Atoms

The study of chemistry begins with the basic unit of matter, the **atom**.

atom = basic unit of matter.

The subatomic particles that make up atoms are

- **Protons (+)**
- **Neutrons (0)**
- **Electrons (-)**

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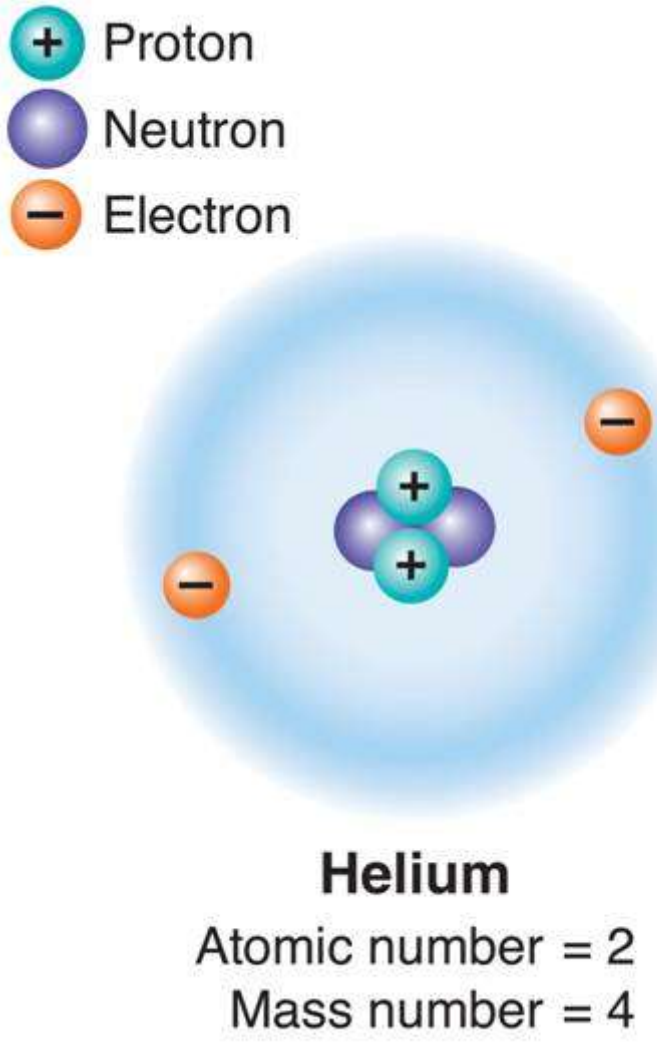
The subatomic particles in a helium atom.



*Protons and neutrons have about the same mass.

Protons are positively charged particles (+).

Neutrons carry no charge.

(Strong forces bind protons and neutrons together to form the **nucleus**, which is at the center of the atom.)

*__nucleus__ = center of an atom.

The **electron** is a negatively charged particle (−) with 1/1840 the mass of a proton.

Because atoms have equal numbers of electrons and protons, and because these subatomic particles have equal but opposite charges, atoms are neutral (they have no charge/balanced).

# of protons = # of electrons
Making atoms neutral

Elements and Isotopes

A chemical **element** is a pure substance that consists entirely of one type of atom.

Elements are represented by a one- or two-letter symbol.

- C stands for carbon.
- Na stands for sodium.

The number of protons in an atom of an element is the element's atomic number.

(# of protons = atomic number)

Carbon has 6 protons, so its atomic number is 6.

Isotopes

Atoms of the same element that have different number of neutrons they contain are known as **isotopes**.

The sum of the protons and neutrons in the nucleus of an atom is called its mass number.

mass # = protons + neutrons

Isotopes are identified by their mass numbers.

For example, carbon has three isotopes—carbon-12, carbon-13, and carbon-14. Each isotope has a different number of neutrons.