



At the Speed of Sound

Lab #18

Pre-Lab Discussion

We have learned that sound is a mechanical longitudinal wave. This means that sound requires a medium in which to travel.

Research Question

How can we measure the speed of sound?

Hypothesis

We need to make an educated guess about how to measure the speed of sound. Name five ways waves can interact with matter _____

Which two could we measure to find the speed? _____

Theory

What equation will we need to calculate the speed of sound? _____

Materials

- blocks trundle wheel stop watch

Method

1. Go to the soccer field and measure and record the air temperature.
2. Measure and record 50 meters from the building.
3. One partner should face away from the person with the blocks. When they hear the blocks strike, start the stopwatch and stop the time when they hear the echo.
4. Repeat until you have data from five trials.

Data Collection and Processing (for each tuning fork)

1. Record the air temperature _____ °C
2. Record the distance to the building and back _____ m
3. Record the times for five trials on the table below.

Data and Results Table		
Trial	Time (s)	Average Time (s)
1		Average Speed (m/s)
2		
3		
4		
5		

Analysis

1. How consistent were your times? What accounts for differences?

2. Write the equation for calculating the speed of sound. Substitute values for your average time and solve the equation showing all units.

3. Look up the speed of sound at the recorded outdoor temperature. How well does our answer match the accepted value (report the percent difference).

4. How does temperature affect the speed of sound in air?

Conclusions

1. The distance from NYC to Los Angeles, CA is 4350 km. How long would it take to make this flight at Mach 1? (Show all equations, substitutions, units, and cancelations.)

2. If you are upstairs in a room and someone downstairs is speaking, how is it possible for you to hear them speaking?
