

Purpose:

To demonstrate the resonance of sound waves and determine the speed of sound traveling in air of the classroom.

Equipment

Resonance tube (graduated cylinder and tube), water, tuning forks, meter stick, Vernier microphone with laptop or calculator

Person 1 (P1):

Person 2 (P2):

Person 3 (P3):

Person 4 (P4):

Procedure:

- Part 1**
- 1) P1 fills the 1 liter graduated cylinder with 1 liter of water.
 - 2) P2 places the inner tube inside the graduated cylinder.
 - 3) P3 chooses a tuning fork and records the labeled frequency.

Labeled frequency = _____ Hz

- Part 2**
- 4) P4 readies the probe with the microphone. Set the time interval in the laptop or calculator program to 0.0001 seconds with 500 samples.
 - 5) P3 strikes the tuning fork with the rubber mallet and holds it the near the microphone. Immediately capture a graph of 0.5 seconds of vibration from the tuning fork.
 - 6) P4 uses the cursor buttons to find the time (Δx) from one crest to the next, or one trough to the next for three different wavelengths:

Period 1 = _____ s

Period 2 = _____ s Average Period = _____ s

Period 3 = _____ s

- Part 3**
- 7) P1 finds the average period and take its reciprocal to find the actual frequency of the tuning fork. Record this on the other side of the worksheet.
 - 8) P3 strikes the tuning fork with the rubber mallet and holds the tuning fork about 1 cm above the tube so that one tine is above the other.
 - 9) P2 moves the inner tube up and down and P3 keeps the fork above the tube, until you get **resonance**. When this happens, the vibration of the air in the tube will duplicate and amplify the tone of the tuning fork.
 - 10) P1 and P4 help make sure it is making the same tone, pitch or note. When in doubt, try it again.
 - 11) P1 measures the distance from the top of the water to the top of the tube and records it in the table on the other side.
 - 12) Repeat three times.
- Part 4**
- 13) P4 measures the diameter of the tube and records it on the other side
 - 14) P1 uses the temperature probe to find the temperature of the room and records it on the other side.
 - 15) Turn off the calculators and return probes to their boxes.

Calculations

Actual Frequency (calculated from actual period): _____ Hz

% Difference between labeled and actual frequency:
(labeled – actual) / ($\frac{1}{2}$ * (labeled + actual)) = _____ %

Diameter of Tube: _____ meters
multiply by 0.4 to get a correction to your other measurements. This accounts for the small amount of air just above the tube that also vibrates.

Correction to add to measurements: _____ meters

Record Data in the Table below. The wavelength is the measured distance, plus the correction above, times four.

Measured Distance (meters)	Wavelength (meters)	Actual frequency (Hz)	Speed of sound (m/s)

Average Measured Speed of Sound : _____ meters per second

The accepted value for the speed of sound in air is 332m/s at 0°C. The speed of sound in air increases by 0.6m/s for each Celsius degree above zero. Compute the accepted value for the speed of sound at the temperature of the classroom.

Accepted Speed = 332 m/s + (0.6 m/sC) (temp in °C) = _____ m/s

Calculate the percentage error of your average measured value.

% error = (accepted - measured) / accepted = _____ %

Class Findings for Block _____

Resonance and Speed of Sound Lab

[illegible]

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[illegible]