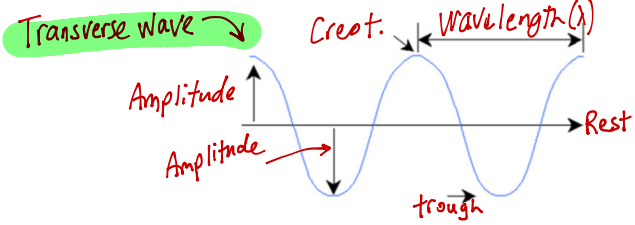
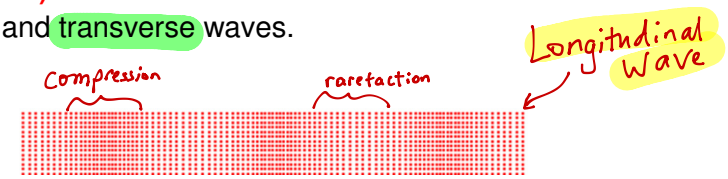
Test Review: Ch. 25 Waves Sudbury - Key

Formulas provided: $v = f \bullet \lambda$ $T = \frac{1}{f}$ $f = \frac{1}{f}$

To fully prepare for the tests make sure you have: 1) Watched the "flip" lecture videos over waves, 2) Reviewed the vocabulary flashcards on your iPad app, 3) Reviewed the daily assignments we completed (Waves guided reading, Wave velocity calculations) 4) Review that labs we completed for understanding of the concepts and relationships (Waves on a pendulum, drawing waves, slinky lab). 5) Complete this test review—Don't just look up answers but be able to explain the answers to these questions.

1. Define period and frequency and describe how they are related. **Period (T) is the time it takes for one complete eave cycle and frequency (*f*) is the number of wave cycles that pass in a second.**
2. Describe the wavelike motion of a pendulum including how the motion of the pendulum demonstrates the frequency (*f*), period (T) and wavelength (λ) of oscillatory motion. **The length of the string of the pendulum represents that wavelength (λ), the period (T) is the time it takes for one complete swing "out-and-back" and the frequency is how many complete swings the pendulum makes in 1 second. (The frequency can be a decimal.)**
3. Identify longitudinal (AKA compressional) and transverse waves.





4. Draw and label the parts of a wave. (Both longitudinal and transverse).

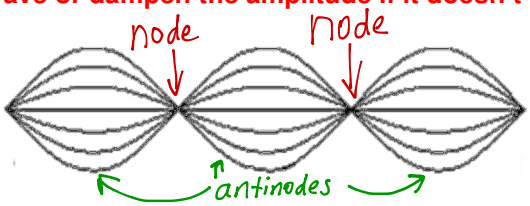
See above

5. Be able to define wavelength, amplitude, crest, trough, rest, compression & rarefaction. **Wavelength (λ) is the length of one complete cycle of a wave, amplitude is the distance from the rest position to the crest or trough, crest is the peaks of a transverse wave (maximum amplitude) and a tough is the minimum point of a transverse wave (minimum amplitude). The rest position is the average position between the crest and trough. A compression is the portion of a longitudinal wave where the particles are densely packed (similar to a crest on a transverse wave) and a rarefaction is where the particles in a longitudinal wave are spread out (equilivant to a trough on a transverse wave.)**
6. What is the source of all waves? **Vibrations or a disturbance of some kind**. What happens to the frequency of a wave then this is doubled? **When the vibration source or disturbance that causes the wave speeds up or is doubled, the frequency of the wave is doubled. If they vibration source or disturbance slows down, the frequency decreases. Remember that the frequency (*f*) is inverse to the period (T) and if the frequency is larger (quicker) the period (T) gets shorter and if the frequency slows down (gets lower) the Period (T) gets longer or has a larger value.**
7. What is the unit for frequency? **Hertz (Hz)**
8. Compare and contrast mechanical and electromagnetic waves. **Mechanical waves require a medium to travel through and electromagnetic waves do not require a medium to travel through. Many electromagnetic waves can travel through a medium, but it is not necessary for them to have a medium to travel in through. For example, sound waves (longitudinal waves) must have a medium. Sound waves can travel through solids, liquids, or gases, but they must have a medium to carry the vibration or disturbance.**
9. What is a transverse waves and list some examples? **A transverse wave is the type of wave that has crests and troughs. All electromagnetic waves are transverse waves (Gamma rays, Radio waves, Microwaves, UV light, Infrared Light, Visible light, X-rays).**
10. A longitudinal wave is also known as a **compression** wave.
11. Sound is what type of wave? **Longitudinal AKA compression wave.**
12. When does interference occur? **Interference occurs when two waves pass each other. If they are in-phase a crest combines with another crest to result in a crest with higher amplitude. If they are out of**

phase, the crest and trough will overlap to cancel out the wave or dampen the amplitude if it doesn't cancel completely.

13. What part of a standing wave does NOT move? **Nodes**

14. Label the nodes and antinodes in a standing wave.



15. What are some ways to create a standing wave? **Standing waves are created when a wave bounces off or reflects off of a boundary and is in-phase with the next incoming (or incident) wave.**
16. What feature of a wave relates to the amount of energy it carries? **The amplitude of a wave represents the energy that it carries.**
17. What happens to the amplitude over time as a wave travels through a medium? **Over time, the amplitude of a wave decreases as it transfers tiny amounts of it energy to the surrounding medium usually as heat.**
18. What happens to the period of a wave if you double the frequency (remember they are inverses!)? **If you double the frequency, the period will be cut in half. If the f= 2 Hz, then the T = 0.5 sec. If you double the f to be f = 4 Hz, then the T = 0.25 seconds.**
19. What does the amplitude represent? **The amplitude represents the energy that the wave carries.**
20. What does the wavelength represent? **The wavelength (λ) represents the length of one complete cycle of a wave.**
21. Two waves are constructively (they are in sync-in phase) interfering…what should you do with the amplitudes? **The resultant amplitude of the constructively interfered wave will be equal to the sum of the amplitude of both individual crests.**

Problems

a. The period of a wave is 20 seconds, what is its frequency?

$F = \frac{1}{T} = \frac{1}{20\ sec} = 0.05\ Hz$

b. A wave has a frequency of 0.10 Hz, what is the period?

$T = \frac{1}{f} = \frac{1}{0.10\ Hz} = 10\ sec$

c. What is the velocity of a wave that moves up and down 4 complete cycles in one second and has a wavelength of 6.0 m?

4 cycles/sec = 4 Hz

$V = f \cdot \lambda = 4\ Hz \cdot 6m = 24\ m/s$

d. A wave has a frequency of 3.0 Hz, and travels a distance of 5.0 m in one second – what is its velocity? (Tricky-think through this one!)

if it travels 5 meters in 1 sec, the velocity is $5\ m/s$

e. All electromagnetic waves move at a speed of 3.0 X 10^8 m/s, if the frequency a radio receives is 50 megahertz, what is the wavelength in m?....(hint a megahertz = 1x10^6 Hz).

$V = f \cdot \lambda \ \therefore\ \lambda = \frac{V}{f} = \frac{3.0 \times 10^8\ m/s}{50 \times 10^6\ Hz} = 6m$

f. A captain notices wave crests passing the anchor line on his boat every 4 seconds and estimates the distance between crests at 12m. What is the speed of the water waves?

1 wave every 4 sec is T = 4 sec if T = 4 sec

$f = \frac{1}{T} = \frac{1}{4} = 0.25\ Hz$

$V = f \cdot \lambda = 0.25\ Hz \cdot 12m = 3\ m/s$

3 m/s	24m/s	0.05 Hz	6m	5m/s	10 sec
F	C	A	E	D	B