

Work each of the following problems. SHOW ALL WORK.

4. Draw the first four harmonics of standing waves in an open-ended tube.
5. If the length of the tube in question four is 1 m, what are the wavelengths of the first four harmonics?
6. Choose the possible wavelengths of standing waves in an open-ended tube that is 3 m long. State which harmonic corresponds to each possible wavelength.
- a. 1 m _____
- b. 1.5 m _____
- c. 2 m _____
- d. 3 m _____
- e. 5 m _____
- f. 6 m _____

Work each of the following problems. SHOW ALL WORK.

7. Draw the first three harmonics of standing waves in a closed-ended tube ($n = 1, 3, 5$).
8. If the length of the tube in question seven is 2 m, what are the wavelengths of the first three harmonics?
9. Choose the possible wavelengths of standing waves in a closed-ended tube that is 15 m long. State which harmonic corresponds to each possible wavelength.

a. 10 m _____

b. 12 m _____

c. 20 m _____

d. 30 m _____

e. 40 m _____

f. 60 m _____