

Nuclear radiations

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Types of Radiation

Radioactive substances give out radiation all of the time. There are three types of nuclear radiation: alpha, beta and gamma. Alpha is the least penetrating, while gamma is the most penetrating. Radiation can be harmful, but it can also be useful. The uses of radiation include smoke detectors, paper-thickness gauges, treating cancer and sterilising medical equipment.

Alpha Particles

Different forms of radiation may be emitted from an unstable radioactive nucleus. Energy is released and a new, more stable nucleus is formed. The 3 types of radiation to be considered in this section are: alpha, beta and gamma radiation. An alpha particle can be considered as a helium nucleus. Helium has 2 protons and 2 neutrons in its nucleus. If both of its electrons were removed, the result would be an alpha particle:

or α

Since there are two protons and no electrons, alpha particles are positively charged. Alpha particles are not very penetrating. Paper, clothing or a few centimeters of air can effectively shield against alpha particles. However, if ingested or inhaled, alpha particles can be hazardous.

Beta Particles

Beta particles are high-speed electrons emitted from the nuclei of decaying radioisotopes. Since these are electrons, they have a negative charge and a small mass, approximated as 0 amu.

or β

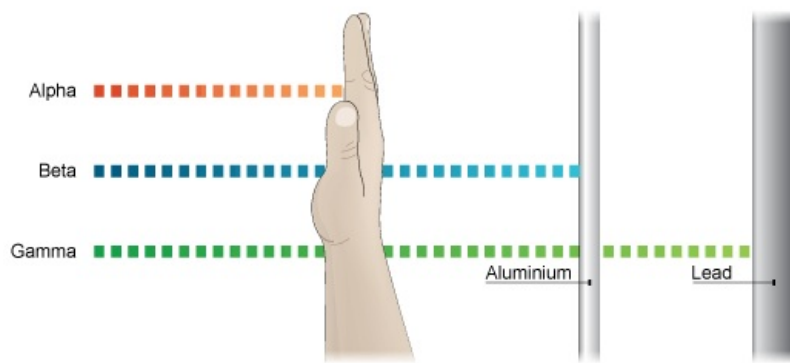
Beta particles may travel 2 or 3 meters through air. Heavy clothing, thick cardboard or one-inch thick wood will provide protection from beta radiation.

Gamma Radiation

Gamma radiation is very much like x rays. It has no charge, a very short wavelength and high energy. Gamma radiation is the most penetrating form of radiation considered in this section. It travels great distances through air (500 meters). To be protected from a gamma emitter, thick sheets of lead or concrete are required.

Besides alpha, beta and gamma radiation, other types of particles have been found to be emitted by radioactive isotopes. Examples of these other particles are: protons, neutrons and positrons. We have already studied protons and neutrons. A positron is a particle emitted from the nucleus that has the same mass as an electron but has a positive charge.

The positron is represented by the symbol:



Reference:

<http://www.mdc.edu/kendall/chmphy/nuclear/types.htm>

http://www.bbc.co.uk/schools/gcsebitesize/science/ocr_gateway_pre_2011/living_future/4_nuclear_radiation1.shtml