



BETA PARTICLES

Beta particles are a form of ionizing radiation made up of high-energy, fast-moving, and electrically-charged subatomic particles. Henri Becquerel is credited with the discovery of nuclear radiation in 1896. In 1898 Ernest Rutherford, working at McGill University in Montreal, discovered that “Becquerel rays”, as they were then known, consisted of both positively-charged and negatively-charged particles, which he named “alpha” and “beta”, respectively, after the first and second letters of the Greek alphabet. In 1900, Becquerel showed that beta particles were identical to electrons, which had recently been discovered by J. J. Thompson.. In 1903 Rutherford, still working at McGill University in Montreal, proposed the ground-breaking concepts of “radioactive decay” and “half-life”. In 1908 Rutherford’s revolutionary ideas earned him the Nobel Prize – the first awarded for work performed in Canada.

The production of beta particles is therefore termed “beta decay”. As it turns out, there are two types of beta particles: β^+ and β^- .

β^- decay occurs when a neutron in the nucleus of an unstable atom is converted into a proton. During this conversion an electron and an antineutrino are ejected from the atom. This type of beta decay is also known as electron emission.

β^+ decay, also known as positron emission, is almost the exact opposite. β^+ decay occurs when a proton in the nucleus of an unstable atom is converted into a neutron where a neutron, a positron and a neutrino are ejected from the nucleus. Whenever beta decay occurs, a small amount of gamma radiation is also released.

Beta particles can travel a few metres through the air and can be stopped by a thin sheet of aluminum or a piece of wood a few centimetres thick. However, they do travel fast enough to penetrate clothing and do pose a health risk especially alpha particles if they are inhaled or ingested.

Radioactive isotopes which emit beta particles are called beta emitters. Beta emitters exist in our environment from both natural and man made sources. Some beta emitters such as carbon-14 and potassium-40 exist naturally in your body.

Radioactive isotopes which emit beta particles are called beta emitters. Below is a list of some beta emitting radioactive isotopes.

- Carbon-14
- Cesium-137
- Cobalt-60
- Hydrogen-3 (tritium)
- Iodine-129
- Iodine-131
- Strontium-90
- Technetium-99

The beta emitters listed above are commonly used in medical imaging, diagnoses and treatments as well as industrial applications.



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Name: _____ Period: _____ Date: _____

Read through the “Beta Particles” section in the *What is Radiation?* module on the **Nuclear Technology: Exploring Possibilities Website** then answer the following questions.

Who discovered beta particles?

What are beta particles?

How many different types of beta particles are there?

Whenever beta decay takes place, what other type of ionizing radiation is also released?

How far can beta particles travel?

List three beta emitters.
