1110: Structure of the atomic nucleus

(Knowledge of the internal structure of the atomic nucleus is not directly related to understanding chemical phenomena, except in the field of nuclear chemistry, but you should understand "why it is not related")

Key words: Atomic nucleus; electrons; protons; neutrons; nucleons; nuclear force; elementary charge; gravitation; weak force; electromagnetic force; strong force; only electromagnetic force is involved in chemical phenomena

[Structure of the atomic nucleus]

An atom consists of a nucleus and electrons. A schematic diagram of a helium atom is shown in Figure 1. This diagram does not show the actual shape of an atom, but it is a widely known conceptual diagram.

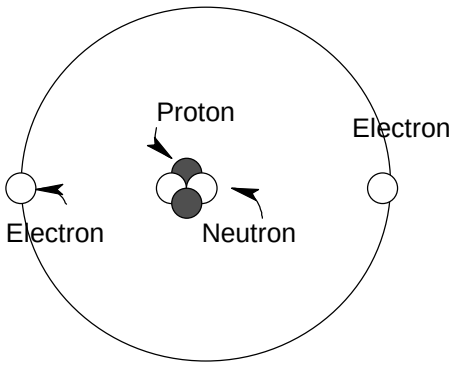

Figure 1. Structure of a helium atom. Protons have a charge of +1, measured in units of e (= 1.6022×10^{-19} Coulombs [C], but neutrons have no charge.

An atomic nucleus consists of protons and neutrons, which are called nucleons. The exception is the hydrogen atom, which has no neutrons in its nucleus.

[The force that holds atomic nuclei together]

Nucleons are bound together by a force called the nuclear force. e is also known as the elementary electric charge.

Nuclear force belongs to the "strong force" of the four forces in nature (universal gravitation (also known as gravity) < weak force < electromagnetic force < strong force.

The "strong force" only acts inside the nucleus, while the "weak force" is the force that acts during beta decay of an atomic nucleus, and universal gravitation is a force that acts between substances, neither of which are related to chemical phenomena. Note that substances have mass.