



Physics: Waves

Waves:

Definition:

- A disturbance that travels through a medium from one location to another
- Energy transport phenomenon that transports energy without transporting matter
- **Displacement:** Distance of the oscillating particle in a wave from its equilibrium position at any instant
- **Amplitude:** Maximum displacement of the oscillating particle in a wave from the equilibrium position (determined by the **amount of energy** in the wave)
- **Period:** Time taken **to complete one oscillation** of the wave (Unit being second)
- **Frequency:** Number of oscillations made by the wave **per unit time** (Unit being Hertz)
- **Wavelength: Distance** between corresponding points in successive waveforms, such as the distance between 2 successive crests and troughs (usually in nanometre)
- **Speed:** Distance moved by the wave per second
- **Wavefronts:** Lines that join all the peaks and identical points on the wave
- **Peak:** highest point of a wave
- **Trough:** lowest point of a wave
- **In phase:** Set of points that have the same displacement from the point and are moving in the same direction (usually one or more wavelengths apart, in fixed integers)
- **Medium:** A physical substance made up of particles through which mechanical waves can pass through (for sound)

Transverse Waves:

- Waves with vibrations of particles perpendicular to the direction of travel of wave motion
- Examples are EM Waves and Water Waves
- Obvious crests and trough (amplitude measured vertically)

Longitudinal Wave

- Waves with vibrations of particles parallel to the direction of travel of wave motion
- Sound waves
- Obvious compressions and rarefactions (which are measured horizontally)
- **Compression:** Particles are the closest together at this point
- **Rarefaction:** Particles are far apart at this point
- **Wavelength:** measured by compression to compression distance (where the particles are in phase)

Mechanical Waves:

- Require a medium for them to propagate
- Transfer energy through a medium

Electromagnetic Waves:

- Do not require any medium
- Ability to pass through vacuum

Formulas:

- $F=1/T$ (Frequency is inverse proportionate to Time)
- $V=F(\lambda)$ (Speed=Frequency x Wavelength)
- $V= \lambda/T$ (Speed = Wavelength/Time)