# Notes – Waves

- There are two types of waves. Waves that are mechanical in nature (water and sound waves) and waves that are electromagnetic in nature (light, radio and x-rays).

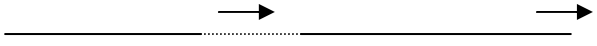
- Mechanical waves need a medium to transmit them (air, water or other matter), while electromagnetic don't need a medium to move and they move at the speed of light.

- Mechanical waves can be divided into three parts.

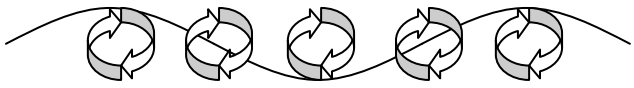
1.) Transverse waves – when the particles of the medium vibrate perpendicular to the direction of wave travel. - Piano and guitar strings act like this.

Ex. -  Direction of movement of wave

2.) Longitudinal waves – when the particles of the medium vibrate parallel to the direction of wave travel. - Sound waves act like this.

Ex. –  Direction of movement of wave

3.) Surface waves – a mixture of parallel and perpendicular movement of the particles of medium to the direction of wave travel. Water in a lake with waves act like this.

Ex. – 

- A wave pulse is a single disturbance travelling through a medium. A student jerking a rope once will cause a single pulse.

- A travelling wave is created by a regular repeating motion through the medium. A student moving a rope back and forth quickly and repeatedly will cause a travelling wave.

- Period (T) is the time between an interval start and then starting again. In relation to waves the period is the time it takes for a vibration to pass a point until the next time the vibration passes that point in a travelling wave.

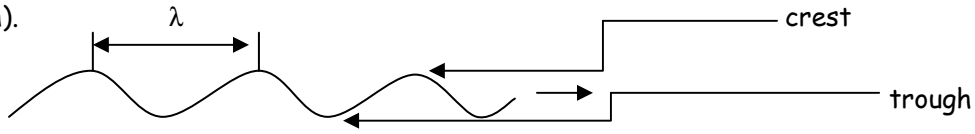
- Frequency (f) is the number of complete vibrations passing a single point per second. One vibration per second is one hertz (Hz). Frequency and period are related by the equation $f = \frac{1}{T}$ .

- Ex. – A sound wave has a frequency of $262\ Hz$. What is the time between successive wave crests (the period)?

Answer –

- Wavelength (λ) is the distance from one peak (crest) to the next peak of a transverse wave (or trough to trough).

Ex. –




- The velocity of a wave can be calculated by the equation $\vec{v} = \frac{\lambda}{T}$ or as it's more often written $\vec{v} = \lambda f$.

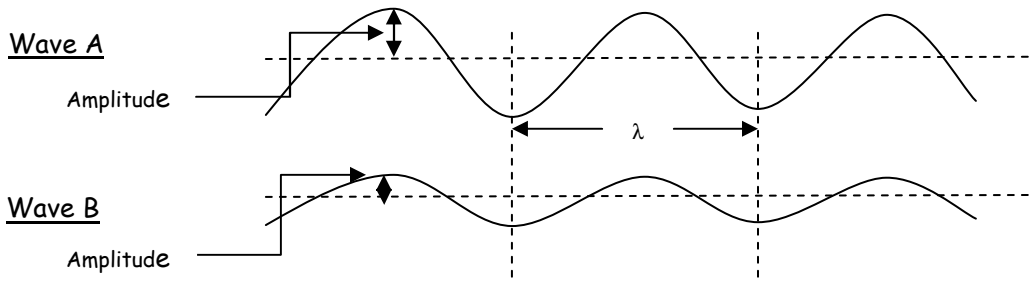
- Both of these equations should make sense as velocity is distance divided by time and the wavelength is a certain distance and the period takes a certain amount of time.

- Ex. – A sound wave with frequency $262\ Hz$ has a wavelength of $1.29\ m$. What is the speed of the sound wave?

Answer –

- Two waves can have the same frequency but have different wavelengths. As well waves of sound can be soft or quite. These differences are caused by a difference in amplitude. Amplitude is the maximum displacement from the middle to the highest point.

Ex. -




- A wave with larger amplitude contains and transfers more energy.