Answer on Question #43403, Physics, Other

A wave in a spring, stretched to a length of 7.50m, travels at a speed of 3.88m/s. What frequency is required to generate a standing wave pattern with seven antinodes along the length of the spring?

Solution:

The velocity of a wave may be expressed as the product of its wavelength and frequency:
$$v = \lambda f .$$

The velocity of a wave is the speed at which a fixed point on the wave propagates through the medium in which the wave is traveling.

For a given harmonic, the wavelength, λ, may be written: $\lambda = 2L/n$, where L is the length of the spring between the fixed endpoints and n is the number of loops in the spring.

For seven antinodes n = 7.

Thus,

$$f = \frac{v}{\lambda} = \frac{vn}{2L} = \frac{3.88 \cdot 7}{2 \cdot 7.50} = 1.81 \text{ Hz}$$

Answer: $f = 1.81$ Hz.