Writing Chemical Formulas

Valence

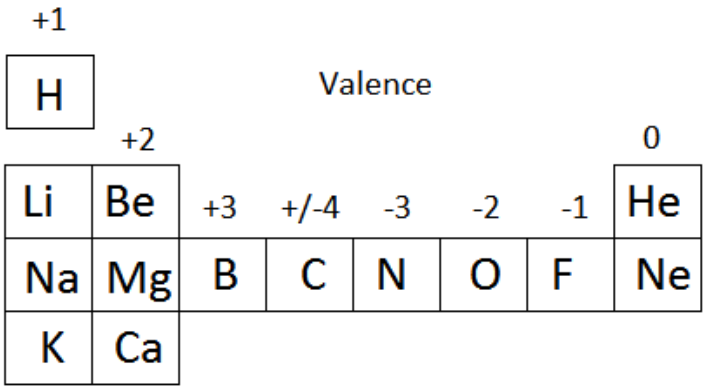
The valence of an element is another word for the amount of electrons an element can lose or gain to achieve a stable number (usually 8) in its outer shell.

We can signify loss with a + sign and gain with a – sign, to indicate the charges the atoms take on when they lose or gain these electrons.

For example, the valence of:
a) Oxygen, is 2-
b) Lithium, is 1+
c) Carbon, is 4- (The element is a non-metal, meaning it needs to gain electrons)

Metals lose electrons and non-metals gain electrons to be stable.

You might have noticed this through the booklet that you can see there is a slight pattern to the valency of elements. You may have noticed that the periodic table is useful in finding the valency of certain elements.



Anything under each group (column downwards) has different valences. For example, K, potassium, has a valence of +1, while Fluorine has a valence of -1.

Polyatomic Ions

Polyatomic ions, also known as radicals, are **charged groups of atoms**. They can represent a normal ion, but it is grouped. This means that brackets must be placed around the group of atom symbols to emphasise that the whole group has a charge. This is especially required when you need more than one polyatomic ion.

Here are some important polyatomic ions that should be memorised. Remember, they are charged, so you will need to memorise their charges too. Note that ammonium is the only positively charged polyatomic ion.

Formula	Charge	Name	Formula	Charge	Name
CO_3^{2-}	2-	Carbonate	SO_4^{2-}	2-	Sulphate
OH^-	1-	Hydroxide	PO_4^{3-}	3-	Phosphate
NO_3^-	1-	Nitrate	NH_4^+	1+	Ammonium

Naming Ionic Compounds

Ionic compounds always have **two-part names**. The name of the positive ion, the metal, goes first. The positive ion has the same name as its atom. For example, in NaCl, the first part is 'sodium'. The name of the negative ion comes second, but the ending is changed to 'ide'. In NaCl, this is 'chloride'. Thus, NaCl would be called 'sodium chloride'.

Naming Covalent Compounds

To name covalent compounds, the name of the non-metal with the lowest electron affinity[1] comes first, and then the ending of the name of the second non-metal is changed to 'ide'. Prefixes are added to indicate the number of atoms of each non-metal. For example, in CO_2, the first non-metal is 'carbon', and the second is 'oxygen', but changed to 'di-oxide'. Thus, CO_2 is 'carbon dioxide'.

Atom Number	1	2	3	4	5	6	7	8	9
Prefix	mono	di	tri	tetra	penta	hexa	hepta	octa	nona

Some More Examples

Ionic Compounds

$CaCO_3$	Calcium Carbonate
KCl	Potassium Chloride
$FeSO_4$	Iron Sulphate
LiBr	Lithium Bromide

Covalent Compounds

N_2O_5	Dinitrogen pentaoxide
PCl_3	Phosphate tetrachloride
SiO_2	Silicon dioxide
KBr_3	Potassium tribromide

[1] Electron Affinity is the energy released when an electron is added to an atom. The higher, and more left an element is, the lower the electron affinity.