

Your Name (Print):
Group Members:

Audrey Main

Date: _____
Group: _____

Oscillations - Problems

1. A 0.700 kg glider is attached to the end of a smooth track by a horizontal spring of spring constant 21.0 N/m. At time $t = 0$, the glider is displaced 15.0 cm from its equilibrium position and released from rest so that it oscillates back and forth on the track.
- What is the glider's position at a time equal to one-eighth of the oscillator's period? $\{0.106 \text{ m}\}$
 - What is the glider's position at a time equal to $(9/8)$ of the oscillator's period?
 - What is the glider's velocity at a time equal to one-eighth of the oscillator's period? $\{-0.581 \text{ m/s}\}$
 - What is the magnitude of the maximum acceleration of the glider? $\{4.50 \text{ m/s}^2\}$
 - What is the glider's acceleration at a time equal to one-eighth of the oscillator's period?
 $\{-3.18 \text{ m/s}^2\}$

$$m = 0.7 \text{ kg} \quad k = 21.0 \text{ N/m} \quad A = 0.15 \text{ m} \quad T = 2\pi\sqrt{\frac{m}{k}} = 1.147147442$$
$$\omega = \frac{2\pi}{T} = 5.477225573$$

$$x\left(\frac{T}{8}\right) = (0.15) \cos\left(5.48 \times \frac{T}{8}\right) = 0.1060660172$$

$$x\left(\frac{9T}{8}\right) = (0.15) \cos\left(5.48 \times \frac{9T}{8}\right) = 0.1060660172$$

$$v\left(\frac{T}{8}\right) = -(5.48)(0.15) \sin\left(5.48 \times \frac{T}{8}\right) = -0.5809475019$$

$$a_{\text{max}} = \omega^2 A = 5.48^2 \times 0.15 = 4.49 \quad a\left(\frac{T}{8}\right) = -\omega^2 A \cos(\omega t) = -(5.48)(0.15) \cos\left(5.48 \times \frac{T}{8}\right)$$
$$= -3.181980515$$

- (a) 0.106 m (b) 0.106 m (c) -0.581 m/s (d) 4.50 m/s² (e) -3.18 m/s²