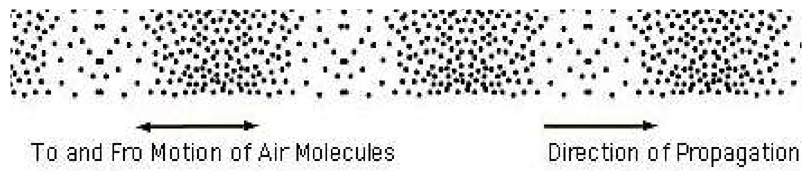
Wave [illegible] Guide DAL 03/26/14 Name____________________________ Period______

1. Waves are disturbances which move through space, carrying ____________ from one place to another.

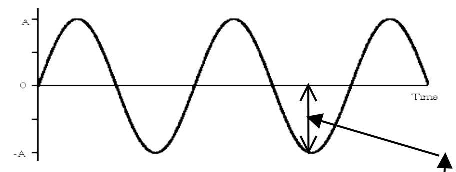
2. Most waves must travel in a physical substance, known as a ________________, but light waves can travel through empty space, also called a __________________.

3. The two major types of waves are _____________________, and ________________________, also known as compressional.



4. In a __________________ wave, such as a sound wave, particles move back and forth along the direction the wave moves. In longitudinal waves, where the particles are squeezed together are ___________________, and where the particles are spread apart are _______________________. The wavelength is the distance between adjacent compressions, or between adjacent rarefactions.
   On the diagram above, label every compression with a C, and every rarefaction with an R.

5. In a ___________________________ wave, such as the wave drawn below, the particles move at right angles to the direction the wave moves. Here, if the wave is moving to the right, the particles in the medium will move __________ and ___________. The highest points are called ______________ and the lowest points are called ________________.



Amplitude: the maximum distance a particle moves from *equilibrium*, or the middle position.

Period = the time from one wave (cycle) to the next.

Ex: Period = 3.2 sec or τ = 0.25 sec (τ = Greek letter "tau")

Frequency = the number of waves (or cycles) per second:
Ex: f = 60 waves/2 seconds = 30 waves per second = 30 Hertz
("Hertz" just translates as "per second")

Frequency = 1 / Period
Period = 1/ frequency (they are reciprocals)

Amplitude is the maximum displacement from equilibrium.

Velocity = Speed at which a wave pulse travels along the medium. Ex: v = 340 m/s

Wavelength = Distance between two identical parts of a wave: Ex: λ = 125 cm = 1.25 m
λ is "lambda", the greek letter used to represent wavelength.

Wavelength can be from crest to crest, or trough to trough, or any other set of matching points.
For more precision, measure multiple wavelengths, and divide to find the average.

6. **On each wave diagram on this page, draw a double-ended arrow to label the wavelength, "λ".**

Velocity = Wavelength · Frequency **Velocity = Wavelength / Period**

7. Machine A makes waves at a rate of 420 per minute. The frequency equals ____________, and the period equals ____________.

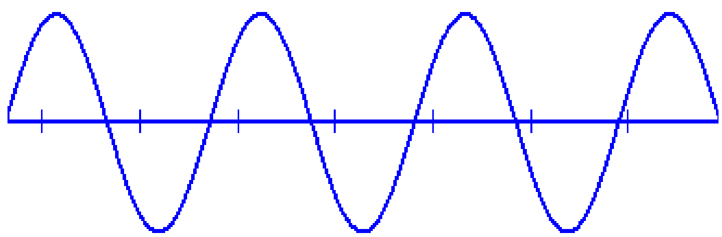
8. A student measures waves on a pond which pass by at the rate of 30 per minute. The distance between crests is 2.5 meters, and the vertical difference between crests and troughs is 12 cm.
   PAY ATTENTION TO THE UNITS!

   a) The frequency is ____________ Hertz   b) The period is ________________ seconds.

   c) The wavelength is _____________ meters   d) The amplitude is ______________ meters.

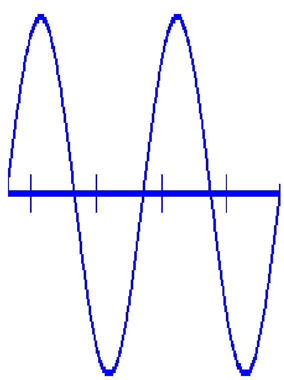
   e) Using the velocity formula $v = \lambda f$, calculate the speed of the waves in meters per second.

9. For each of the waves below, measure the wavelength and amplitude, to the nearest 0.1 cm.



λ = ______ cm   A = ______ cm

_____ wavelengths are drawn.

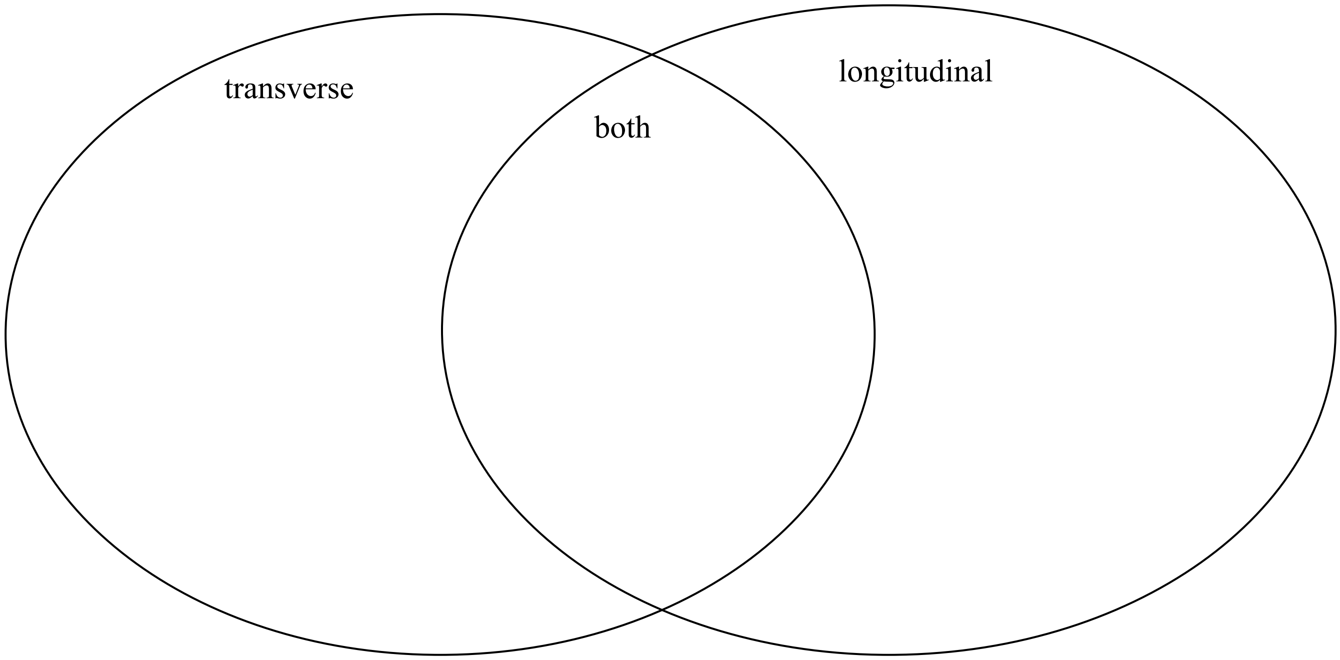


λ = ______ cm   A = ______ cm

_____ wavelengths are drawn.

10. On the table below, which has grid spacing of 1.0 cm and 0.5 cm, draw two wavelengths of a wave which has an amplitude of 1.5 cm, and a wavelength of 8.0 cm.

11. Describe the similarities and differences between transverse waves and longitudinal waves.



12. Explain why sound and other longitudinal waves can't travel through outer space.

13. A machine which shakes a wire to make waves is made to run at a higher and higher frequency.

a) What happens to the period, the time between each wave, as the machine is made to run faster?

b) What happens to the velocity of the wave on the wire?

c) Solve the wave equation for wavelength. Then explain in words the relationship between wavelength and frequency, assuming velocity is constant.

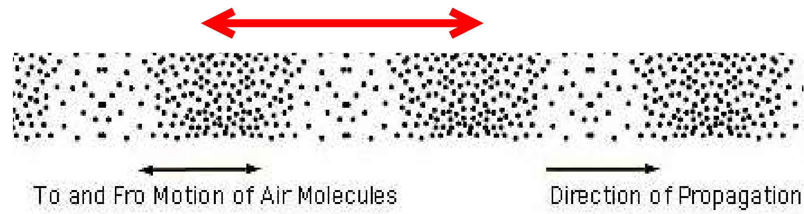
d) What happens to the wavelength as the frequency increases?

Wave I DAL 03/26/14 **Guide** Name______________________________ Period______

1. Waves are disturbances which move through space, carrying _energy_ from one place to another.

2. Most waves must travel in a physical substance, known as a _medium__, but light waves can travel through empty space, also called a _vacuum__.

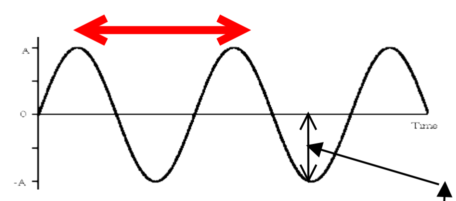
3. The two major types of waves are _transverse___, and _______longitudinal____, also known as compressional.



4. In a _longitudinal_ wave, such as a sound wave, particles move back and forth along the direction the wave moves. In longitudinal waves, where the particles are squeezed together are __compressions_____, and where the particles are spread apart are ____rarefactions______. The wavelength is the distance between adjacent compressions, or between adjacent rarefactions.

On the diagram above, label every compression with a C, and every rarefaction with an R.

5. In a ____transverse______ wave, such as the wave drawn below, the particles move at right angles to the direction the wave moves. Here, if the wave is moving to the right, the particles in the medium will move __up_____ and ___down____. The highest points are called __crests____ and the lowest points are called ____troughs_____.



Amplitude: the maximum distance a particle moves from *equilibrium*, or the middle position.

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λ is "lambda", the greek letter used to represent wavelength.

Wavelength can be from crest to crest, or trough to trough, or any other set of matching points.
For more precision, measure multiple wavelengths, and divide to find the average.

6. **On each wave diagram on this page, draw a double-ended arrow to label the wavelength, "λ".**

Velocity = Wavelength · Frequency **Velocity = Wavelength / Period**

7. Machine A makes waves at a rate of 420 per minute. The frequency equals __420/60s = 7.0 Hz_____, and the period equals ___60s/420 = 0.14s_________.

8. A student measures waves on a pond which pass by at the rate of 30 per minute. The distance between crests is 2.5 meters, and the vertical difference between crests and troughs is 12 cm.
   PAY ATTENTION TO THE UNITS!

   a) The frequency is __30/60s = 0.5_ Hertz

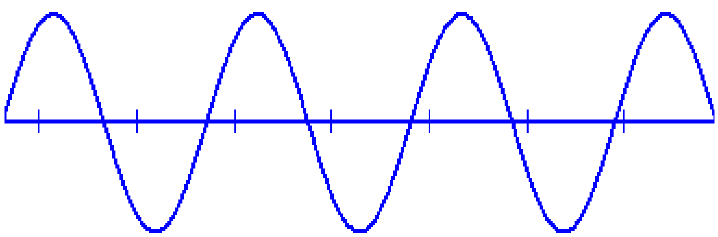
   b) The period is ___60s/30 = 2.0___ seconds.

   c) The wavelength is ___2.5____ meters

   d) The amplitude is _12cm/2 = 6cm = 0.06 meters.

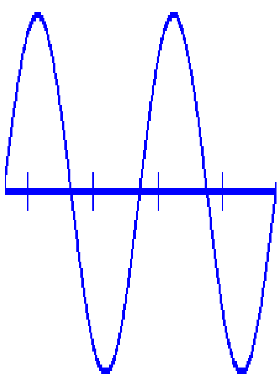
   e) Using the velocity formula v = λf, calculate the speed of the waves in meters per second.
   v = (2.5m)(0.5 Hz) = 1.25 m/s

9. For each of the waves below, measure the wavelength and amplitude, to the nearest 0.1 cm.



λ = 2.7cm A = 1.4 cm

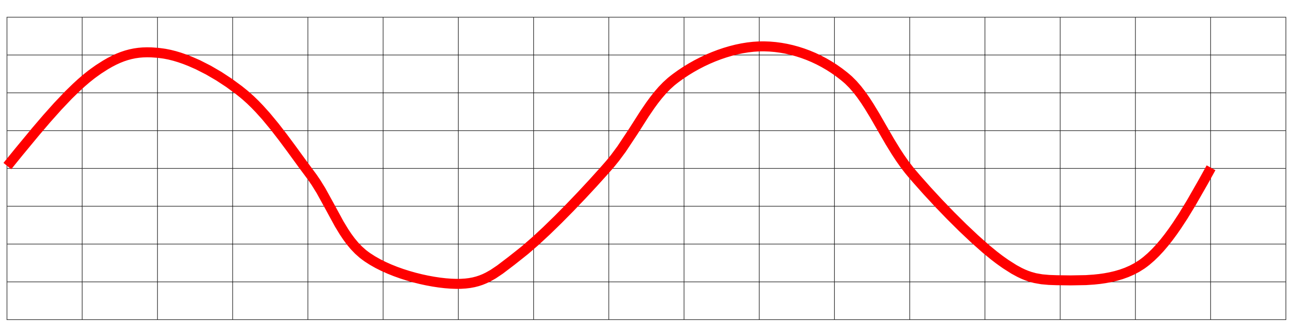
3.5_ wavelengths are drawn.



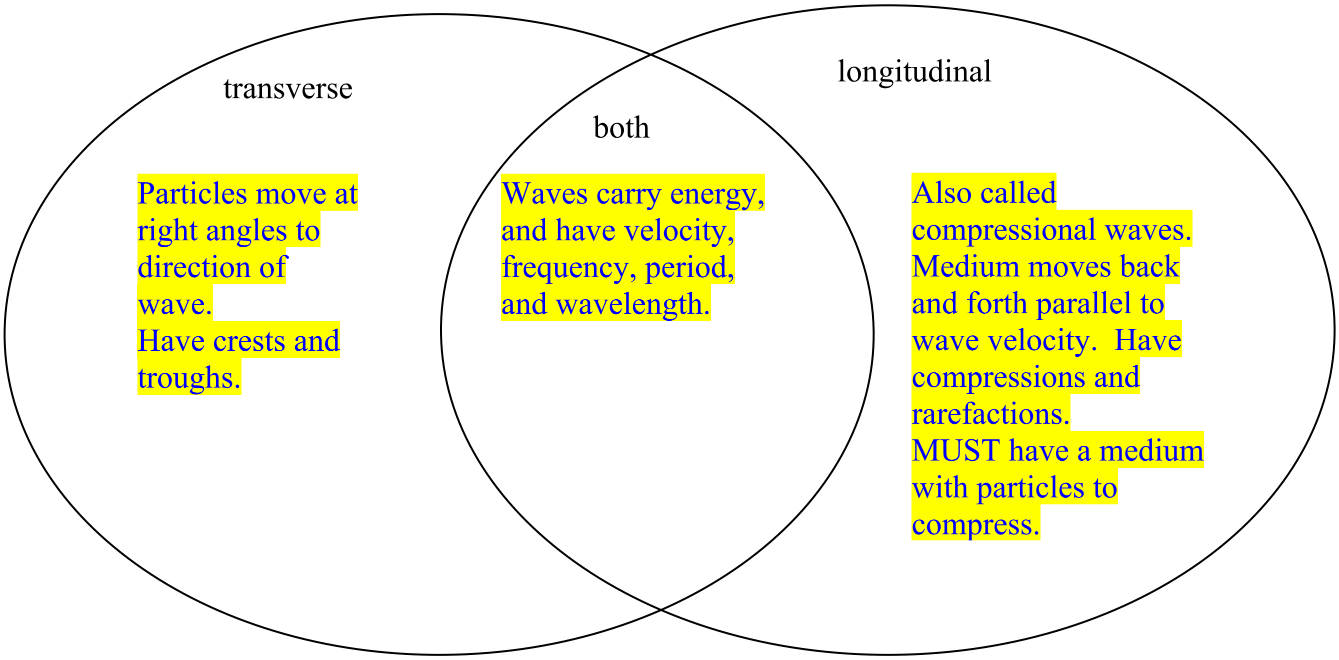
λ = ___1.8cm A = _2.4cm

2 wavelengths are drawn.

10. On the table below, which has grid spacing of 1.0 cm and 0.5 cm, draw two wavelengths of a wave which has an amplitude of 1.5 cm, and a wavelength of 8.0 cm.



11. Describe the similarities and differences between transverse waves and longitudinal waves.



12. Explain why sound and other longitudinal waves can't travel through outer space.

Longitudinal waves must have a medium so there is matter to compress and rarefy. In outer space, there are no particles, so there is nothing to compress.

13. A machine which shakes a wire to make waves is made to run at a higher and higher frequency.

a) What happens to the period, the time between each wave, as the machine is made to run faster?

The period gets shorter as the frequency increases.

b) What happens to the velocity of the wave on the wire?

The velocity stays the same, because the speed of the wave depends on the density of the wire, and the tension in the wire.

c) Solve the wave equation for wavelength. Then explain in words the relationship between wavelength and frequency, assuming velocity is constant.

$\lambda = \frac{v}{f}$ Wavelength is inversely proportional to frequency.

d) What happens to the wavelength as the frequency increases?

As frequency increases, wavelength decreases, although it will never reach zero.