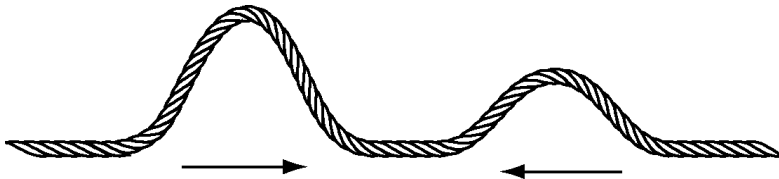


Cp physics Test Ch 12 Waves

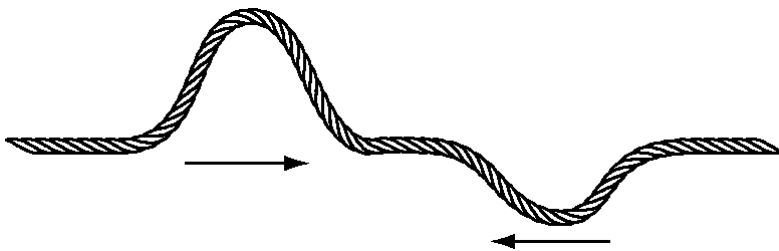
Multiple Choice

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

- _____ 1. 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.
- _____ 2. A simple pendulum swings in simple harmonic motion. At maximum displacement,
 a. the acceleration reaches a maximum. c. the acceleration reaches zero.
 b. the velocity reaches a maximum. d. the restoring force reaches zero.
- _____ 3. If a pendulum is adjusted so that its frequency changes from 10 Hz to 20 Hz, its period will change from n seconds to
 a. $n/4$ seconds. c. $2n$ seconds.
 b. $n/2$ seconds. d. $4n$ seconds.
- _____ 4. Two mechanical waves that have positive displacements from the equilibrium position meet and coincide. What kind of interference occurs?
 a. constructive c. complete destructive
 b. destructive d. none

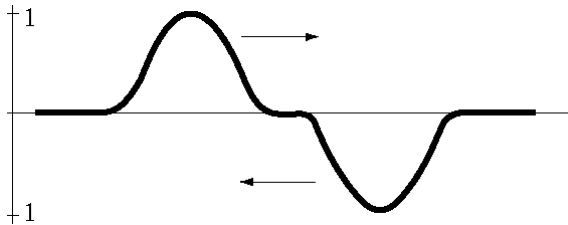


- _____ 5. Which of the following types of interference will occur when the pulses in the figure above meet?
 a. no interference c. destructive interference
 b. constructive interference d. total interference



- _____ 6. Which of the following types of interference will occur when the pulses in the figure above meet?
 a. no interference c. destructive interference
 b. constructive interference d. total interference
- _____ 7. Waves arriving at a free boundary are
 a. neither reflected nor inverted. c. reflected and inverted.
 b. reflected but not inverted. d. inverted but not reflected.

- _____ 8. For a mass hanging from a spring, the maximum displacement the spring is stretched or compressed from its equilibrium position is the system's
- amplitude.
 - period.
 - frequency.
 - acceleration.
- _____ 9. 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.)
- 28°
 - 14°
 - 56°
 - 7.0°
- _____ 10. Which of the following features of a given pendulum changes when the pendulum is moved from Earth's surface to the moon?
- the mass
 - the length
 - the equilibrium position
 - the restoring force
- _____ 11. Which of the following is a single nonperiodic disturbance?
- pulse wave
 - periodic wave
 - sine wave
 - transverse wave
- _____ 12. One end of a taut rope is fixed to a post. What type of wave is produced if the free end is quickly raised and lowered one time?
- pulse wave
 - periodic wave
 - sine wave
 - longitudinal wave



- _____ 13. Which of the following types of interference will occur when the pulses in the figure above meet?
- no interference
 - complete constructive interference
 - partial interference
 - complete destructive interference
- _____ 14. Consider two identical wave pulses on a rope having a fixed end. Suppose the first pulse reaches the end of the rope, is reflected back, and then meets the second pulse. When the two pulses overlap exactly, what will be the amplitude of the resultant pulse?
- zero
 - same as the original pulses
 - double the amplitude of the original pulses
 - half the amplitude of the original pulses
- _____ 15. A student sends a pulse traveling on a taut rope with one end attached to a post. What will the student observe?
- The pulse will not be reflected if the rope is free to slide up and down on the post.
 - The pulse will be reflected and inverted if the rope is free to slide up and down on the post.
 - The pulse will be reflected and inverted if the rope is fixed to the post.
 - The pulse will not be inverted if the rope is fixed to the post.

Cp physics Test Ch 12 Waves Answer Section

MULTIPLE CHOICE

1. C
2. A
3. B
4. A
5. B
6. C
7. B
8. A
9. B
10. D
11. A
12. A
13. D
14. A
15. C
16. B
17. D
18. D

PROBLEM

19. 200 N/m

Given

$$x = -0.1 \text{ m}$$

$$F_{\text{elastic}} = 20 \text{ N}$$

Solution

$$F_{\text{elastic}} = -kx$$

$$k = -\frac{F_{\text{elastic}}}{x} = -\frac{20 \text{ N}}{-0.1 \text{ m}}$$

$$k = 200 \text{ N/m}$$

20. 4.0 Hz

Given $x = 8.0 \text{ cm}$ (This value is not relevant to the problem.) $m = 0.20 \text{ kg}$ $k = 130 \text{ N/m}$ *Solution*

$$T = 2\pi\sqrt{\frac{m}{k}} \text{ and } f = \frac{1}{T}, \text{ so}$$

$$f = \frac{1}{2\pi\sqrt{\frac{m}{k}}} = \frac{1}{2\pi} \sqrt{\frac{k}{m}} = \frac{1}{2\pi} \sqrt{\frac{130 \text{ N/m}}{0.20 \text{ kg}}} = 4.1 \text{ Hz}$$

21. 500 N/M

Given $F_{\text{elastic}} = 50 \text{ N}$ $x = -0.10 \text{ m}$ *Solution*

$$F_{\text{elastic}} = -kx$$

$$k = \frac{-F_{\text{elastic}}}{x} = \frac{-50 \text{ N}}{-0.10 \text{ m}}$$

 $k = 500 \text{ N/m}$

22. 0.4

Given

$$a_g = \frac{1}{6}g$$

Solution

$$T = 2\pi\sqrt{\frac{L}{a_g}}$$

Because L and 2π remain constant when the pendulum is

moved to the moon, $T_{moon} \propto \sqrt{\frac{1}{a_g}}$, where a_g is the gravitational

acceleration of the moon.

$$\frac{T_{moon}}{T_{earth}} = \frac{\sqrt{\frac{1}{a_g}}}{\sqrt{\frac{1}{g}}} = \sqrt{\frac{g}{a_g}}$$

$$f = \frac{1}{T}, \text{ so } \frac{f_{moon}}{f_{earth}} = \sqrt{\frac{a_g}{g}} = \sqrt{\frac{1}{6}} = 0.4$$

23. 17.6 m/s^2 *Given*

$$L = 1.00 \text{ m}$$

$$T = 1.50 \text{ s}$$

Solution

$$T = 2\pi\sqrt{\frac{L}{a_g}}, \text{ so } T^2 = 4\pi^2\left(\frac{L}{a_g}\right)$$

$$a_g = \frac{4\pi^2 L}{T^2} = 4\pi^2\left(\frac{1.00 \text{ m}}{(1.50 \text{ s})^2}\right) = 17.6 \text{ m/s}^2$$

24. 21.7 kg

Given

$$T_{\text{pendulum}} = 3.45 \text{ s}$$

$$k = 72.0 \text{ N/m}$$

Solution

If both systems have the same frequency, they will also have the same period.

Therefore, the given period may be substituted into the equation for a mass-spring system.

$$T = 2\pi\sqrt{\frac{m}{k}}$$

$$T^2 = 4\pi^2\left(\frac{m}{k}\right)$$

$$m = \frac{T^2 k}{4\pi^2} = \frac{(3.45 \text{ s})^2 (72.0 \text{ N/m})}{4\pi^2} = 21.7 \text{ kg}$$

25. 40 Hz

Given

$$v = 20 \text{ m/s}$$

$$\lambda = 0.50 \text{ m}$$

Solution

$$v = f\lambda$$

$$f = \frac{v}{\lambda} = \frac{20 \text{ m/s}}{0.50 \text{ m}} = 40 \text{ Hz}$$