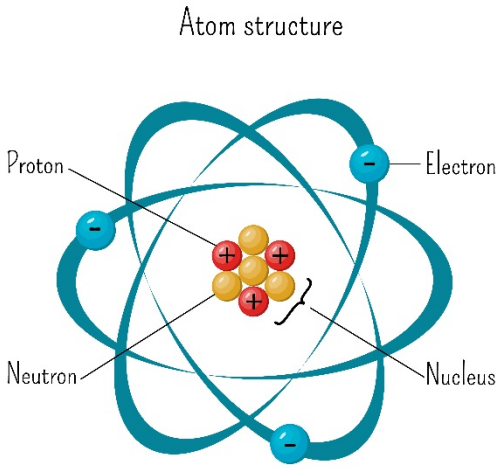
S4 The Atom

An atom is the very basic unit of all matter. The word “atom” comes from the Greek word “atomos”, which means something that cannot be divided. Atoms are extremely small and are made up of a few even smaller particles. Atoms fit together with other atoms to make up matter.

Atoms are different depending on the number of electrons, protons, and neutrons each atom contains. Each different kind of atom makes up an element. There are 92 natural elements and up to 118 when man-made elements are included.



Structure of the Atom

At the center of the atom is the nucleus. The nucleus is made up of the protons and neutrons. The electrons spin in orbits around the outside of the nucleus.

The Proton

The proton is a positively charged particle that is located at the center of the atom in the nucleus.

The Electron

The electron is a negatively charged particle that spins around the outside of the nucleus. Electrons spin so fast around the nucleus, scientists can never be 100% sure where they are located. If there are the same number of electrons and protons in an atom, then the atom is said to have a neutral charge. Electrons are attracted to the nucleus by the positive charge of the protons. Electrons are much smaller than neutrons and protons.

The Neutron

A neutron is a subatomic hadron particle that has no electrical charge. Its mass is slightly larger than that of a proton. The nucleus of every atom contains at least one neutron, with hydrogen-1 being the only exception. Neutrons bind with protons to stabilise the nucleus of an atom.

What else should I know?

- Together, protons and neutrons are referred to as “nucleons”.
- The number of protons in the nucleus of an atom is known as the atomic number. Each element has a different number of protons, so they have their own atomic number.

- An atom is classified by the number of neutrons and protons it has in its nucleus. The number of protons determines the chemical element while the number of neutrons determines the isotope of the element.
- An isotope is a variant contained in a chemical element. Isotopes have the same number of protons in each atom, but the neutron numbers can vary.
- An element is any substance that cannot be broken into two or more simpler substances. Four common elements are earth, air, water and fire.
- A chemical element is a substance that consists of a single type of atom. Chemical elements are divided into metals, metalloids and non-metals. Examples include carbon, nitrogen, oxygen, silicon, aluminum, iron, gold, lead, mercury, copper and arsenic. The lightest chemical elements include helium, hydrogen, lithium and beryllium. Any two atoms that have the same number of protons in their respective nucleus belong to the same chemical element.