Definitions and Concepts for AQA Physics A Level

Topic 2: Particles and Radiation

Alpha Decay: The process of an unstable nucleus emitting an alpha particle (two protons and two neutrons) to become more stable.

Annihilation: The process of a particle and its antiparticle colliding and being converted into energy. The energy is released in two photons to conserve momentum.

Antiparticle: All particles have a corresponding antiparticle with the same mass but opposite charge and conservation numbers.

Baryon Number: A quantum number that is conserved in all particle interactions. Baryons have a baryon number of +1 and non-baryons have a baryon number of 0.

Baryon: A class of hadron, that is made up of three quarks. The proton is the only stable baryon.

Beta-Minus Decay: The process of a neutron inside a nucleus turning into a proton, and emitting a beta-minus particle (an electron) and a antineutrino.

Beta-Plus Decay: The process of a proton inside a nucleus turning into a neutron, and emitting a beta-plus particle (a positron) and a neutrino.

Electron Diffraction: The spreading of electrons as they pass through a gap similar to the magnitude of their de Broglie wavelength. It is evidence of the wave-like properties of particles.

Electron-volt (eV): The work done to accelerate an electron through a potential difference of 1V. 1eV is equal to the charge of an electron (E=qv).

Energy Levels: Defined and distinct energies at which electrons can exist in an atom. An electron cannot exist between energy levels.

Excitation: The process of an electron taking in exactly the right quantity of energy to move to a higher energy level.

Gauge Boson: The exchange particles that transmit the four fundamental interactions between particles.

Ground State: The most stable energy level that an electron can exist in.

Hadrons: A class of subatomic particle that experiences the strong nuclear interaction.

Ionisation: The process of an atom losing an orbital electron and becoming charged.

Isotope: Same number of protons but different numbers of neutrons.

Isotopic Data: Data from isotopes that can be used for a purpose, such as carbon dating.

Kaon: A type of meson that decays into pions.

Lepton Number: A quantum number that is conserved in all particle interactions. Both electron lepton numbers and muon lepton numbers must be conserved.

Lepton: A group of elementary subatomic particles, consisting of electrons, muons and neutrinos.

Meson: A class of hadron that is made up of a quark and antiquark pair.

Muon: A type of lepton that decays into electrons.

Neutrino: A subatomic particle whose existence was hypothesised to maintain the conservation of energy in beta decay.

Nucleon Number (A): The sum of the number of protons and neutrons in a given nucleus.

Nucleon: A proton or neutron.

Pair Production: The process of a sufficiently high-energy photon converting into a particle and its corresponding antiparticle. To conserve momentum, this usually occurs near a nucleus.

Photon: A packet of energy.

Pion: A type of meson and the exchange particle for the strong nuclear force.

Positron: A positively charged particle that is the antiparticle of an electron.

Proton Number (Z): The number of protons present in the nucleus of a given element.

Stopping Potential: The minimum potential difference required to stop the highest kinetic energy electrons from leaving the metal plate in the photoelectric effect.

Strange Particles: Particles that are produced through the strong interaction but decay through the weak interaction.

Strangeness: A quantum number that is conserved in strong interactions but not in weak interactions. This reflects that strange particles are always produced in pairs.

Strong Nuclear Force: A force that acts between nucleons in a nucleus to keep it stable. It is attractive at distances of up to 3fm and repulsive at separations less than 0.5fm.

Threshold Frequency: The minimum frequency of photons required for photoelectrons to be emitted from the surface of a metal plate through the photoelectric effect. It is equal to the metal's work function divided by Planck's constant.

Work Function: The minimum energy required to remove an electron from a metal's surface.