## Gen 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 $\qquad$ .
5. What's the difference between transverse and longitudinal waves? Give an example of each.
6. The diagram below depicts a standing wave. 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 $\qquad$ motion under a $\qquad$ force
$\qquad$ to the amount of displacement from equilibrium.
11. In the diagrams below, label the following: $v_{\max }, v=0, a_{\max }, a=0, K E_{\max }, K E=0, P E_{\max }, P E=0$



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: $\quad x=\operatorname{Acos}(\omega \mathrm{t}) \quad$ Period of a mass-spring system: $T=2 \pi \sqrt{\frac{m}{k}}$
$[$ for $x=\mathrm{A}$ when $\mathrm{t}=0]$
Velocity of an oscillator: $\quad v=-\omega \mathrm{A} \sin (\omega \mathrm{t})$
Acceleration of an oscillator: $\quad \mathrm{a}=-\omega^{2} \mathrm{~A} \cos (\omega \mathrm{t})$
Period of a simple pendulum: $\quad T=2 \pi \sqrt{\frac{L}{g}}$

| Frequency: | $f=1 / \mathrm{T}$ |
| :--- | :--- |
| Angular frequency: | $\omega=2 \pi f$ |
| Spring force: | $\mathrm{F}_{\mathrm{s}}=-\mathrm{k} x$ |
| Elastic potential energy: | $\mathrm{PE}=1 / 2 \mathrm{k} x^{2}$ |
| Velocity of a wave: | $v=\lambda / \mathrm{T}=\lambda f$ |

1. Waves in a lake are 5.00 m in length and pass as anchored boat 1.25 s apart. What is the speed of the waves? Ans. $4.0 \mathrm{~m} / \mathrm{s}$
2. A radio station broadcasts at a frequency of 660 kHz . Knowing that radio waves have a speed of $3.0 \times 10^{8} \mathrm{~m} / \mathrm{s}$, calculate the wavelength of these waves. Ans. 455 m
3. A simple pendulum consists of a 510 g mass on a 75 cm , massless string. If it is pulled 35 cm out from equilibrium, what will be the period of the oscillations? The frequency? Ans. $1.7 \mathrm{~s} ; 0.58 \mathrm{~Hz}$
