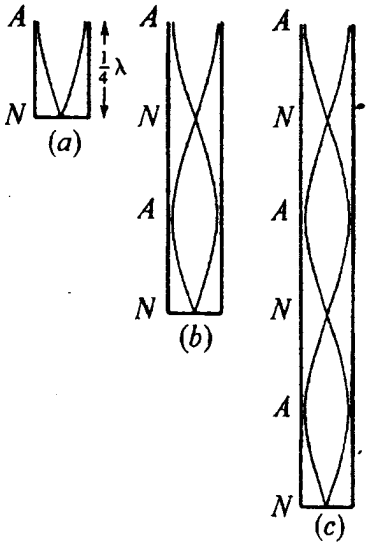

Figure 1. Resonance diagrams for different lengths of air columns

APPARATUS & MATERIAL:

- ? tuning fork
- ? resonance apparatus
- ? ruler

PROCEDURE

CALCULATIONS:

Name:_____

REPORT FORM

Experiment 8

TABLE 1

	Trial 1	***Trial 2***
Frequency of tuning fork (f)		
Temperature of room (T)		
Position of first resonance (L_1)		
Position of second resonance (L_2)		
Position of third resonance (L_3)		

QUESTIONS:

1. How does the wavelength change relative to the frequency of a wave?

2. Why does the sound become louder at some points in the tube?

3. What effect does temperature have on the velocity of sound? Why?

TABLE 2

	Quantity	*Answer*	*Show calculations here*
TRIAL 1	? L_1 (L_2 – L_1)		
	? L_2 (L_3 – L_2)		
	? L (avg)		
	Wavelength (?)		
	Velocity of sound (experimental)		
	Velocity of sound (theoretical)		
	Percent Error		
TRIAL 2	? L_1 (L_2 – L_1)		
	? L_2 (L_3 – L_2)		
	? L (avg)		
	Wavelength (?)		
	Velocity of sound (experimental)		
	Velocity of sound (theoretical)		
	Percent Error		