Physics I

Sound Generation

Standing frequency in a pipe open on both sides: $f = n\frac{v_{sound}}{2L}$, $n = 1,2,3...$

Standing frequency in a pipe open on one side: $f = n\frac{v_{sound}}{4L}$, $n = 1,3,5...$

Problem 1.- Consider the human ear canal as a 2.4 cm pipe open at one end and closed at the other. At what frequencies are the fundamental and the first overtone resonances?

Problem 2.- Consider a chimney to be an open tube (both ends open). If the fundamental frequency heard is 25Hz, how long is the chimney?

Problem 3.- At 20ºC, when the speed of sound is 343 m/s, a pipe open at both ends resonates at a frequency of 440 hertz. At what frequency does the same pipe resonate on a particularly cold day when the speed of sound is 322.8 m/s?

Problem 4.- Two horns produce sounds with wavelength 6.5 m and 7.5 m respectively. What beat frequency is heard when both horns emit sound simultaneously?
Take the speed of sound as 343 m/s