

Simple Harmonic Motion - Sample Test

Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

- _____ 1. Which of the following is *not* an example of approximate simple harmonic motion?
a. a ball bouncing on the floor
b. a child swinging on a swing
c. a piano wire that has been struck
d. a car's radio antenna waving back and forth
- _____ 2. Tripling the displacement from equilibrium of an object in simple harmonic motion will change the magnitude of the object's maximum acceleration by what factor?
a. one-third b. 1 c. 3 d. 9
- _____ 3. A mass attached to a spring vibrates back and forth. At the equilibrium position, the
a. acceleration reaches a maximum. c. net force reaches a maximum.
b. velocity reaches a maximum. d. velocity reaches zero.
- _____ 4. A mass attached to a spring vibrates back and forth. At maximum displacement, the spring force and the
a. velocity reach a maximum. c. acceleration reach a maximum.
b. velocity reach zero. d. acceleration reach zero.
- _____ 5. A pendulum swings through a total of 28° . If the displacement is equal on each side of the equilibrium position, what is the amplitude of this vibration? (Disregard frictional forces acting on the pendulum.)
a. 28° b. 14° c. 56° d. 7.0°
- _____ 6. For a system in simple harmonic motion, which of the following is the number of cycles or vibrations per unit of time?
a. amplitude b. period c. frequency d. revolution
- _____ 7. How are frequency and period related in simple harmonic motion?
a. They are directly related.
b. They are inversely related.
c. Their sum is constant.
d. Both measure the number of cycles per unit of time.
- _____ 8. By what factor should the length of a simple pendulum be changed in order to triple the period of vibration?
a. 3 b. 6 c. 9 d. 27
- _____ 9. Which of the following features of a given pendulum changes when the pendulum is moved from Earth's surface to the moon?
a. the mass c. the equilibrium position
b. the length d. the restoring force

Short Answer

10. The velocity of the bob on a swinging pendulum reaches a maximum when the bob is in the _____ position.
11. In an oscillating mass-spring system, the restoring force is a result of the force exerted by the spring. What causes the restoring force in a swinging pendulum?
12. If a spring is stretched from a displacement of 10 cm to a displacement of 30 cm, the force exerted by the spring increases by a factor of _____.
13. Suppose that a pendulum has a period of 4.0 s at Earth's surface. If the pendulum is taken to the moon, where the acceleration due to gravity is much less than on Earth, will the pendulum's period increase, decrease, or stay the same? Explain your answer.

Problem

14. A 0.20 kg mass suspended from a spring moves with simple harmonic motion. At the instant the mass is displaced from equilibrium by -0.050 m, what is its acceleration? (The spring constant is 10.0 N/m.)
15. An amusement park ride has a frequency of 0.05 Hz. What is the ride's period?
16. What is the period of a 4.12 m long pendulum with a bob of mass 75.0 kg?
17. On the planet Xenos, an astronaut observes that a 1.00 m long pendulum has a period of 1.50 s. What is the free-fall acceleration on Xenos?
18. A student wishes to construct a mass-spring system that will oscillate with the same frequency as a swinging pendulum with a period of 3.45 s. The student has a spring with a spring constant of 72.0 N/m. What mass should the student use to construct the mass-spring system?