Answer on Question #39572, Physics, Other

Question:

A string fixed at both ends is 8.40 m long and has a mass of 0.120 kg.It is subjected to a tension of 96.0 N and set oscillating.(a) What is the speed of the waves on the string? (b)What is the longest possible wavelength for a standing wave? (c) Give the frequency of that wave.

Answer:

a) The speed of the waves on the string is given by:

$$v = \sqrt{\frac{T}{m/L}} = \sqrt{\frac{96}{0.12/8.4}} = 82.0\frac{m}{s}$$

where T is tension, m is mass, L is length.

b) The fundamental vibrational mode of a stretched string is such that the wavelength is twice the length of the string:

$$\lambda = 2L = 2 * 8.4 = 16.8\, m$$

c) From a) and b) frequency equals:

$$f = \frac{v}{\lambda} = 4.88\, Hz$$