

Chapter 16

Problem 112

$$L = 5.00 \text{ m}$$

$$F_T = 90 \text{ N}$$

$$m = 0.15 \text{ kg}$$

Fundamental
frequency

$$n = 1$$

a) what is the velocity of the wave?

$$\mu = \frac{m}{L} = \frac{0.15 \text{ kg}}{5.00 \text{ m}} = 0.030 \text{ kg/m}$$

$$v = \sqrt{\frac{F_T}{\mu}} = \sqrt{\frac{90 \text{ N}}{0.030 \text{ kg/m}}} = \boxed{54.8 \text{ m/s}}$$

b) what is the wavelength?

$$\lambda_n = \frac{2L}{n} \rightarrow \lambda_1 = \frac{2(5.00 \text{ m})}{1}$$

$$\boxed{\lambda_1 = 10.00 \text{ m}}$$

c) what is the period of the wave?

$$\text{from } v = \lambda \cdot f \rightarrow f = \frac{v}{\lambda}$$

$$f = \frac{54.8 \text{ m/s}}{10.0 \text{ m}} = 5.48 \text{ Hz}$$

Time period is then

$$T = \frac{1}{f} = \frac{1}{5.48 \text{ Hz}} = \boxed{0.18 \text{ s}}$$