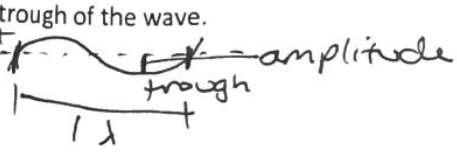
Physics – Waves and Wavelike Motion Question Set 1

Key

All answers must be on a separate sheet for credit.

1. Define a wave.
   A wiggle in time. - traveling disturbance that carries energy.
2. What is meant by periodic motion?
   motion repeated in equal intervals - over same path
3. What is a wave medium?
   the material through which the wave is traveling (ex: air, water)
4. What do waves transport?
   energy
5. What is a mechanical wave and give three examples of a mechanical wave?
   waves that require a medium to travel – sound, water
6. What is the difference between a transverse and compressional wave?
   transverse travels perpendicular to motion, compressional travels
7. Draw a transverse wave and show the wavelength, amplitude, crest and trough of the wave.



8. What is the period of a wave and what is the fundamental SI unit?
   seconds/cycle unit: seconds.
9. What is the frequency of a wave and what is the fundamental SI unit?
   cycles/second unit: Hertz (Hz)
10. What is the mathematical relationship between a wave period and a wave frequency?
    They are inverse of each other. $T=\frac{1}{f}$ $f=\frac{1}{T}$
11. An observer on a beach notices that a wave reaches the beach every seven seconds. What is the period and frequency of the observed ocean waves?
    $T=\frac{\text{seconds}}{\text{cycle}}\ \frac{7s}{1\text{ cycle}}=7s$ $f=\frac{1}{T}\ \frac{1}{7}\ f=.14\text{ Hz}$
12. Two physics students hold opposite ends of a rope. One student "flips" the rope and a wave is created that has a frequency of .5 Hz. What is the period of the wave?
    $T=\frac{1}{f}\ T=\frac{1}{.5}$ $T=2s$
13. A slinky has transverse waves that have a period of .75 s. What is the frequency of the waves on the slinky?
    $f=\frac{1}{T}\ f=\frac{1}{.75}\ f=1.33\text{ Hz}$
14. What does the amplitude of a wave measure?
    The height of wave from resting position.
15. What is the wave speed equation?
    $V=f\lambda$
16. A wave with a wavelength of 1.2 m has a frequency of 3.0 Hz. What is the speed of the wave?
    $V=f\lambda\ (3.0\text{Hz})(1.2\text{m})=3.6\text{ m/s}$
17. A stone is thrown in a pool of water and the waves move though the water at .50 m/s. If the wavelengths of the waves are 10 cm, what is the frequency of the waves?
    $=.1\text{m}$
    $V=f\lambda$
    $\frac{.5\text{ m/s}}{1}=\frac{f(.1\text{m})}{.1}$ $f=5\text{Hz}$
18. A vibrating string has a frequency of 25 Hz. The speed of the waves on the string is 25 m/s. What is the wavelength of the waves on the string?
    $V=f\lambda$
    $25\text{ m/s}=25\text{Hz}\,\lambda$ $\lambda=\frac{25}{25}=1\text{m}$
19. How long would it take a wave with a wavelength of 1.0 m and a frequency of 4.0 Hz to travel 50 m?
    $V=f\lambda$ $V=\frac{d}{t}$
    $4\text{Hz}(1\text{m})$
    $V=4\text{m/s}$
    $4=\frac{50}{t}$
    $t=12.5s$
20. What is the period of a wave that is moving at 8.0 m/s and has a wavelength of 2.0 cm?
    .02m
    $T=\frac{1}{f}$ ← $V=f\lambda$
    $8=\ (.02\text{m})$
    $T=\frac{1}{400}$ $f=\frac{8}{.02}$ $f=400\text{ Hz}$
    $T=0.0025s$