"FORE!" Golf and the speed of sound
Application

Purpose

The purpose of this activity is to determine the speed of sound using the principle of resonance.

Materials

Resonance tube about 50 cm long. (golf club tubes work well), large dowel, meter stick, tuning forks, (256 hertz or above).

Procedure

In this experiment, you will use the principle of resonance to determine the wavelength of a sound wave. Knowing the frequency of that sound wave, you can calculate the speed of sound. You are familiar with applications of resonance, but perhaps never knew what it was called. For example, you may have heard a vase across the room rattle when just one note on a piano was played. The frequency of that note just happens to be the natural frequency (the frequency that causes an object to vibrate) of the vase. By holding a vibrating tuning fork over an open tube and adjusting the length of the tube, it is possible to get the air column to vibrate at its resonant frequency. This will be noticed because the volume becomes louder at the proper length. For a tube open at one end, resonance occurs with the air column is about one fourth the wavelength of the sound.

1. Place a dowel inside of a golf tube. You can vary the length of the air column by moving the tube up and down.

2. Strike the tuning fork with something soft but firm, such as the rubber heel of a shoe. with the tuning fork held horizontally, near the open tube, move both fork and tube up and down. Find the air column length that gives the loudest sound. There are several "louder" sounds but you locate the very loudest.

3. Measure the distance from the top of the resonance tube to the dowel for the loudest sound.

4. To this length add 4/10 the diameter of the tube to correct for the small amount of air just above the tube that also vibrates.

5. This length represents 1/4 wavelength. Calculate the wavelength of that sound.

6. Using the frequency given on the tuning fork, and the calculated wavelength, calculate the speed of sound in air.

7. Repeat for a second frequency.

Data Table

Calculations

Summing Up

1. The accepted speed of sound is 331m/s at 0º C, and increases 0.6m/s for each Celsius degree above zero. From the room temperature, determine the accepted value for the speed of sound in your classroom.

2. How does your calculation for the speed of sound compare with the accepted? Calculate the percent of error.

3. Write a Disscussion of Results!! (a picture of what is going on would be nice.)