## CP4 Waves

1. Describing waves

Waves	Transfer energy without transferring matter.
Oscillate / vibrate	Particles move backwards and forwards or up and down.
Transverse waves	Waves in which particles oscillate perpendicular to the direction of energy movement. E.g., waves on the surface of the water, some seismic waves and light waves (all electromagnetic waves).
Longitudinal waves	Waves in which particles oscillate parallel to the direction of energy movement. E.g., sound waves and some seismic waves.
Medium	The material that waves travel through.
Seismic waves	Waves of vibrating rock caused by earthquakes.
Frequency, f	The number of waves that pass a point every second.
Hertz, Hz	The unit of frequency. 1 Hz = 1 wave per second.
Period, T	The length of time it takes for a single wave to pass.
Wavelength, λ	The distance from the top of one wave to the top of the next.
Amplitude	The maximum distance a particle vibrates away from its resting point
Velocity, v	The speed of a wave
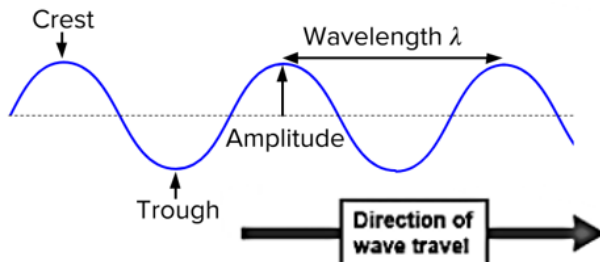
2. Equations

wave speed = distance ÷ time

$$v = \frac{x}{t}$$

The wave equation:

wave speed = frequency × wavelength

$$v = f \times \lambda$$

3. Core practical – Investigating waves

CP4 - Aim	To measure the speed of waves in a liquid and a solid.
Experiment 1: fining the speed of water waves	1. Count the number of waves in 10 s. Divide by 10 to find the frequency. 2. Measure the wavelength with a ruler. 3. Use the wave equation to find the speed
Experiment 2: finding the speed of sound waves in a solid	1. Hit suspended metal bar with hammer and measure the frequency using an app. 2. Measure the metal bar – double the length gives the wavelength 3. Se the wave equation to find the speed
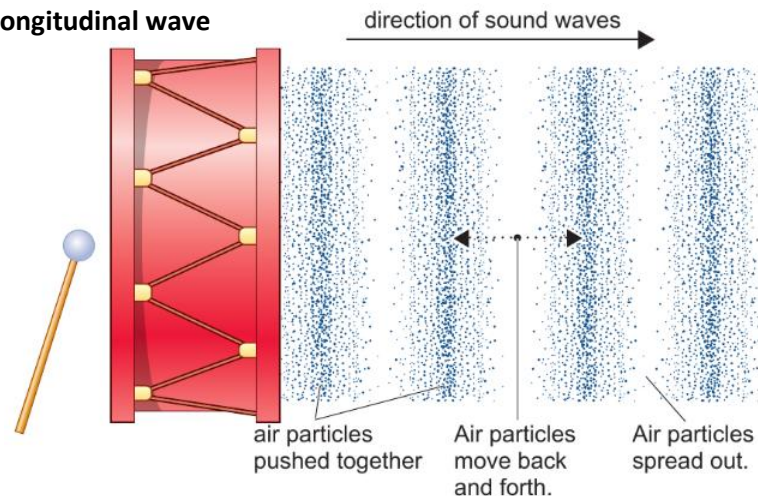
4. Refraction

Refraction	Bending of waves when they enter a new medium at an angle.
Changing speed	Refraction happens because waves travel at a different speed in a different mediums. Light is slower in water than air.
Interface	The boundary between two media (mediums) such as air and water.
Normal	An imaginary line drawn at 90º to where light hits an interface (boundary).
Angle of incidence	*The angle between an incoming light ray and the normal.*
Angle of refraction	*The angle between the normal and a ray of light that has been refracted.*

Transverse wave

Longitudinal wave
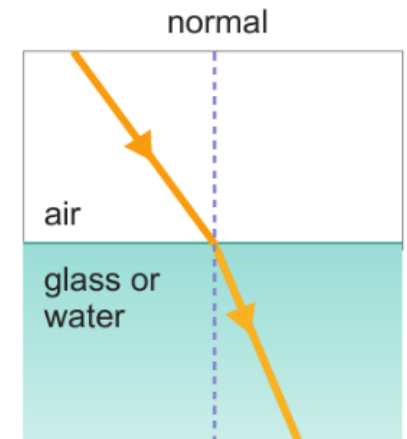
Light refracts towards the normal.