

Chapter 8 Worksheet

Answer the following questions on a separate sheet. Make sure to follow all rules for setting up a question, sig figs, and scientific notation when appropriate. Answers follow all questions in *italics*.

1. The engine on a helicopter is making a sound with a frequency of 3025Hz. You see it first flying towards you, and then it goes right over your head and flies away from you. It is moving at a velocity of 140.0 km/h. **Determine** the frequency of the sound you heard as it was coming towards you and then when it was moving away, if the speed of sound is 340.0 m/s. (*3416 Hz & 2715 Hz*)
2. **Determine** the length of a open ended pipe if it plays a note with a frequency of 450Hz at the third harmonic if the speed of sound in the room is 320m/s. (*1.07 m*)
3. **Determine** the wavelength and frequency of the fundamental played on a closed end pipe if it is 87 cm long and the speed of sound is 337 m/s. (*3.5 m & 97 Hz*)
4. A student has decided to conduct an experiment to try to measure the speed of sound in our classroom. First she gets a 30.0 cm long glass tube (closed at one end) and a container of water. She next holds a 2000 Hz *tuning fork* (made of metal and looks like a “U” with a handle on it, it makes a sound at a particular frequency when hit) above the glass tube while slowly filling the tube with water. She listens to see if she can hear a sound resonating in the tube. She finds that there are three times she can hear it. After filling in 8.4 cm of water, 17.1 cm of water, and finally 25.7 cm of water. With this information she was able to calculate the speed of sound for each of the three trials, and then averaged them. **Determine** the velocity she got. (*345 m/s*)

A few hints...

- each time she added water, it made the length of the tube that air could move in *smaller*.
- when the tube was still mostly empty, it must have corresponded to a higher harmonic since there was lots of room for waves to fit in.
- the last measurement she got must have been a very small volume for the wave to fit in... maybe even the fundamental?