

	Physics 240: UnQuiz06	Name: _____
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A spring has a spring constant of 90 N/m. A mass $m=10$ kg is attached to the spring. Find the period of oscillations.

If the mass is initially pulled to a distance of +0.4 m from the equilibrium position, and released from rest, find the total energy of the system.

Find the maximum velocity of the system.

How fast was the mass moving when $x=+A/2$?

A spring has a spring constant of 90 N/m. A mass $m=10$ kg is attached to the spring. Find the period of oscillations.

$$\omega = \sqrt{\frac{k}{m}} = \sqrt{\frac{90 \text{ N/m}}{10 \text{ kg}}} = \sqrt{9 \text{ rad}^2/\text{s}^2} = 3 \text{ rad/s} : \omega = 2\pi f \Rightarrow f = \frac{\omega}{2\pi} = \frac{3}{2\pi} = 0.48 \text{ Hz} : T = \frac{1}{f} = 2.1 \text{ s}$$

If the mass is initially pulled to a distance of +0.4 m from the equilibrium position, and released from rest, find the total energy of the system.

$$E = \frac{1}{2} k A^2 = \frac{1}{2} \times 90 \text{ N/m} \times (0.4 \text{ m})^2 = 7.2 \text{ J}$$

Find the maximum velocity of the system.

$$E = K + U; \text{ if } U = 0 \Rightarrow E = K_{\text{max}} = \frac{1}{2} m v_{\text{max}}^2 \Rightarrow v_{\text{max}} = \sqrt{2 \frac{E}{m}} = \sqrt{2 \times 7.2 \text{ J} / 10 \text{ kg}} = 1.2 \text{ m/s}$$

Find t

How fast was the mass moving when $x = +A/2$?

$$E = K + U \Rightarrow 7.2 \text{ J} = \frac{1}{2} m v^2 + \frac{1}{2} k (0.2)^2 \Rightarrow 7.2 \text{ J} = 5 v^2 + 1.8 \text{ J} \Rightarrow v = \sqrt{\frac{7.2 - 1.8}{5}} = 1.04 \text{ m/s}$$