

## Definitions and Concepts for AQA Physics A Level

### Topic 3: Waves

**Amplitude:** A wave's maximum displacement from its equilibrium position.

**Antinode:** A position of maximum displacement in a stationary wave.

**Cladding:** A protective layer on an optical fibre to improve the tensile strength of the fibre, prevent scratching and to prevent signal transfer between adjacent fibres.

**Coherence:** Waves are coherent if they have the same wavelength and frequency, as well as there being a fixed phase difference between them.

**Diffraction Grating:** A grating with hundreds of slits per millimetre, that results in sharper interference patterns. They are used to calculate atomic spacing and to analyse elements.

**Diffraction:** The spreading of waves as they pass through a gap of a similar magnitude to their wavelength.

**Electromagnetic Waves:** Waves that consist of perpendicular electric and magnetic oscillations.

**Frequency:** The number of waves that pass a point in a unit time period. It is the inverse of the time period.

**Fringe Spacing:** The distance between two adjacent bright fringes or two adjacent dark fringes.

**Interference:** The name given to the superposition of waves that occurs when two waves meet. If the waves are in phase they will constructively interfere, but if they are out of phase, they will destructively interfere.

**Laser:** A light source that produces a collimated and coherent beam.

**Longitudinal Wave:** A wave with oscillations that are parallel to the direction of energy propagation. Sound waves are an example of a longitudinal wave.

**Material Dispersion:** Waves of different wavelengths travel at slightly different speeds through an optical fibre and so reach the end of the fibre at slightly different times, causing pulse broadening. The use of monochromatic light fixes this.



**Modal Dispersion:** Waves enter an optical fibre at slightly different angles, meaning the distance each beam has to travel is slightly different. This leads to the beams reaching the end at different times and so causes pulse broadening.

**Node:** A position of minimum displacement in a stationary wave.

**Optical Fibre:** A thin glass fibre through which signals are passed through. Optical fibres usually have cladding surrounding them.

**Path Difference:** A measure of how far ahead a wave is compared to another wave, usually expressed in terms of the wavelength.

**Phase Difference:** The difference in phase between two points on a wave. It is usually expressed in radians.

**Phase:** A measure of how far through the wave's cycle a given point on the wave is.

**Polarisation:** The restriction of a wave so that it can only oscillate in a single plane. This can only occur for transverse waves.

**Pulse Broadening:** The elongation of a signal passed down an optical fibre, commonly due to modal or material dispersion.

**Refractive Index:** A material property that is equal to the ratio between the speed of light in a vacuum, and the speed of light in a given material.

**Snell's Law:** A law linking a wave's angle of incidence to its angle of refraction, with the use of the refractive indexes of the mediums involved.

**Speed:** The product of a wave's frequency and wavelength.

**Stationary Wave:** A wave that stores, but does not transfer, energy.

**Total Internal Reflection:** An effect that occurs in optical fibres, where full reflection occurs at the inside boundary of the fibre, meaning no radiation passes out.

**Transverse Wave:** A wave with oscillations that are perpendicular to the direction of energy propagation. Electromagnetic waves are examples of transverse waves.

**Wavelength:** The distance between two identical positions on two adjacent waves. It is commonly measured from peak to peak or trough to trough.

**Young's Double-Slit Experiment:** An experiment that demonstrates the diffraction of light by passing monochromatic light across two narrow slits and observing the resulting pattern of bright and dark fringes.

