

## Definitions and Concepts for OCR (B) Physics GCSE

### Topic 5: Radioactive Materials

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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. They are highly ionising, but can be stopped by a few centimetres of air.

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

**Becquerel:** The unit of radioactive activity.

**Beta Particle:** A high speed electron that a nucleus emits when a neutron converts into a proton. They are ionising but can be stopped by a thin sheet of aluminium.

**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.

**Dalton Model:** A rejected model of the atom that represented the atom as a small spherical ball that could not be broken down into anything smaller. The discovery of subatomic particles led to its rejection.

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

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**\*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. They have a very high penetrating power and require several centimetre of lead to absorb them.

**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.

**\*Mass-Energy Equivalence:** All matter has an associated energy. This means that mass can be converted into energy in the form of radiation.

**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.

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

**Plum Pudding Model:** A rejected 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.

**Rutherford Model:** A model of the atom that represented the atom as being mostly empty space, with a dense positive centre and negative charges scattered around it.

