Definitions and Concepts for AQA Physics A Level

Topic 10: Medical Physics (Option Topic)

A-Scan: A method of scanning tissue that involves placing an ultrasound emitting transducer on the surface of the body, and then measuring reflections of emitted pulses. A-Scans are used to measure the foetal head size during pregnancy.

Accomodation: The name given to the eye's focusing process.

Acoustic Impedance: The product of the speed of sound through a given medium, and the density of the medium.

Air-Soft Tissue Boundary: A boundary at which nearly all incident ultrasound pulses are reflected, due to there being a very large acoustic impedance difference.

Astigmatism: A sight defect caused by a misshapen cornea.

B-Scan: A method of scanning tissue, used for more complex structures than A-scans. Instead of the echo signals controlling the y-gain (as in A-scans), they control the brightness of the oscilloscope spot. B-scans are used to determine the placenta's position during pregnancy.

Barium Meal: A contrast medium that ensures that there is a significant difference between the density of the area being scanned and the rest of the body. Barium is chosen due to its high proton number. It is consumed by the patient.

Bone-Soft Tissue Boundary: A boundary at which the acoustic impedance is very large. This means that ultrasound is more intensely reflected.

Ceruminous: The wax glands that line the ear canal and protect the eardrum.

Choroid: A layer of tissue containing blood vessels that carry oxygen and food to the eye. It lines the sclera.

Ciliary Muscles: Circular muscle fibres responsible for making changes to the lens' shape.

Coherent Fibre Bundle: A bundle of fibres in which each fibre is positioned in an orderly fashion

Cones: A light sensitive cell that is used to detect high light intensities. Each cone is connected to a nerve fibre that joins it to the brain and so results in detailed, colour images.

CT Scans: A scanning method that produces a cross section of the body by rotating a monochromatic x-ray beam around it, in combination with a series of detectors. Whilst it produces higher resolution images that ultrasound and is non-invasive, it is highly ionising and costly.

Decibel: The unit used for sound intensity.

Flat-Panel Detectors: A light detecting panel that is used in medical imaging. They are faster and more sensitive to light differences than traditional film.

Gamma Camera: A type of detector used in PET scanners, consisting of a photomultiplier tubes that convert gamma photons into electrical pulses.

Gelatinous Vitreous Humour: The fluid found between the lens and retina in the human eye.

Hypermetropia: The name given to long sightedness.

Incoherent Fibre Bundle: A bundle of fibres in which the fibres have not been orderly arranged. They are only suitable for the transportation of light.

Iris: A coloured region of the eye that is partly responsible for controlling that amount of light that enters.

Linear Attenuation Coefficient: X-rays attenuate when it passes through matter. The linear attenuation coefficient is the ratio of the fractional reduction of intensity over the thickness of the layer.

Magnetic Resonance Imaging: A scanning method that involves the patient lying in a very strong cylindrical magnet. Electromagnetic radiation is emitted that causes a reorientation of hydrogen nuclei. When they return to their original positions radiofrequency radiation is emitted and detected.

Mass Attenuation Coefficient: The linear attenuation coefficient divided by the density of the material being passed through.

Myopia: The name given to short sightedness.

Optic Papilla: A region of the retina that contains no rods or cones and so isn't sensitive to light. It is also known as the eye's blind spot.

Piezoelectric Effect: An effect shown by crystals like quartz. When a potential difference is applied, the crystal will mechanically deform. Likewise, when the crystal is deformed, a potential difference is produced.

Positron Emission Tomography Scans: A scanning technique that produces cross-sectional and 3D images. It involves a radionuclide being injected into the body, which then releases gamma photons that are detected by the scanning machine.

Retina: The light-sensitive region, found at the back of the eye.

Rods: A light sensitive cell that is used to detect low light intensities. They produce gray scale images with limited detail.

Scintillator: A device that converts X-ray photons into light photons.

Sclera: A coating that covers the entire eye. It is clear in front of the cornea but is opaque around the remainder of the eye.

Suspensory Ligament: Responsible for holding the lens of the eye in place.

Transducer: A device that contains a piezoelectric crystal. In medical contexts, they are responsible for producing pulses of ultrasound, as well as acting as a detector for ultrasound echos.

Ultrasound: Sound waves with a frequency higher than the upper-frequency audible to the human ear (20kHz).

Visual Purple: A compound found in rods, that is bleached by light. The bleaching is reversed by enzymes. The reversal process is fastest under low light intensities and so the rods are more sensitive in low-light environments.

Watery Aqueous Humour: The fluid found between the lens and cornea in the human eye.