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Lab report on measuring the speed of sound

Objective

The goal of this lab is to measure the speed of sound using the resonant standing waves in a Graduated Cylinder.

Introduction

In this lab we are going to measure the speed of sound using the concept of standing waves in cylinders with one end open and the other end closed by water, Using an app which produces frequencies we generate resonant sounds, by measuring the distance between the water and the frequency generator, we can calculate the sped of sound.

Materials

Water
Ruler
Graduated Cylinder
App “f Generator”
Conical Flask

Method

Hold the phone above the Graduated Cylinder. Generate the sound with the specific frequency and move it above the cylinder until you hear the resonant sound and then measure the length between the speaker and water surface. We do this for four different frequencies, measure the speed and take an average of the speed. We are measuring the first harmonic motion so when we use the formula v=fλ, the $\lambda = 4 * L$
v/4 = f * L

Results

Number	Length (m)	Frequency (Hz)
1	0.23	350
2	0.17	485
3	0.28	303
4	0.38	224

As I mentioned in method $v=f\lambda$, $v/4 = f * L$

Number 1 example: $V= 4f*L= 0.23* 350 *4 =322\ ms^{-1}$

Number	Frequency (Hz)	Velocity ms^{-1}
1	350	322
2	485	329.8
3	303	339.4
4	224	340.5

For Uncertainty we measure the standard deviation of our four trials and take that as the uncertainty: $\pm$ 8.72
Average Speed = $332.9 \pm 8.72\ ms^{-1}$

Conclusion

In this lab we used the characteristics of wave to measure the speed of sound, which was measured to be $332.9 \pm 8.72\ ms^{-1}$ which is pretty close to the theoretical value that is $340.3\ ms^{-1}$.