Sound in air

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1 Determining the speed of of sound in air

A Sound wave is a pressure disturbance that travels through a medium by means of particle to particle interaction. As one particle becomes disturbed, it exerts a force on the next adjacent particle, thus disturbing that particle from rest and transporting the energy through the medium. While frequency refers to the number of vibrations that an individual particle makes per unit of time, speed refers to the distance that the disturbance travels per unit of time A Sound wave is a pressure disturbance that travels through a medium by means of particle to particle interaction. As one particle becomes disturbed, it exerts a force on the next adjacent particle, thus disturbing that particle from rest and transporting the energy through the medium. While frequency refers to the number of vibrations that an individual particle makes per unit of time, speed refers to the distance that the disturbance travels per unit of time

1.1 Material

1. Tube
2. Frequency generator
3. water
4. ruler

1.1.1 METHOD

The experiment was performed by first choosing a certain frequency that would be generated over a tube filled with water on the open end. Sound wave would travel down the tube and reflected on the water surface the water level will then be adjusted to create the loudest sound according to the frequency. This would represent the first harmonicThe experiment was performed by first choosing a certain frequency that would be generated over a tube filled with water on the open end. Sound wave would travel down the tube and reflected on the water surface the water level will then be adjusted to create the loudest sound according to the frequency. This would represent the first harmonic

EXPERIMENT The pipe length can be represented as

$$L = \lambda \div 4$$

and the equation

$$v = f\lambda$$

will be used to determine the speed of sound]

1.1.2 DATA

$$Data\,1\ F = 512HZ\ and\ L = 16.5com$$

$$Data\,2\ F = 384HzandL = 22.0cm$$

$$Data\,3\ F = 320Hz\ and\ L = 25cm$$

$$Data\,4\ F = 220\ and\ L = 38$$

2 RESULTS

$$Data\,1\ : \lambda = 4L = 4 * .165 = 0.66$$

$$0.66 * 512 = 337.92\frac{m}{s}$$

$$Data\,2\ : \lambda = 4L = 4 * .220 = 0.88$$

$$0.88 * 384 = 337,92\frac{m}{s}$$

$$Data\,3\ : \lambda = 4 * 0.25 = 1$$

$$1 * 320 = 320\frac{m}{s}$$

$$Data\,4\ : \lambda = 4 * 0.38 = 1.52$$

$$1.52 * 220 = 334,4\frac{m}{s}$$

At normal atmospheric pressure the temperature dependence of the speed of a sound wave through dry air is approximated by the following equation

$$v = 331\frac{m}{s} + (0.6m/m/s/C) * T$$

where T is the temperature of the air in degrees Celsius. Using this equation to determine the speed of a sound wave in air at a temperature of 18 degrees Celsius yields the following solution.

$$v = 331m/s + (0.6m/m/s/C) * (18C)$$

$$v = 342$$

This result differ from the data provided through the experiment and

$$Data\ 1\ \frac{342 - 337.92}{342} = 12\%$$

$$Data\ 2\ \frac{342 - 337.92}{342} = 12\%$$

$$Data\ 3\ \frac{342 - 320}{342} = 6.4\%$$

$$Data\ 4\ \frac{342 - 334.4}{342} = 22.2\%$$

2.1 Discussion of error

1. Error in measurement
2. Source of Frequency
3. resonate chamber
4. Wave hard to find

There are several reason for the different answer provided by experiment and equation, some of these error has been listed above and could be a possible reason for the percentage different.

3 Conclusion

Through this experiment one was able to have a further understanding of speed of sound in air. It was very learning-full to be able to experience how by increasing or decreasing water could affect the sound being created. Another observation made in this experiment was that experiment data and data obtained from equation differed.