Definitions and Concepts for Edexcel Physics GCSE

Topic 6: Radioactivity

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

Definitions marked by '' are for separate sciences only*

Activity: The rate at which an unstable nucleus decays. The activity of a radioactive source reduces over time.

Alpha Particle: A positively charged particle consisting of two protons and two neutrons.

Atomic Number: The number of protons found in an atom of a specific element. Each element has a different atomic number.

Background Radiation: Radiation that is found in small quantities all around us and originates from natural sources such as rocks and cosmic rays, as well as from man-made sources such as nuclear weapons testing and accidents.

Becquerel: The unit of radioactive activity.

Beta Particle: A high speed electron that a nucleus emits when a neutron converts into a proton.

Bohr Model: A model of the atom that suggested that electrons orbit the nucleus at set distances.

***Chain Reaction:** The process of neutrons released by a fission reaction, being absorbed by another unstable, large nuclei, and inducing further fission.

Electrons: A negatively charged constituent of the atom, that are found in different energy levels, around the nucleus.

Element: A substance that cannot be chemically broken down into other substances. Each element has a characteristic number of protons in its nucleus.

Energy Levels: The stable states in which electrons are found in around a nucleus. Electrons can transition to a higher energy level through the absorption of electromagnetic radiation and can transition to a lower energy level through the emission of electromagnetic radiation.

***Fission Products:** Fission produces two smaller nuclei, two or three neutrons and gamma rays. All these products are released with kinetic energy.

Gamma Ray: Electromagnetic radiation emitted from a nucleus.

Geiger-Muller Tube: A device used to detect ionising radiation.

Half-Life: The time it takes for the number of unstable nuclei of an isotope in a sample to halve, or the time it takes for the initial count rate of a sample of the isotope to halve.

Ions: Atoms with a resultant charge due to the loss or gain of electrons.

Irradiation: The process of an object being exposed to nuclear radiation. The object doesn't become radioactive.

Isotopes: Atoms with the same number of protons but different numbers of neutrons. The atomic number is the same, but the mass number is different.

Mass Number: The number of protons and neutrons in an atom.

Negative Ions: Atoms that gained electrons and so have a resultant negative charge.

Neutrons: A neutrally charged constituent of the nucleus.

***Nuclear Fission:** The splitting of a large and unstable nucleus into two smaller and more stable nuclei to produce energy. This is the method currently used in nuclear power stations.

***Nuclear Fusion:** The joining of two small, light nuclei to form a larger, heavier one and release energy. It cannot happen at low pressures and temperatures since in these conditions the electrostatic repulsion of protons in the nucleus cannot be overcome.

Nucleus: The positively charged centre of an atom, containing protons and neutrons.

***PET Scanner:** A medical imaging device that uses radioactive tracers and detectors to form internal body images.

Plum Pudding Model: An old model of the atom that represented the atom as a ball of positive charge, with negative charges distributed throughout it.

Positive Ions: Atoms that have lost electrons and so have a resultant positive charge.

Protons: A positively charged constituent of the nucleus.

Radioactive Contamination: The unwanted presence of radioactive atoms on other materials. It is hazardous due to the decay of the contaminating atoms.

Radioactive Decay: The random process involving unstable nuclei emitting radiation to become more stable.

Random Nature of Radioactive Decay: You cannot predict which nuclei in a radioactive sample will decay next, or when the next decay will occur - it is a random process.