

Nuclear Energy Splitting Atoms to Generate Electricity

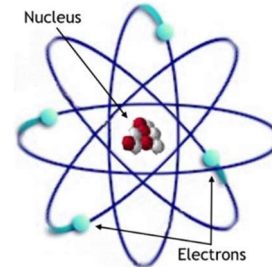
11 November 2022

$E=MC^2$ The equation that changed the world

Anatomy of an atom

Atoms have two main structures:

1. a tiny and extremely dense inner core called the **Nucleus**
2. an outer cloud of **Electrons** that orbit the central nucleus



The nucleus is composed of two types of particles that have about the same mass, these are **Protons** (which carry a positive charge), and **Neutrons**, (which carry no charge).

The number of protons in the nucleus determines what the atom is, for example 6 protons = carbon, 8 protons = oxygen 92 protons = uranium

The number of neutrons in the nucleus does not change the identity of the atom or its chemical properties, but it does affect the stability of the nucleus.

Atomic Mass is simply the total of Protons and Neutrons in an atomic nucleus

e.g. Carbon has 6 protons and 6 neutrons in its nucleus, giving it an **atomic mass** of 12

What is an Isotope?

An isotope is an atom that has other than its normal complement of neutrons in the nucleus

e.g. a Carbon atom normally has 6 protons and 6 neutrons in its nucleus (C_{12}), however, very occasionally a Carbon atom will have 8 neutrons in the nucleus giving it an atomic mass of 14. Carbon 14 is thus an isotope of carbon and is written as C_{14}

What is nuclear Fission?

The protons and neutrons in the nucleus (collectively known as nucleons) are held together by a powerful force. This force makes atoms very stable. Certain heavy atoms, such as Uranium, can be made unstable to the point that they break apart into pieces. This event is known as nuclear fission.

What is an Ion?

The number of electrons (negative charge) orbiting the nucleus is normally equal to the number of protons (positive charge) contained in the nucleus. The positive and negative charges cancel each other out leaving the atom with a net charge of zero. If an electron is stripped off an atom the atom gains a net charge of +1 and becomes known as an Ion. Ions are highly reactive with other atoms and in human terms are often referred to as Free Radicals. This understanding is important for when we discuss radiation.

With these fundamentals in your back pocket we'll turn you into nuclear scientists in no time!

Further reading <https://www.nuclearfaq.ca/> A comprehensive and easily readable discussion of all things nuclear in Canada