**THE SPEED OF SOUND IN AIR**

**PURPOSE:**

To experimentally determine the speed of sound in air for our classroom.

**PROCEDURE:**

1. Obtain a tuning fork and record its frequency in Hz. Only use one tuning fork at a time.
2. Place a PVC pipe into a tall graduated cylinder.
3. Fill the graduated cylinder with water (don't forget to leave some room for the PVC pipe).
4. Insert the pipe into the graduated cylinder. I recommend performing this experiment on a waterproof surface that is cleared of stuff.
5. Strike a tuning fork on a soft surface. **NEVER STRIKE A TUNING FORK ON A HARD SURFACE THAT COULD DENT THE FORK!!!** You will incur the wrath of the physics teachers.
6. Hold the fork just above the top of the PVC pipe. Move the pipe and the fork up and down until the loudest volume is heard.
7. Measure the length of the column of air from the water level to the top of the pipe. This is the length of the air column.
8. Return the fork to the correct box.
9. Repeat until you have tested five different tuning forks.

**DATA:**

Inside diameter of the PVC pipe (use a ruler, not a meter stick) = _____cm = _____m

| Tuning fork frequency (Hz) | Measured length of air column (cm) | Measured length of air column (m) |
|---|---|---|
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**RESULTS:**

The speed of sound in air at sea level and at 0°C is 330m/s. To determine what the speed of sound should be, use this website: https://www.digitaldutch.com/atmoscalc/

Altitude of Castle View: _____ m above sea level

Room Temperature =_____˚C

Theoretical speed of sound in this room =

Since the column of air that vibrates extends slightly above the top of the tube, we need to calculate the effective length of air that was resonating. To do this you multiply 0.4 times the diameter of the tube, and then add that value to the measured length of the tube. This effective length is exactly ¼ of the wavelength of the sound wave. Determine the wavelength of the sound wave for each trial, and then also calculate the speed of sound for each trial.

| Tuning fork frequency (Hz) | Effective length of column (m) | Wavelength (m) | Speed of sound (m/s) |
|---|---|---|---|
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**Average Speed of Sound** _____

Calculate the percent error between theoretical and average speed of sound. Show all work!

**CONCLUSION:**

What type of relationship did you find between frequency and wavelength during this lab? Does this agree with what should happen? Explain your answers.