# Name: Date: Period:

**Honors Physics Vibrations & Waves Review WS 1**

Use your notes to answer the questions below.

*Review the Concepts: Attributes of Waves*

1. Define the period of a wave. What are the units of the period?

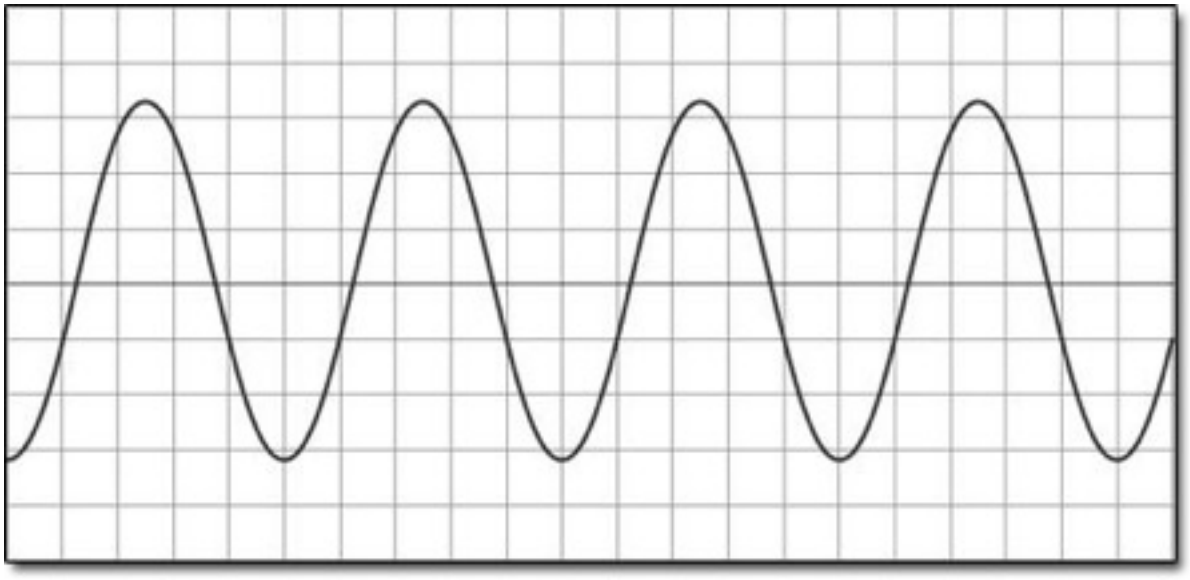
2. Define the wavelength of a wave. What are the units of the wavelength?

3. Define the frequency of a wave. What are the units of frequency?

4. Waves carry energy from one place to another without transferring _____.

5. What's the difference between transverse and longitudinal waves? Give an example of each.

6. The diagram below represents a standing wave. Label the label the following wave characteristics: *amplitude, crest, trough, and wavelength. Draw x's at the nodes and dots at the antinodes.*



7. What does it mean for waves to be in phase vs out of phase?

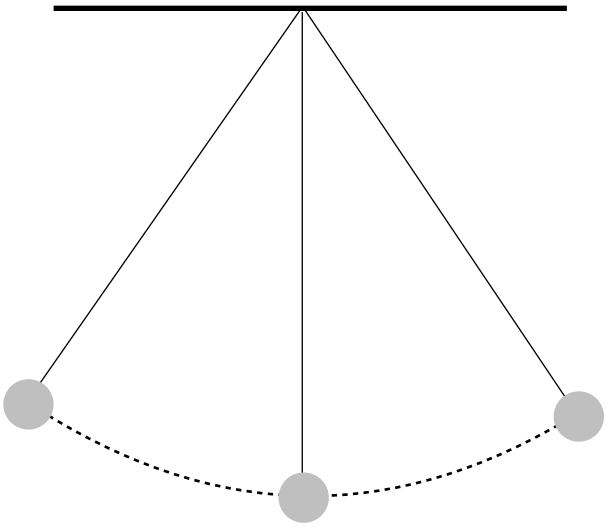
8. What is interference? What is the difference between constructive and destructive interference?

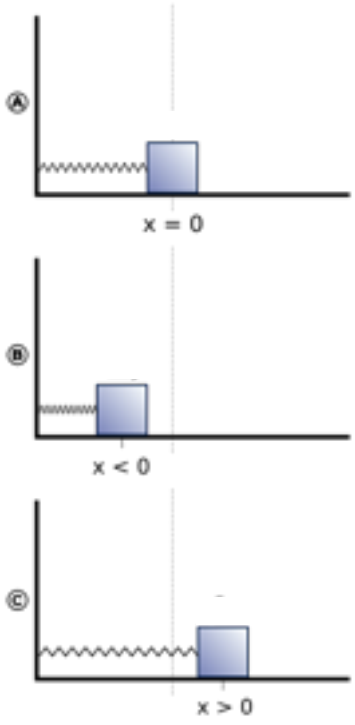
9. What is a standing wave?

*Review the Concepts: Simple Harmonic Motion*

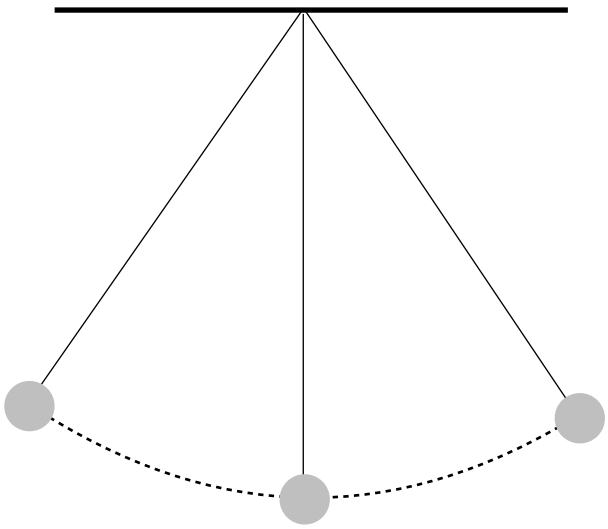
10. Simple harmonic motion is _____ motion under a _____ force _____ to the amount of displacement from equilibrium.

11. In the diagrams below, label the following: $v_{max}$, $v = 0$, $a_{max}$, $a = 0$, $KE_{max}$, $KE = 0$, $PE_{max}$, $PE = 0$

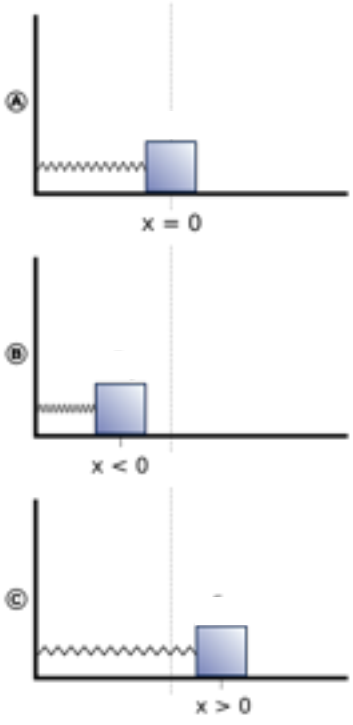




12. What is the restoring force on a simple pendulum? Draw arrows for the forces on the pendulum bob in the three positions below. Ignore air resistance and friction.



13. What is the restoring force on a mass-spring system? Draw arrows for the forces on the mass below. Ignore air resistance and friction.




14. What is the spring constant, $k$, a measure of?

*Review the Math*

Position of an oscillator: $x = A\cos(\omega t)$ [for $x = A$ when $t = 0$]

Velocity of an oscillator: $v = -\omega A\sin(\omega t) = \sqrt{\frac{k}{m}(A^2 - x^2)}$

Acceleration of an oscillator: $a = -\omega^2 A\cos(\omega t)$

Period of a *simple pendulum*: $T = 2\pi\sqrt{\frac{L}{g}}$

Period of a *mass-spring system*: $T = 2\pi\sqrt{\frac{m}{k}}$

Frequency: $f = 1/T$

Angular frequency: $\omega = 2\pi f$

Spring force: $F_s = -kx$

Elastic potential energy: $PE = \frac{1}{2}kx^2$

Velocity of a wave: $v = \lambda/T = \lambda f$

1. A radio station broadcasts at a frequency of 660 kHz. Knowing that radio waves have a speed of $3.0\times10^8$ m/s, calculate the wavelength of these waves. *Ans. 455 m*

2. The 3.0 kg mass of a mass-spring system is displaced 10.0 cm from its equilibrium position and released. A frequency of 4.0 Hz is observed.
   a. What is the spring constant of the spring in the spring-mass system? *Ans. 1900 N/m*

   b. Write an expression that yields the mass's position as a function of time.

   c. What is the position of the mass at time t = 0.75 s? *Ans. 10 cm*

   d. What is the velocity of the mass at $x = 5.0$ cm? *Ans. -2.2 m/s*