
PHYS 1110 Worksheet: Spring Motion

1. A weight of mass $m = 0.200$ kg hangs from a spring with spring constant $k = 7.20$ N/m. It is set into oscillation with amplitude $A = 0.150$ m.

A. What is the angular frequency ω of its oscillation?

B. What is the frequency f of its oscillation?

C. What is the period T of its oscillation?

The oscillation behaves like the projection onto an axis of circular motion with radius A and angular frequency ω .

D. What is the tangential speed of this circular motion?

E. What is the centripetal acceleration of this circular motion?

Let us consider the spring again.

F. What is the spring's greatest extension $x_{\max}$ in its oscillation?

G. What is the greatest force exerted on the mass?

H. What is the mass's greatest acceleration?

I. What is the spring's greatest potential energy?

J. What is the mass's greatest kinetic energy?

L. What is the mass's greatest speed?

2. (We answered these questions before.) A 2.00-kg point mass travels in a circular path of radius 3.00 meters at a constant speed of 4.00 meters per second.
- A. What is its angular velocity? $\omega = v/r = 4/3 \text{ rad/s}$
 - B. What is the magnitude of its momentum? $p = mv = 8.00 \text{ kg}\cdot\text{m/s}$
 - C. What is its angular momentum? $L = rmv = 24 \text{ kg}\cdot\text{m}^2/\text{s}$
 - D. What is its kinetic energy? $K = \frac{1}{2} mv^2 = 16 \text{ J}$
3. A 2.00-kg cylinder has a radius of 0.10 m.
- A. What is its moment of inertia for rotation about its principal axis?
 - B. What is its moment of inertia for rotation about a parallel axis 3.00 meters from its center of mass?
 - C. What is its angular momentum when it rotates in this 3.00-m radius circle at a tangential speed of 4.00 meters per second?
 - D. What is its kinetic energy when it rotates in this 3.00-m radius circle at a tangential speed of 4.00 meters per second?