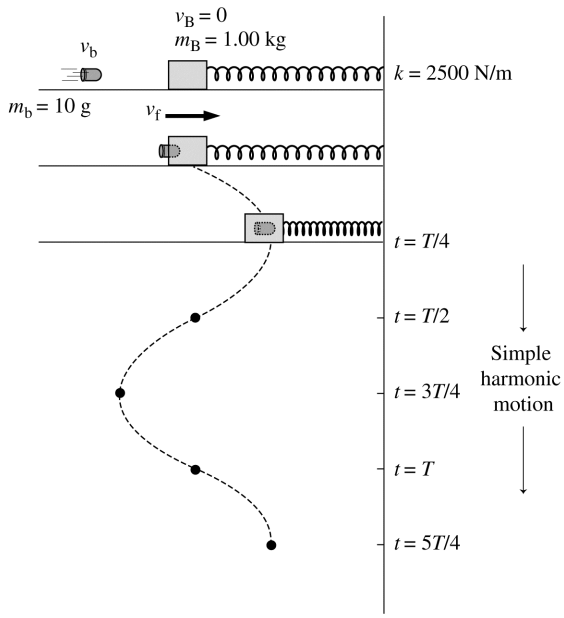
**14.63. Model:** A completely inelastic collision between the bullet and the block resulting in simple harmonic motion.

**Visualize:**




**Solve:** **(a)** The equation for conservation of energy after the collision is

$$\frac{1}{2}kA^2 = \frac{1}{2}(m_b + m_B)v_f^2 \Rightarrow v_f = \sqrt{\frac{k}{m_b + m_B}}A = \sqrt{\frac{2500 \text{ N/m}}{1.010 \text{ kg}}}(0.10 \text{ m}) = 4.975 \text{ m/s}$$

The momentum conservation equation for the perfectly inelastic collision $p_{after} = p_{before}$ is

$$(m_b + m_B)v_f = m_b v_b + m_B v_B$$

$$(1.010 \text{ kg})(4.975 \text{ m/s}) = (0.010 \text{ kg})v_b + (1.00 \text{ kg})(0 \text{ m/s}) \Rightarrow v_b = 502 \text{ m/s}$$

**(b)** No. The oscillation frequency $\sqrt{k/(m_b + m_B)}$ depends on the masses but not on the speeds.