



Radioactivity and Radioactive Decay

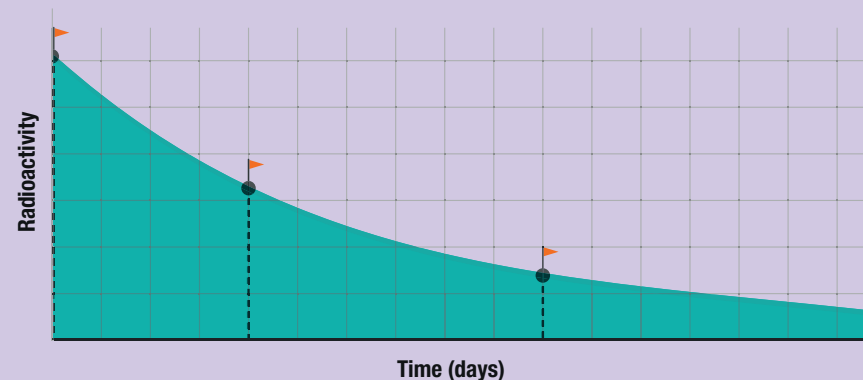
Radioactive decay is the spontaneous disintegration (breaking apart) of an unstable isotope. When this happens radiation is released, mostly in the form of particles (alpha and beta) and electromagnetic energy (gamma rays).

Radiation type	Details	Stopped by
Alpha (α)	Particle made from two protons and two neutrons. It can only travel about 5cm in air and can be stopped by a thin layer of material such as paper, clothing or the skin.	Paper, clothing or the skin
Beta (β)	High-speed, high-energy electrons or positrons. It can travel further (about 20 cm in air) and is more penetrating. It passes through paper but is stopped by a few millimetres of aluminium or a thin piece of lead.	Thin sheet of aluminium or lead
Gamma (γ)	High frequency electromagnetic radiation. Gamma radiation can travel a long way through air, and is extremely penetrating. Several centimetres of lead or metres of concrete are required to stop it.	Several centimetres of lead or metres of concrete

Other types of radiation are released during nuclear reactions, such as neutron radiation. Neutron radiation happens when a neutron is ejected from the nucleus of an atom. Neutron radiation is emitted by nuclear fusion reactions in the sun, in the form of cosmic rays, and is also produced inside a nuclear power reactor by nuclear fission of the uranium-235 contained in the nuclear fuel.

The free neutron then interacts with the nuclei of other atoms to form new isotopes. These isotopes may be unstable and undergo radioactive decay and release further radiation. Materials that have been bombarded by free neutrons and have become radioactive as a result are said to be activated, rather than contaminated by radioactive substances.

The amount of radioactivity given off by a radioactive substance decreases over time. The time it takes for the amount of radioactivity to decrease by half is called the half-life. Different radioactive atoms have different half-lives: some can be as short as less than a second and some can be many thousands of years.



Graph: A graph showing radioactive decay of a substance with a half-life of two days