WJEC (Eduqas) Physics GCSE

5.1: Waves in Air, Fluids and Solids

Detailed Notes

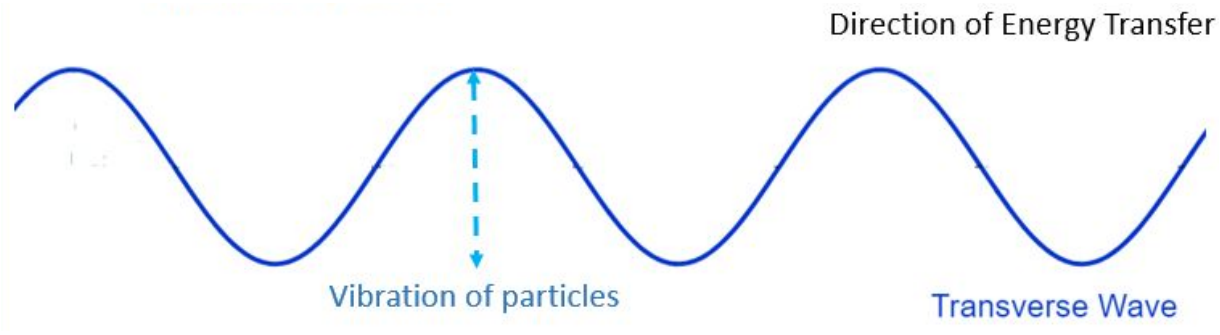
(Content in **bold** is for higher tier **only**)

Wave Motion

A wave transfers energy through **vibrations** and there are two main types of vibration.

Transverse Waves

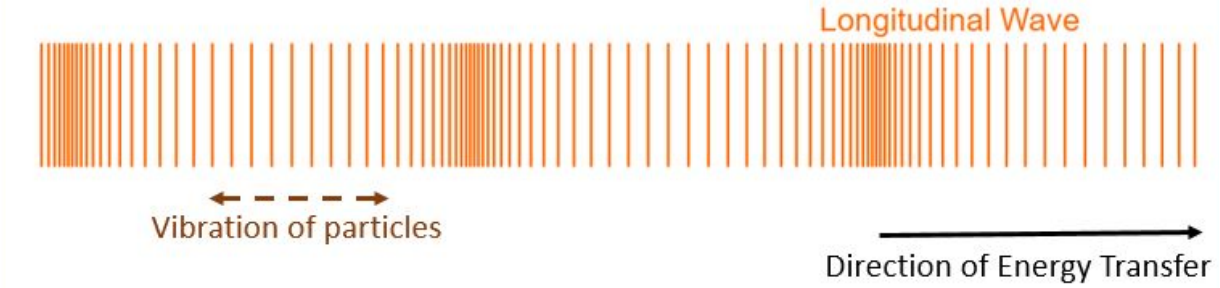
Transverse waves form when particles vibrate **perpendicular** to the direction of energy transfer in a series of **peaks and troughs**. Water waves, light and EM waves are all transverse.



A transverse wave with peaks and troughs (onlinemathlearning.com).

Longitudinal Waves

Longitudinal waves form when particles vibrate **parallel** to the direction of energy transfer in a series of **compressions and rarefactions**. Compressions are where the particles move close together and rarefactions where they spread out to be further apart. Sound waves are longitudinal.



A longitudinal wave with compressions and rarefactions (onlinemathlearning.com).

Properties of Waves

Wave properties can be can be measured and analysed using displacement-distance graphs

Amplitude (a)

The amplitude of a wave is the **maximum displacement** that a particle will experience from zero. It can be measured as the **peak height** from the undisturbed position.

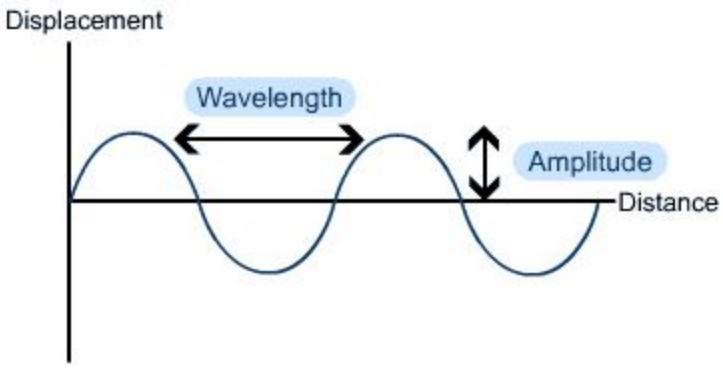
Wavelength (λ)

This is the **horizontal distance** travelled by a single wave cycle (one peak and one

trough). It can be measured as the **distance between a point** on a wave and the **same point** on the next wave cycle. This point can be anywhere on the wave but measuring wavelength between peaks or troughs is often easiest.

Frequency (*f*)

This is the **number of wave cycles** that pass a single point in **one second**. It is measured in **hertz (Hz)**, where 1 Hz is one wave per second.



Features of a transverse wave (s-cool.co.uk).

Wave Speed (v)

The speed of a wave is **proportional** to its frequency and wavelength.

$$v = f\lambda$$

***v* is velocity in m/s, *f* is frequency in hertz (Hz) and *λ* is wavelength in meters (m).**

Period (T)

The time period of a wave is the time it takes for one complete wave cycle (a peak and trough). It is the inverse of frequency and is measured in seconds.

$$T = 1 / f$$

***v* is velocity in m/s, *f* is frequency in he**

Water & Air Waves

All longitudinal waves require a **medium** to travel through so that the **vibrating particles** can **collide** to pass on vibrations. Sound waves are an example of an air wave, they travel at **330 m/s** in air. Sound can not travel in a vacuum as there are no particles to pass on the vibrations.