Name_____
Class_____Date_____

The Speed of Sound

Aim

To determine the speed of sound in air using resonance in an air column.

Information

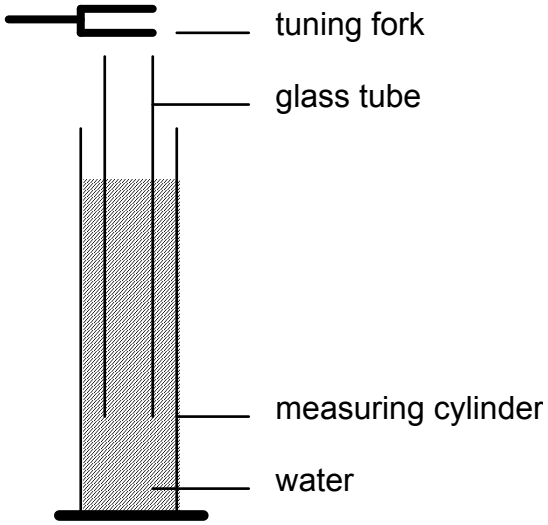
The water acts to close one end of the glass tube. As the glass tube is slowly lifted out of the water, the length of the pipe changes. At some length the air in the tube will resonate to the frequency of the tuning fork held over it. This should be its fundamental frequency. If the tube is lifted further, the next point of resonance will be the 1st overtone. From this can be calculated the wavelength of the note in air, and hence the velocity.
The expected velocity of sound in air may be calculated, given that the speed of sound at 0^oC is 332 ms^{-1} and that it increases by 0.6 ms^{-1} for every Celcius degree above 0^oC.

Equipment

Glass tube (60 cm long, approx. 3cm diameter)
Measuring Cylinder (at least 55cm tall)
512 Hz Tuning Fork
Metre Rule
Thermometer

Method

1. Set up the equipment as shown in figure 1. The glass tube should be as low as possible in the water.



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2. Slowly raise the tube, with the tuning fork sounding. Measure the length of the tube above the water, when you hear the resonance.
3. Continue to raise the tube until you hear a second resonance. Measure the length of the tube above the water.
4. Repeat steps 2 and 3 at least three more times.
5. Calculate the speed of sound, showing your working.

Interpretation

Briefly comment on the errors, and your observed and expected results. No full discussion is necessary.

S. Hersey, adapted from Essential Physics by Christian & Crossley.