Date: 10 Feb. 2002
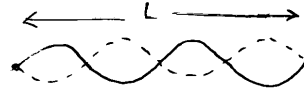
Name: Key Id: Sect:

A string of mass 2.0 g and length 80 cm is fixed at both ends and is under a constant tension. The string oscillates in its forth harmonic with a frequency of 120 Hz. Calculate:

(a) The wavelength

$$2\lambda = L \implies \lambda = \frac{L}{2}$$

$$\lambda = 0.4 \, m$$

(b) The speed of the wave

$$V = \lambda f = (0.4) \times (120) = 48 \, m/s$$

(c) The tension in the string

$$V = \sqrt{\frac{\tau}{\mu}} \implies \tau = V^2 \mu$$

$$= (48)^2 \times \left(\frac{2 \times 10^{-3}}{0.8} \right) = 5.76 \, N$$

(d) The distance between two successive nodes.

$$d = \frac{\lambda}{2} = 0.2 \, m$$

(e) The frequency corresponding to the first harmonic

$$f_1 = \frac{f_4}{4} = \frac{120}{4} = 30 \, Hz$$