

A string of length 4.0-m is fixed at both ends. A standing wave with 6 antinodes is formed on the string. What is the frequency of the standing wave, if the wave speed is 30 m / s ?

Given:

Length of the string:

$$L = 4.0 \text{ m}$$

Number of antinodes:

$$n = 6$$

Speed of wave:

$$v = 30 \text{ m / s}$$

Determine: frequency of the standing wave: f

Use formula:

$$f = v / \lambda \text{(1)}$$

“ λ ” is the wavelength of the standing wave.

For a standing wave formed on a string:

$$\lambda = 2L / n \text{(2)}$$

where $n = 1, 2, 3, \dots$

Substituting for L and n in (2):

$$\lambda = (2 \times 4.0) / 6 = 1.33 \text{ m}$$

Substituting for λ and v in (1):

$$f = v / \lambda = 30 / 1.33 = 23 \text{ Hz}$$