Definitions and Concepts for Edexcel Physics IGCSE

Topic 3: Waves

*Definitions in **bold** are for higher tier only*

Definitions marked by '' are for separate sciences only*

Amplitude: The maximum displacement of a wave from its undisturbed (equilibrium) position.

Critical Angle: The angle of incidence beyond which all the wave is totally internally reflected when it meets a boundary.

Doppler Effect: The change in a wave's observed wavelength and frequency when there is relative motion between its source and an observer.

Diffuse Reflection: The reflection of a wave from a rough surface that results in the wave being scattered.

Electromagnetic Spectrum: A group of transverse waves that cover a large range of frequencies and wavelengths. The highest frequency waves in the spectrum are gamma-rays and the lowest are radio waves.

Electromagnetic Waves: Transverse waves that transfer energy from the source of the waves, to an absorber. They form a continuous spectrum of different frequencies and all travel at the same speed in a vacuum.

Frequency: The number of waves passing a given point in a second. It is the inverse of the wave's time period.

Gamma Rays: High energy radiation rays used for detecting and treating cancers, and sterilising food and medical implements. They can cause cell damage and mutations.

Hertz (Hz): The unit of frequency.

***Human Hearing:** **Humans can hear sounds in the frequency range of 20Hz to 20kHz.**

Infrared Radiation: A type of radiation that all objects emit and absorb. The hotter an object is, the greater the infrared radiation it emits in a given time.

Infrared: Used for cooking food, thermal imaging and short range communications. It can

cause skin burns.

Law of Reflection: The angle of incidence must always equal the angle of reflection when a wave reflects.

Longitudinal Waves: Waves with oscillations that are parallel to the direction of travel/energy transfer.

***Loudness:** **A measure of the amplitude of the oscillations of a sound wave. The larger the amplitude, the louder the sound will be.**

Microphone: A device that converts the particle oscillations of a sound wave into an electrical signal that can be analysed using an oscilloscope.

Microwaves: Used for satellite communications and for cooking food. They can cause internal heating of body cells.

Oscilloscope: **A device used to display the waveform of a signal. It shows how the voltage of the electrical signal varies with time.**

***Pitch**: **A measure of the frequency of the oscillations of a sound wave. The higher the frequency, the higher the pitch of the sound.**

Radio Waves: Used for television and radio signals. **They can be produced by oscillations in electrical circuits, or can induce these oscillations themselves.**

***Ray Diagram:** A visual representation of the path of a wave, usually around the point where it meets a boundary. Rays are usually drawn as straight lines with an arrow pointing in their direction of travel.

Real Image: An image produced by light-rays physically converging. Real images are ones that can be projected onto a screen.

***Reflection:** The bouncing back of a wave at a boundary.

***Refraction:** The changing of speed, and consequently the direction, of a wave as it changes medium. The wavelength of the wave will also change but the frequency remains constant.

Refractive Index: The ratio of the speed of the wave in a vacuum to the speed of the wave in a given medium.

Seismic Waves: Waves that are produced by earthquakes.

Sound Waves: The longitudinal waves responsible for sound. They require a medium to travel through and are transmitted by the vibrations of the medium's particles.

Specular Reflection: The reflection of a wave from a smooth surface.

Speed of EM Waves: All electromagnetic waves travel at the same speed in a vacuum (3×10^8 m/s).

Time Period: The time it takes for one complete wave to pass a given point. It is the inverse of frequency.

Total Internal Reflection: The process of all a wave being reflected when it meets a boundary. It occurs when the angle of incidence is greater than the critical angle, and only when going from a higher refractive index to a lower one.

Transverse Waves: Waves with oscillations that are perpendicular to the direction of travel/energy transfer.

***Ultrasound Waves:** Waves that have a frequency higher than the upper limit of human hearing (20kHz).

Ultraviolet: Used in energy efficient lamps, disinfecting water, and for sun tanning. It can cause cell and eye damage that can result in skin cancer and eye conditions.

Virtual Image: An image produced by the apparent, but not actual, divergence of light-rays. Virtual images cannot be projected onto a screen.

Visible Light: The only type of electromagnetic radiation that our eyes can detect. It is used for fibre optic communications and photography.

Wave Velocity: The velocity at which energy is transferred through the medium. It is equal to the product of the wave's wavelength and frequency.

Wave: A process of energy transfer through oscillations, without matter being transferred with it.

Wavefront: An imaginary surface representing points of a wave that are at the same point in their cycle.

Wavelength: The distance from a point on one wave to the same point on the adjacent wave (ie. peak to peak or trough to trough).

X-Rays: Used for medical imaging and security scanners. They can cause cell damage and mutations.