PhysicsTutor

Standing Wave

Giordano 12.57

Problem:

- You want to set up a standing wave on a string that has a length of 3.5 m. You find that the lowest frequency that will work is 20 Hz.
- What is the speed of a wave on this string?

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- The wavelength then follows as $\lambda_1=2L$.
- The propagation speed is given as the product of λ_1 with the frequency of the fundamental f_1 which is given.

Equations associated with ideas:

Standing waves on a string : (length L, both ends fixed)

$$\lambda_n = \frac{2L}{n} \qquad f_n = \frac{v_w}{\lambda_n}$$

Lowest f_n : $n = 1$ (longest $\lambda \rightarrow \lambda_1 = 2L$)

Strategy

- A straightforward calculation now.

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- Message: the modes on a vibrating string are quantized ∴ allowed frequencies and wavelengths are discrete.

The Schrödinger wave equation for particles can predict the allowed energy levels in atoms, nuclei, ...