

Name: _____ Block: _____ Date: _____

Pre-AP Textbook Problems Ch. 12

8. Janet wants to find the spring constant of a given spring, so she hangs the spring vertically and attaches a 0.40 kg mass to the spring's other end. If the spring stretches 3.0 cm from its equilibrium position, what is the spring constant?

(See Sample Problem 12A.)

9. In preparing to shoot an arrow, an archer pulls a bow string back 0.40 m by exerting a force that increases uniformly from 0 to 230 N. What is the equivalent spring constant of the bow?

(See Sample Problem 12A.)

19. Find the length of a pendulum that oscillates with a frequency of 0.16 Hz.

(See Sample Problem 12B.)

20. A visitor to a lighthouse wishes to determine the height of the tower. The visitor ties a spool of thread to a small rock to make a simple pendulum, then hangs the pendulum down a spiral staircase in the center of the tower. The period of oscillation is 9.49 s. What is the height of the tower?

(See Sample Problem 12B.)

21. A pendulum that moves through its equilibrium position once every 1.000 s is sometimes called a "seconds pendulum."

a. What is the period of any seconds pendulum?

b. In Cambridge, England, a seconds pendulum is 0.9942 m long. What is the free-fall acceleration in Cambridge?

c. In Tokyo, Japan, a seconds pendulum is 0.9927 m long. What is the free-fall acceleration in Tokyo?

(See Sample Problem 12B.)

22. A spring with a spring constant of 1.8×10^2 N/m is attached to a 1.5 kg mass and then set in motion.
- What is the period of the mass-spring system?
 - What is the frequency of the vibration?
- (See Sample Problem 12C.)
52. What is the free-fall acceleration in a location where the period of a 0.850 m long pendulum is 1.86 s?
53. A mass-spring system oscillates with an amplitude of 3.5 cm. The spring constant is 250 N/m and the mass is 0.50 kg.
- Calculate the mechanical energy of the mass-spring system. Recall the potential energy of a mass-spring system: $PE_{elastic} = \frac{1}{2}kx^2$.
 - Calculate the maximum acceleration of the mass-spring system.
54. A simple 2.00 m long pendulum oscillates in a location where $g = 9.80$ m/s². How many complete oscillations does this pendulum make in 5.00 min?
56. A 0.40 kg mass is attached to a spring with a spring constant of 160 N/m so that the mass is allowed to move on a horizontal frictionless surface. The mass is released from rest when the spring is compressed 0.15 m.
- Find the force on the mass at the instant the spring is released.
 - Find the acceleration of the mass at the instant the spring is released.
 - What are the maximum values of force and acceleration?