Answer on question #64440, Physics / Other

Question   1-An open tube 34 cm long resonates in its second overtone with a tuning fork. The air temperature in the room is 15 degrees. Calculate the wavelength of the sound waves and the frequency of the tuning fork. 2-An open organ pipe has a fundamental frequency of 212 Hz at room temperature 20 degrees. What is the length of the pipe?

Solution   1. The fundamental frequency is connected to length of tube as

$$f_0 = \frac{c}{4L}$$

where c is speed of sound. Here we suppose that tube is one-end-opened. The speed of sound is

$$c = (331.3 + 0.606 \cdot \vartheta)$$

where ϑ is the temperature in degrees Celsius. Hence

$$c = 331.1 + 0.606 \cdot 15 = 340.19 \, m/s$$

Hence, fundamental frequqency is

$$f = \frac{340.19}{0.34 \cdot 4} \approx 250 \, Hz$$

Then, second overtone is

$$250 \cdot 4 = 1000 \, Hz$$

The correspondent wave lenght is

$$\lambda = \frac{c}{\nu} = \frac{340}{1000} = 0.34 \, m$$

2. Again lets first find speed of sound

$$c = 331.1 + 0.606 \cdot 20 = 343.2 \, m/s$$

Then length is

$$L = \frac{c}{4f_0} = \frac{343.2}{4 \cdot 212} \approx 0.40 \, m$$