Physics Laboratory

Measuring the Speed of Sound

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03/09/2016

Date of performance: March 1, 2016

1 Objective

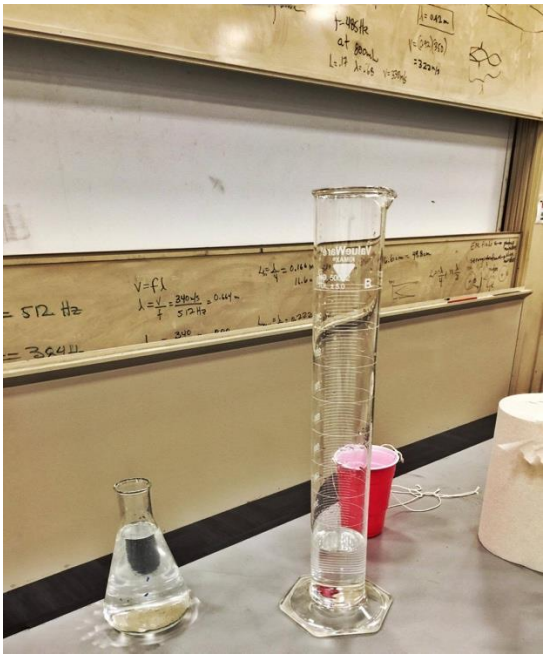
The objective of this following lab is to measure the speed of sound.

2 Definitions:

Wave speed - the speed at which a wave travels. Wave speed is related to wavelength, frequency, and period. The most commonly used wave speed is the speed of visible light, an electromagnetic wave.
Frequency - the number of crests of a wave that move past a given point in a given unit of time. The most common unit of frequency is the hertz (Hz), corresponding to one crest per second.
Wavelength - the distance between consecutive corresponding points of the same phase, such as crests, troughs, or zero crossings and is a characteristic of both traveling waves and standing waves, as well as other spatial wave patterns.
Standing wave - also known as a stationary wave { is a wave in a medium in which each point on the axis of the wave has an associated constant amplitude. The locations at which the amplitude is minimum are called nodes, and the locations where the amplitude is maximum are called anti-nodes.
Resonance - is a phenomenon that occurs when a vibrating system or external force drives another system to oscillate with greater amplitude at a specific preferential frequency.

3 Materials

- Graduated cylinder
- Frequency generator app ("F Generator")
- Water
- Ruler
- Conical ask



4 Data

Water volume (mL)	Length (m)	Frequency (Hz)	Wavelength (m)
800	0.17	485	0.68
600	0.23	380	0.92
500	0.28	305	1.12
200	0.38	223	1.52

Table 1: Experimental data

5 Example Calculations

This is the calculation for speed of the measuring cylinder filled with 500mL of water.

L = 28cm which is the same as 0.28m

f = 308 Hertz as measured from the application

$$\frac{\lambda}{4}$$

so

$$\lambda = 4 * L$$

therefore

$$\lambda = 1.12\text{m}$$

Now using equation

$$v = f/lambda$$

you can calculate the speed as lambda and frequency have been obtained.

$$v = 308 * 1.12 \approx 345 m/s$$

The calculated value for the speed of sound in dry air at 20 is 343.2 m/s.
Even though this may not be the ideal conditions in the room
we can use it as an estimate to predict what may happen.
The percent error is calculated as follows.

$$\text{Error} = \frac{345 - 342.2}{343.5} = 0.524\%$$

6 Conclusion

Through this lab of measuring the speed of sound, I was able to measure the speed of sound, see how different amount of water impacts on the effect and accuracy of getting the data, which leads a person to the proof that the speed of sound must be approximately 345m/s, with possible percentage error of 0.524% in this investigation.

7 References

- (n.d.). Retrieved March 01, 2016, from http://www.bbc.co.uk/schools/gcsebitesize/science/aqa$_{p}$re2 011=radiation=anintroductiontowavesrev 3:shtml

- Hyper Physics. (n.d.). Quarks. Retrieved March 2, 2016, from http://hyperphysics.phy-astr.gsu.edu/hbase/particles/quark.html