

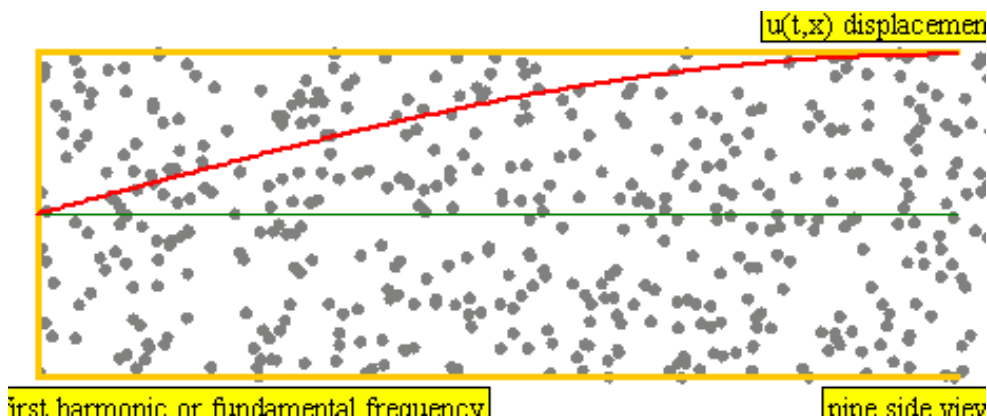
Answer on Question #40593, Physics, Acoustics

Question:

Calculate the fundamental frequencies and the first 3 overtones of a pipe of length 1.7 m and closed at one end.

Answer:

The fundamental frequency is defined as the lowest frequency of a periodic waveform. For a tube of length L with one end closed and the other end open the wavelength of the fundamental harmonic is $4L$.



Therefore,

$$f_0 = \frac{v}{4L} = \frac{340}{4 \cdot 1.7} \frac{1}{s} = 50 \text{ Hz}$$

where v is speed of sound.

For overtones wavelength equals:

$$\lambda_n = \frac{4L}{1 + 2n}$$

where n is number of overtones, therefore:

$$f_n = \frac{v}{4L} (1 + 2n) = f_0 (1 + 2n)$$

$$f_1 = 50(1 + 2) = 150 \text{ Hz}$$

$$f_2 = 50(1 + 4) = 250 \text{ Hz}$$

$$f_3 = 50(1 + 6) = 350 \text{ Hz}$$

