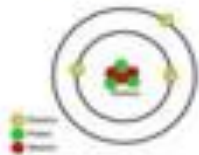


# C5 Atoms and the Periodic table

## The structure of the Atom

- All matter is made from atoms. Atoms are very small. The radius of atom is about  $1 \times 10^{-10}$  m (this is also known as 0.1 nanometres).
- The central part of the atom is known as the nucleus. It is only  $1 \times 10^{-14}$  m across, which is 10,000 times smaller than the total atom.
- An atom is made up of three subatomic particles: **protons, electrons and neutrons**.
- Protons and neutrons are found in the nucleus
- Electrons are found orbiting the nucleus in shells (also known as energy/levels).



- The mass and charges of the sub atomic particles is shown below:

	Mass	Charge
Proton	1	+1
Neutron	1	0
Electron	0	-1

- Atoms have **no overall charge** because they have the same number of positive protons as negative electrons.

## Atomic Number and Mass Number



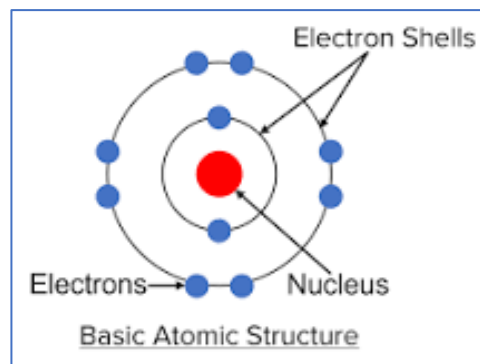
Mass number: This is the total of protons+neutrons

Atomic number: This is the number of protons

Therefore sodium has 11 protons, 11 electrons and  $23-11=12$  neutrons

[Structure of the atom - Atomic structure - AQA - GCSE Combined Science Revision - AQA Trilogy - BBC Bitesize](#)

Key Terms	Definitions
Atom	The particles that make up all substances with mass, they contain protons, neutrons and electrons.
Nucleus	The centre of an atom, it contains protons and neutrons.
Nanometre	A unit of measurement: $1 \times 10^{-9}$ m
Proton	A sub atomic particle found in the nucleus, it has a charge of +1 and a relative mass of 1.
Electron	A sub atomic particle found in the shells of an atom, it has a charge of -1 and a negligible mass
Subatomic	These are the smaller particles that make up an atom
Neutron	A sub atomic particle found in the nucleus of an atom, it has a charge of 0 and a mass of 1
Atomic Number	The number of protons in an atom.
Mass Number	The total of protons and neutrons in an atom.



## Electron Configuration

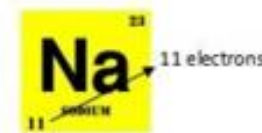
There are very strict rules about how electrons fill up the electron shells, the inner shell is always filled first. Each shell has a maximum number of electrons it can take.

Shell 1: maximum 2 electrons

Shell 2: maximum 8 electrons

Shell 3: maximum 8 electrons

Example:



The electronic configuration of Sodium (Na) can also be written like this 2,8,1. This shows there is 2 electrons in the 1st shell, 8 electrons in the second shell and 1 electron in the 3rd shell.

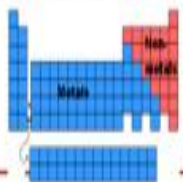
[GCSE Core Chemistry \(C1\) Drawing Atoms - YouTube](#)

# Groups in the Periodic Table

	Physical Properties	Chemical Properties	Equation	Trends/ Explanation
Group 1 (Alkali metals)	Soft, low density.	React vigorously with water releasing Hydrogen	Sodium + Water $\rightarrow$ Sodium Hydroxide + Hydrogen $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$	More reactive as you go down, outermost electron further from the nucleus so its easier to lose
Group 7 (Halogens)	Low melting point, exist as pair (O <sub>2</sub> )	React with group 1 metals to form compounds. Can carry out displacement reactions	Sodium + Chloride $\rightarrow$ Sodium Chloride Sodium Bromide + Chlorine $\rightarrow$ Sodium Chloride + Bromine	Higher melting point as you go down the group, (higher molecular mass). Less reactive as you go down the group
Group 0 Noble gases	Low melting point/boiling point. Eight electrons in outer shell (except Helium)	Unreactive as they have a full outer shell	N/A	Higher melting point and boiling point as you go down the group (due to increase in density)

## Metals and Non-Metals

- Metals are found on the left hand side of the Periodic Table, the majority of elements are metals.
- When metals react, they lose an electron to form positive ions.
- Non metals gain electrons to form a negative charge.



Key Terms	Definitions
Dimitri Mendeleev	A Russian Chemist, who in 1869 published a Periodic Table containing gaps
Periodic Table	The table which organises the 118 elements based on atomic structure
Isotope	Two atoms with the same number of protons and electrons but a different number of neutrons
Metal	An element which loses electrons to form a positive charge
Non Metal	An element which gains electrons to form a negative charge
Ion	An element with a positive or negative charge.

Key Terms	Definitions
Element	A substance that only contains one type of atom
Mixture	A mixture is two or more different atoms which are not chemically bonded-can be separated
Compound	Two or more elements that are chemically bonded
Group	The columns on the Periodic Table
Period	The rows on the Periodic Table
Reactant	What you start with in a chemical reaction
Product	What is made in chemical reaction

[AQA GCSE Chemistry Development of the Periodic Table – YouTube](#)

[Mendeleev's periodic table - The periodic table - AQA - GCSE Chemistry \(Single Science\) Revision - AQA - BBC Bitesize](#)