Waves

P3.1 Wave properties

Waves transfer energy, not matter

Waves move energy from one place to another. The particles in the medium don't travel with the wave – they just vibrate.

Wave motion examples

Ropes and springs: Show waves by moving one end up and down. Water waves: Dropping something in water shows ripples spreading out – energy moves, water stays.

Features of a wave

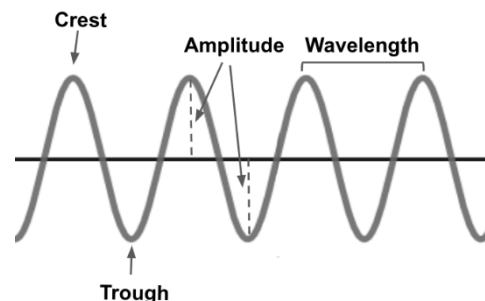**Wavelength** (λ): Distance between two crests or troughs.

Frequency (f): Number of waves per second (measured in Hz).

Crest: The highest point of a wave.
Trough: The lowest point.

Amplitude: Height from rest to crest/trough – shows how much energy the wave has.

Wave behaviour

Reflection: Waves bounce off a surface (like light on a mirror).

Refraction: Waves bend when they enter a new material and change speed (like a straw looking bent in water).

Wave speed formula

Wave speed $v = f × λ$, where v = speed (m/s), f = frequency (Hz) and λ = wavelength (m)

Wave speed (v): How fast the wave travels.

Transverse waves: Vibrations are at right angles to wave direction. E.g. light (EM waves), water waves, seismic S-waves

Longitudinal waves: Vibrations are parallel to wave direction. Have compressions and rarefactions. E.g. sound waves, seismic P-waves