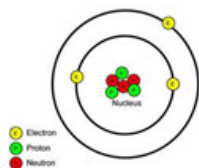


Chemistry Knowledge Organiser

Topic: Atomic Structure and the Periodic Table

The structure of the Atom

- All matter is made from atoms, atoms are very small. The radius of an atom is about 1×10^{-10} m (this is also known as 0.1 nanometres).
- The central part of the atom is known as the nucleus. It is only 1×10^{-14} m, 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*).

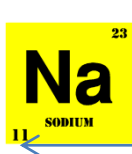


- The mass and charges of the subatomic particles is shown below:

	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

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 1×10^{-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

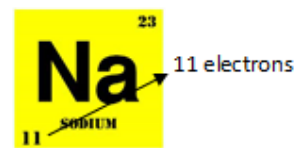
There are very strict rules about how electrons fill up the electron shells, the inner shell is always filled first. Each shell has a maximum number of electrons it can take.

Shell 1: maximum 2 electrons

Shell 2: maximum 8 electrons

Shell 3: maximum 8 electrons

Example:



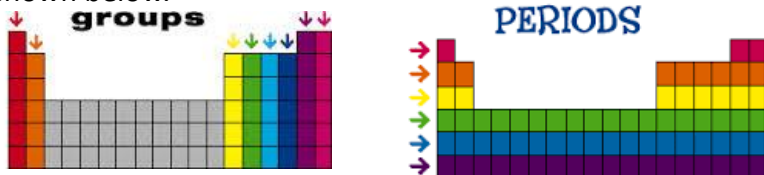
The electronic configuration of Sodium (Na) can also be written like this 2,8,1. This shows there is 2 electrons in the 1st shell, 8 electrons in the second shell and 1 electron in the 3rd shell.

Chemistry Knowledge Organiser

Topic : Atomic Structure and the Periodic Table

Elements

- An **element** contains only one type of atom, all elements are given a symbol and are found on the Periodic Table. You need to learn the symbols for the first 20.
- The Periodic Table is arranged into groups (columns) and periods (rows), as shown below.



Elements in the same group have:

- The same number of electrons in their outer shell
- Similar properties

Elements in the same period have:

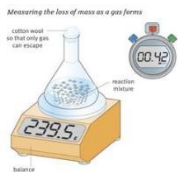
- The same number of electron shells

Compounds

- Compounds are 2 or more elements that are chemically bonded
- These are made in chemical reactions.
- Compounds are given a formula for example carbon dioxide is CO_2 means 1 carbon atom and 2 oxygen atoms.
- Another example is calcium hydroxide $\text{Ca}(\text{OH})_2$ which means 1 calcium, 2 oxygen atoms and 2 hydrogen atoms

Chemical Reactions

- In some chemical reactions it may appear that there are less products than there were reactants, however this is often because a gas has been made and this has gone into the atmosphere



Key Terms	Definitions
Element	A substance that contains only one type of atoms
Mixture	A mixture is two or more different atoms which are not chemically bonded
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 a chemical reaction

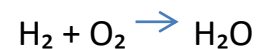
The Conservation of Mass

- In a chemical reaction, chemical bonds are broken the atoms are rearranged and the **chemical bonds** are made again.
- In a chemical reaction, **mass is never lost**, you must start and finish with the same mass.



Balancing Equations

- We need to write balanced chemical equations represent chemical reactions and the conservation of mass.
- For example: The equation below shows hydrogen and oxygen making water but there are more oxygen atoms on the right than the left.



- In the equation below there are 4 hydrogen atoms on the left and right of the equation and 2 oxygen atoms on each side

