Name: ______________________________________ Date: ___________________

Determination of the Velocity of Sound

Abstract: A vibrating tuning fork held over an open tube will cause the air to vibrate at a natural frequency that matches the frequency of the tuning fork. The vibration is loudest when the air column resonates with the tuning fork. The lowest frequency of natural vibration is one for which the length of the air column is 0.25 the wavelength of the sound wave.

Objective:
Determine the wavelength of the wave for each tuning fork from the effective length of the resonance tube. Compute the speed of sound from the measured wavelengths and known tuning fork frequencies. Compare the computed speed of sound to the accepted value, which includes the effect of temperature.

Procedure:
1. Set the steel cup near the top of the rod. Fill the glass resonance cylinder nearly to the top with water. You can vary the water level by lowering and raising the steel cup.
2. Select a tuning fork and record the frequency imprinted on it.
3. Strike the tuning fork with a rubber stopper or side of a shoe. Do NOT strike it against a hard surface or it will lose its frequency permanently and the surface will chip!
4. Hold the tuning fork close to the top of the glass cylinder. Do NOT touch the glass cylinder with the fork or it will crack! At the same time, quickly drop the steel cup to lower the water level until a resonance point (i.e. loud frequency sound) is heard. Mark the point or place a finger at the approximate point.
5. Repeat striking the tuning fork and move the steel cup slightly up and down to more precisely find the resonance point.
6. Measure the length from the top of the resonance tube to the water level mark and record.
7. Measure the diameter of the resonance tube. Compute the corrected length by adding 0.4 times the diameter to the measured length of the last step. This is done to account for the air that resonates just above the column.
8. The corrected length is ¼ of the wavelength of the sound vibrating in the air column. The wavelength is four times this value.
9. Compute the velocity of sound using the data found.
10. The accepted velocity of sound can be found as follows:
    331 m/s +0.6*temperature above zero
11. Determine percent error.
12. Repeat for each tuning fork.

Data:
Diameter of tube: ____________________________ m

Temperature of room: _________________________ degrees Celsius

Frequency (Hz)	Length of resonance tube (m)	Corrected length (m)	Wavelength (m)	Experimental Velocity (m/s)	Accepted Velocity (m/s)	Percent error (%)

Calculations:
Show how the speed of sound was determined for the classroom.

Show how the corrected length, wavelength, experimental velocity and percent error are calculated for one trial.

Conclusion:
Average all of the percent errors together. Provide some possible reasons for this value. In other words, why is there a difference between accepted and experimental values?