P #18

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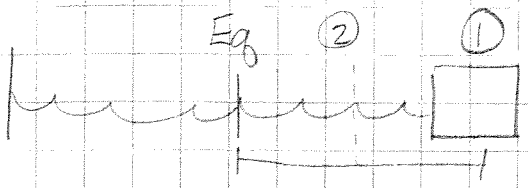

$V_1 = 0$ m/s

$x_1 = .25$ m

$m = 50$ g $= .05$ kg

$k = 10.0$ N/m

x_2 is halfway to equilibriu

$x_2 = \frac{1}{2}(.25\text{m}) = .125$ m

$$PE_1 + KE_1 = PE_2 + KE_2$$

$$\frac{1}{2} \cdot k \cdot x_1^2 + \frac{1}{2} \cdot m \cdot v_1^2 = \frac{1}{2} \cdot k \cdot x_2^2 + \frac{1}{2} \cdot m \cdot v_2^2$$

$$\frac{1}{2} \cdot (10\ \text{N/m})(.25\text{m})^2 + \cancel{\frac{1}{2}(.05\text{kg}) \cdot 0} = \frac{1}{2} \cdot (10\ \text{N/m})(.125\text{m})^2 + \frac{1}{2} \cdot (.05\text{kg}) \cdot v_2^2$$

$$.3125 = .078 + \frac{1}{2}(.05\text{kg}) \cdot v_2^2$$

$$\boxed{v_2 = 3.06\ \text{m/s}}$$