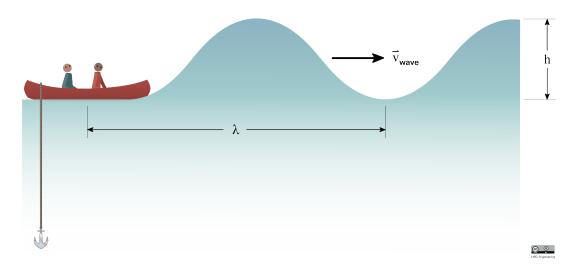
22-R-VIB-TW-45



A small toy boat sits anchored in the water, bobbing up and down with a natural frequency of $\omega_n = 5$ Hz. If the wind picks up, creating waves of wavelength $\lambda = 15$ cm, what speed, v_{wave} , will cause the vertical displacement of the boat to experience resonance?

Solution:

For resonance we require that $\omega_n = \omega_0$

$$\omega_n = \omega_0$$

$$v_w = \lambda f$$

$$2\pi v_w = \lambda \omega_0 = \lambda \omega_n$$

$$v_w = \frac{\lambda \omega_n}{2\pi} = \frac{(0.15)(5)}{2\pi} = 0.119 \text{ [m/s]}$$