Waves

- A traveling _____
- Carries _____ from place to place

When a boat makes a wave,

- the water itself does not get up and move
- the water _____ a little, then moves _____
- energy is _____ in the wave and is what you _____

Transverse

- _____ and _____ disturbance
- Wave travels _____ or _____
- Disturbance is _____ to direction of travel
- Examples:
  - _____ waves, _____ waves, _____waves, _____ instruments

Longitudinal Waves

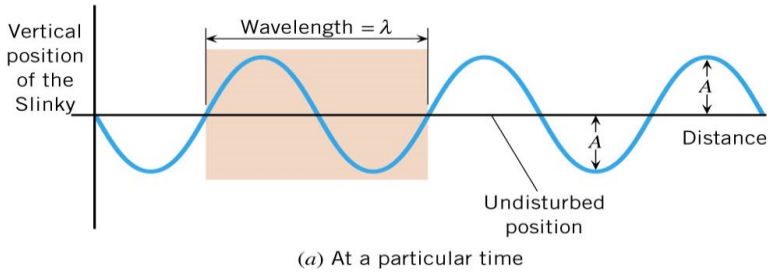
- Disturbance is _____ and _____
- Direction of travel is _____ or _____
- Disturbance and direction of travel are _____
- Series of _____ and _____ regions
- Example:
  - _____

Other

- Water waves are a _____
- Water at the surface of a water wave travels in small _____

Parts of a Wave at a Particular Time

- Periodic → pattern is regularly _____
- Cycle → one unit of _____
- Wavelength (λ) → _____ of one cycle
- Amplitude (A) → _____ from equilibrium to crest



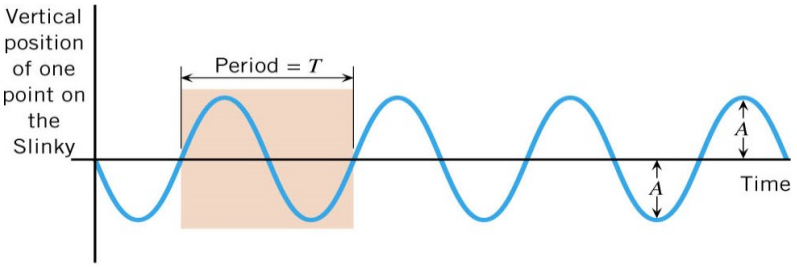
(a) At a particular time

Parts of a Wave at a Particular Location

- Period (T) → time it takes for one _____
- Unit: s
- Frequency (f) → number of _____ per _____
- Unit: 1/s = 1 hertz (Hz)

$$f = \frac{1}{T}$$

$$v = \frac{\lambda}{T} = f \cdot \lambda$$



(b) At a particular location

WAUS operates at a frequency of 90.7 MHz. These waves travel at 2.99×10^8 m/s. What is the wavelength and period of these radio waves?

Physics 10-01 Waves ***Name:*** _____

You are sitting on the beach and notice that a seagull floating on the water moves up and down 15 times in 1 minute. What is the frequency of the water waves?

Practice Work

1. "Domino Toppling" is one entry in the *Guinness Book of World Records*. The event consists of lining up an incredible number of dominoes and then letting them topple, one after another. Is the disturbance that propagates along the line of dominoes transverse, longitudinal, or partly both? Explain.
2. Suppose that a longitudinal wave moves along a Slinky at a speed of 5 m/s. Does one coil of the Slinky move through a distance of 5 m in one second? Justify your answer.
3. Give one example of a transverse wave and another of a longitudinal wave, being careful to note the relative directions of the disturbance and wave propagation in each.
4. What is the difference between propagation speed and the frequency of a wave? Does one or both affect wavelength? If so, how?
5. What is the period of 60.0 Hz electrical power? (OpenStax 16.7) **16.7 ms**
6. If your heart rate is 150 beats per minute during strenuous exercise, what is the time per beat in units of seconds? (OpenStax 16.8) **0.400 s/beat**
7. Find the frequency of a tuning fork that takes 2.50×10^{-3} s to complete one oscillation. (OpenStax 16.9) **400 Hz**
8. A stroboscope is set to flash every 8.00×10^{-5} s. What is the frequency of the flashes? (OpenStax 16.10) **12500 Hz**
9. Storms in the South Pacific can create waves that travel all the way to the California coast, which are 12,000 km away. How long does it take them if they travel at 15.0 m/s? (OpenStax 16.47) **9.26 d**
10. Waves on a swimming pool propagate at 0.750 m/s. You splash the water at one end of the pool and observe the wave go to the opposite end, reflect, and return in 30.0 s. How far away is the other end of the pool? (OpenStax 16.48) **11.3 m**
11. Wind gusts create ripples on the ocean that have a wavelength of 5.00 cm and propagate at 2.00 m/s. What is their frequency? (OpenStax 16.49) **40.0 Hz**
12. How many times a minute does a boat bob up and down on ocean waves that have a wavelength of 40.0 m and a propagation speed of 5.00 m/s? (OpenStax 16.50) **7.50 times**
13. What is the wavelength of an earthquake that shakes you with a frequency of 10.0 Hz and gets to another city 84.0 km away in 12.0 s? (OpenStax 16.53) **700 m**
14. Radio waves transmitted through space at 3.00×10^{8} m/s by the Voyager spacecraft have a wavelength of 0.120 m. What is their frequency? (OpenStax 16.54) $\mathbf{2.50 \times 10^{9}}$ **Hz**
15. A person lying on an air mattress in the ocean rises and falls through one complete cycle every five seconds. The crests of the wave causing the motion are 20.0 m apart. Determine (a) the frequency and (b) the speed of the wave. (Cutnell 16.6) **0.200 Hz, 4.00 m/s**