

Atoms

Atoms consist of a central nucleus, composed of protons and neutrons, surrounded by electrons, orbiting in shells.

Particle	Relative Mass	Relative Charge
PROTON	1	+1
NEUTRON	1	0
ELECTRON	0.0005	-1



Atomic number (Proton number): the number of protons in the nucleus of an atom

Mass number (Nucleon number): the number of (protons + neutrons) in the nucleus of an atom

The number of protons in an atom equals the number of electrons – protons and electrons have equal but opposite charges and the atom has overall zero charge.

number of neutrons = mass number – atomic number

A lithium atom has 3 protons, 3 electrons and 4 neutrons.

The elements in the Periodic Table are arranged in order of increasing **atomic number**.

The group number in the Periodic Table - the number of electrons in the outer shell (except Group 0)
 The period number - number of occupied shells of electrons

Isotopes are different atoms of the same element with same number of protons but different number of neutrons in the nucleus. They have identical chemical properties (same number of electrons) and slightly different physical properties.

Relative atomic mass (A_r) – weighted average mass of the atoms of an element relative to the mass of $^{12}_6\text{C}$ of a carbon-12 atom.

Calculate the relative atomic mass of an element from the relative abundances of its isotopes

e.g. Calculate the A_r for Cl: ^{35}Cl (75%) ^{37}Cl (25%)

Assume there are 100 Cl atoms, 75 of them will have a mass of 35 and 25 of them will have a mass of 37.

$$A_r = \text{total mass} / \text{total number of atoms} = (75 \times 35 + 25 \times 37) / 100 = 35.5$$

Electrons are arranged in shells around the nucleus. The maximum number of electrons in each shell is:

shell	1	2	3	4
maximum number of electrons	2	8	8	>2

e.g. The electronic configuration of potassium is 2, 8, 8, 1.

The number of outer shell electrons (which is equal to the group number of an element) determines the chemical properties of an element.

