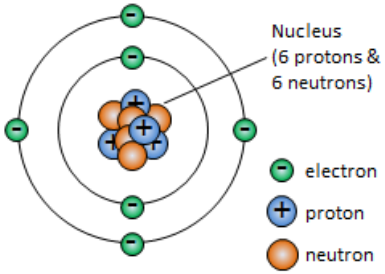
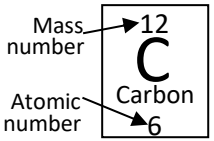
C1: Atoms, Elements and Compounds

Atomic Structure



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



Radius of an atom = 0.1nm (1×10^{-10}m)

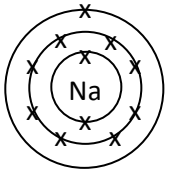
Radius of nucleus = 1×10^{-14}m (1/10,000 of an atom)

The **atomic number** is the number of **protons**.

The number of **electrons** = number of protons.

The number of **neutrons** = mass number – atomic number.

Electron Configuration



2,8,1

Atoms can have a **maximum** of **2** electrons in the first shell, **8** in the second and **8** in the third.

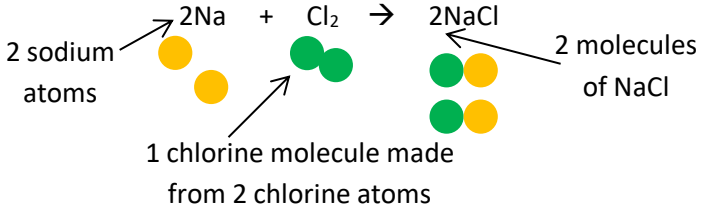
You must **fill each shell** before moving onto the next one.

Element – a group of the same type of atoms (ie. have the same atomic mass)

Compound – two or more different elements chemically joined.

Mixture – different types of molecules that are not chemically joined.

Chemical Equations



Isotopes

Different forms of the same element.

Have the **same number of protons** but **different number of neutrons**.

Have the same atomic number but different mass numbers

$$\text{Relative atomic mass} = \frac{\text{sum of (isotope abundance x isotope mass number)}}{\text{sum of abundances of all isotopes}}$$

Compounds

Elements are held together by **chemical bonds.**

Bonds are made by taking, giving or sharing electrons.

Properties usually **different** from the original elements. Difficult to separate the original elements.

Separation Techniques

REQUIRED PRACTICAL
SEE PRACTICAL SHEET FOR DETAIL

Chromatography – separates out different colours in ink. An Rf value can be calculated to compare inks.

Filtration – Separates a solid from a liquid.

Crystallisation – Separates out a solid that has dissolved in a liquid. The liquid evaporates leaving behind the solid.

Distillation – Separates out liquids that have different boiling points.

Balancing Equations

The same number of atoms of each element are needed on each side of an equation:

$H_2 + O_2 \rightarrow H_2O$ — 2 hydrogens on each side ✓; 2 oxygens on left, one on right ✗

$H_2 + O_2 \rightarrow 2H_2O$ — 2 hydrogens on left, four on right ✗; 2 oxygens on each side ✓

Multiply by the big number

$2H_2 + O_2 \rightarrow 2H_2O$ — 4 hydrogens on each side ✓; 2 oxygens on each side ✓