

AP Physics 1
Sound Practice Problems

- 1.) An organ pipe open at both ends has a length of 0.80 m. What is the frequency of the second harmonic?
- 2.) What is the length of the shortest closed pipe that will have a fundamental frequency of 60 Hz?
- 3.) A pipe is 2.00 m long.
 - a.) Determine the frequencies of the first three harmonics if the pipe is open at both ends.
 - b.) What are the three lowest frequencies if the pipe is closed at one end and open on the other end?
- 4.) The frequency of the third harmonic of an open pipe is 900 Hz. What is the length of the pipe?
- 5.) The frequency of the fifth harmonic of a closed pipe is 1500 Hz. What is the length of the pipe?
- 6.) The third harmonic of a closed pipe resonator is 600 Hz. What is the length of the pipe?
- 7.) The lowest tone to resonate in an open pipe of length L is 400 Hz. What is the frequency of the lowest tone that will resonate in an open pipe of length $2L$?
- 8.) The lowest tone to resonate in a closed-pipe of length L is 400 Hz. What is the frequency of the lowest tone that will resonate in an open pipe of length L ?
- 9.) The fundamental frequency of an open organ pipe has a frequency of 300 Hz. The third harmonic of a closed pipe has the same frequency. Find the length of the closed pipe.
- 10.) An open organ pipe has a fundamental frequency of 300 Hz. The third harmonic of a closed organ pipe has the same frequency as the second harmonic of the open pipe. Find the length of the closed pipe.
- 11.) The water level in a vertical glass tube 1.0 m long can be adjusted to any position in the tube. A tuning fork vibrating at 680 Hz is held just over the open top end of the tube. At what positions of the water level will there be resonance?
- 12.) A pipe is open at both ends. The frequency of a certain harmonic is 400 Hz, and the frequency of the next higher harmonic is 480 Hz.
 - a.) Find the fundamental frequency.
 - b.) Find the length of the pipe.
- 13.) Three successive resonant frequencies in an organ pipe are 1310, 1834, and 2358 Hz.
 - a.) Is the pipe closed at one end or open at both ends?
 - b.) Find the fundamental frequency and length of the pipe.
- 14.) One way to tell if a mosquito is about to sting is to listen for the Doppler shift as the pest is flying. The buzzing sound of a mosquito's wings is emitted at a frequency of 1050 Hz. If you hear a frequency of 1034 Hz, does this mean that the mosquito is coming in for a landing or that it has just bitten you and is flying away? Explain your answer.
- 15.) A fire engine is moving at 40 m/s and sounding its horn. A car in front of the fire engine is moving away from the fire engine at 30 m/s, and a van in front of the car is stationary. Which observer hears the fire engine's horn at a higher pitch, the driver of the car or the driver of the van? Explain your answer.