Quiz 1-A Solutions

1. The figure below is a snapshot of a vibrating string, fixed at both ends, taken at maximum displacement.

(a) For each of the following, identify and label the item on the figure:
   - Wavelength
   - Anti-node

(b) Remembering that the fundamental mode of a string is its first harmonic, which harmonic is represented above?

   By counting the number of half-wavelengths that fit along the string, we conclude that this mode is the 10th harmonic.
2. You have a tube of air that vibrates at a fundamental frequency of 220 Hz (corresponding to the note A₃).

(a) How long is the tube if it is open at both ends?

\[ f_1 = \frac{v_s}{2L} \Rightarrow L = \frac{v_s}{2f_1} \]

\[ L = \frac{344 \text{ m/s}}{2(220 \text{ Hz})} \]

\[ L = 0.78 \text{ m} \]

(b) How long is the tube if it is closed at one end?

\[ f_1 = \frac{v_s}{4L} \Rightarrow L = \frac{v_s}{4f_1} \]

\[ L = \frac{344 \text{ m/s}}{4(220 \text{ Hz})} \]

\[ L = 0.39 \text{ m} \]

(c) Are these vibrations transverse or longitudinal?

These vibrations are **longitudinal** sound waves.