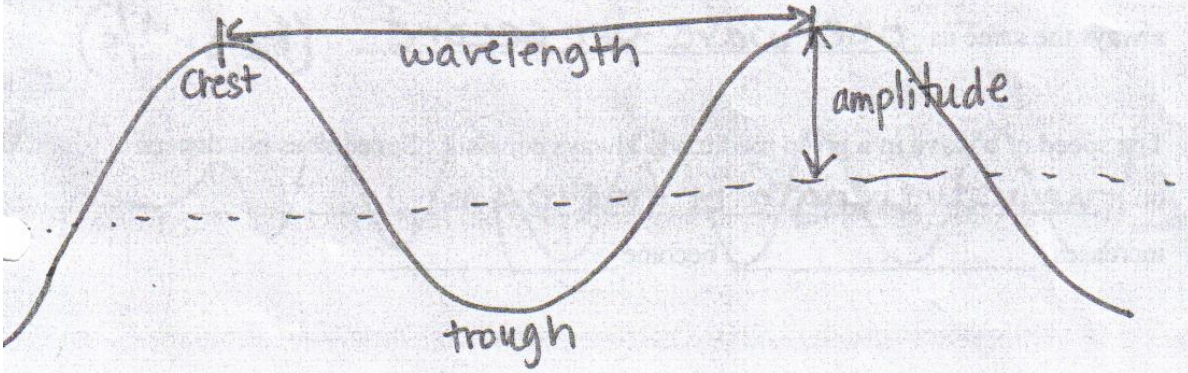
Characteristics of Waves

What comes to mind when you think of waves? Do the kinds of waves you can think of have anything in common with each other? Water waves, microwaves, sound waves and radio waves as well as all other types of waves transfer energy from one place to another.

Waves are rhythmic disturbances that carry energy through matter or space. Water waves transfer energy through the water Earthquakes transfer energy in powerful waves that travel through the Earth. Both types of waves travel through a medium, a material through which a wave transfers energy. This medium may be solid, liquid, gas, or a combination of these Radio waves and light waves, however, are types of waves that can travel without a medium

Two types of waves carry energy. These are transverse and compressional waves. In the first type, a transverse wave, the medium moves at right angles to the direction the wave travels. A transverse wave is drawn below:



A transverse wave can be described by its characteristics. When you snap a rope up and down, you may notice that high and low points form. The highest points of a wave are called crests, and the lowest points of a wave are called troughs. Waves are measured by their wavelength. Wavelength is the distance between a point on one wave and the identical point on the next wave such as from trough to trough, or crest to crest.

Ocean or lake waves can be described by how high they appear above normal H_2O level. Amplitude is the distance from the crest (or trough) of a wave to the rest position of the medium. The amplitude corresponds to the amount of energy carried by the wave. Waves that carry great amounts of energy have large heights or amplitudes and waves that carry less energy have smaller heights or amplitudes

Do you know the frequency of your favorite radio station? When you tune your radio to a station, you are actually looking for waves of a certain frequency. The frequency of a wave is the number of wave crests that pass one place each second. Frequency is expressed in hertz (Hz). One hertz is always the same as one wave per second. (Hz or 1/s)

Sometimes you may want to know how fast a wave is traveling. For example, earthquakes below the ocean can produce giant waves (called tsunamis). You would want to know how soon such a wave would reach you, and whether or not you should seek shelter on higher ground. Wave velocity (v) describes how fast the wave moves forward

Wave velocity can be found by multiplying the wavelength & the frequency. Wavelength is represented by the Greek letter λ, (lambda). If you know any two variables in the equation, you can find the missing variable.

Velocity = wavelength x frequency

OR

$v = \lambda \times f$

Calculating the Velocity of a Wave

A wave is generated in a wave pool at a water amusement park. The wavelength is 3.2 m. The frequency of the wave is 0.60 Hz. What is the velocity of the wave?

$v = \lambda \times f$, $\lambda = 3.2\,m$ $f = 0.60\,Hz$ or $0.60/s$

$3.2\,m \times 0.6/s = 1.92\,m/s$

A wave moving along a rope has a wavelength of 1.2 m and a frequency of 4.5 Hz. How fast is the wave traveling along the rope?

$v = \lambda \times f$ $\lambda = 1.2\,m$, $f = 4.5\,Hz$ or $4.5/s$

$1.2\,m \times 4.5/s = 5.4\,m/s$

An ocean wave has a length of 10 m. Two waves pass a fixed point every 1 second. What is the speed of the wave?

$\lambda = 10\,m$ $f = 2.0\,Hz$ or $2.0/s$

$10\,m \times 2.0/s = 20\,m/s$