Activity 7.3.1

Measuring the Speed of Sound Outside

adapted from: Nelson Physics 11, pg 244

Purpose

To perform an experiment outside to determine the speed of sound in air.

Materials

You will need a loud source of sound (two pieces of wood to be struck together, a tape measure (how long?), a stopwatch, and a thermometer.

Procedure

1. Locate a high wall with a clear space at least 70 m deep in front of it (and to all sides).
2. Measure the temperature of the air in degrees celsius.
3. Clap two boards together and listen for the echo. Repeat until you have determined the approximate time interval between the original sound and the echo.
4. Now clap the boards after the echo so that the time between the previous clap and the echo is the same as the time between the echo and the next clap. In other words, clap the boards so that a regular rhythm is set up: clap ... echo ... clap … echo ... clap.
5. When you have achieved the correct timing, have your partner record, with the stopwatch, the number of seconds required for 20 or more clap intervals. (Remember to start counting with zero!)
6. Determine the average interval between claps. This interval is equal to the time taken for the sound to travel four times the distance between you and the wall.
7. Repeat step 4 and 5 as needed.
8. Measure the distance to the wall in metres and the temperature of the air in degrees celsius.
9. Calculate the speed of sound in air using two different methods.

Analysis

How does your value for the speed of sound in air compare with the value you would expect for air temperature when you collected your data? What was the percentage difference (pg 565) between the two values? Discuss the sources of experimental error.

Notes

★ You must work with a partner/helper - include your helper's names (max group size is 3).
★ Record the time and place of your experiment.
★ A sketch of your surroundings with approximate distances is required. (Google maps!)
★ Outline exactly how you determined the distance from the wall.
★ If you did not use a thermometer at the experiment site, record how the temperature was determined.
★ Hand in one formal report for the group.
Format as discussed in class. See also pg 560 &
http://ntci.on.ca/departments/science/NTCI-LabReport.pdf

Evaluation

☐ Observations (6)
☐ Speed of Sound (3)
☐ Analysis (2)
☐ Conclusion (2)
☐ Lab format (2)

Total Marks (15)