Introduction

In the previous class, you have read about physical an chemical changes. Chemical changes result from chemical reaction taking placed between substances. In this chapter we shall deal with the chemical reactions and their representation in the form of chemical equations.

The processes in which a substance or substances undergo change to produce new substances with new properties are known as chemical reactions. for example, when calcium carbonate is heated, calcium oxide (lime) and carbon dioxide are formed. The breaking up of calcium carbonate into calcium oxide and carbon dioxide is, thus, a chemical reaction because calcium carbonate changes into new substances, calcium oxide and carbon dioxide.

Reactant :

The substance which takes part in a chemical reaction is called reactant. For example, in the breaking up of calcium carbonate into calcium oxide and carbon dioxide, calcium carbonate is the reactant. Similarly, sodium and water are the reactants when they react.

Product :

A product is a new substance formed in a chemical reaction. For example, hydrogen and sodium hydroxide are the products of the reaction between sodium and water.

$$\underset{\text{sodium}}{Na} + \underset{\text{water}}{H_2O} \rightarrow \underset{\text{sodiumhydroxide}}{NaOH} + \underset{\text{hydrogen}}{H_2}$$

Similarly, in the breaking up of calcium carbonate, calcium oxide and carbon dioxide are the products.

$$\underset{\text{calciumcarbonate}}{CaCO_3} \rightarrow \underset{\text{calciumoxide}}{CaO} + \underset{\text{carbondioxide}}{CO_2}$$

You know, atoms in a molecule are held together by a force of attraction called bond. The molecules do not participate directly in a chemical reaction. First they break down into atoms and these atoms then take part in the reaction. New bonds are formed between the atoms to form the products. That is, there take place rearrangement or regroupings of atoms in various ways to give products. For example, when ammonium cyanate is heated, different bonds in ammonium cyanate molecules are broken and new bonds are formed to produce urea.

$$\underset{\text{ammoniumcyanate}}{H_4N-N=C=O} \rightleftharpoons \underset{\text{urea}}{H_2N-\overset{\overset{O}{\|}}{C}-NH_2}$$

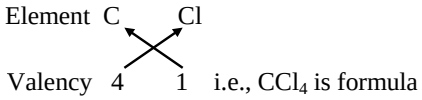
Here, we see that the molecular formulae of both ammonium cyanate and urea are the same, but their properties are quite different and they are two different compounds. Such compounds are

known as isomers of each other and the reactions that produce such isomers are called isomerization reactions.

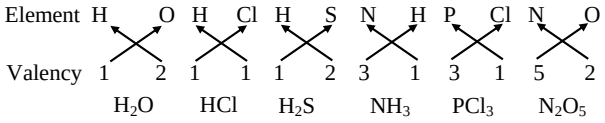
Valency :

The number of electrons shared by an atom is called its valency. It is also called the combining capacity of an atom, e.g., Cl atom can share one valence electron, its valency is 1, Oxygen can share two valence electrons, its valency is 2. Nitrogen can share 3 valence electrons, its valency is 3, Carbon can share 4 valency electrons, therefore its valency is 4 and so on.

It means if carbon combines with Chlorine, Carbon will share four valence electrons with four chlorine atoms, therefore the molecular formula of the covalent compound will be



Some more examples are :



Some Common Monoatomic Ions

+1 Charge	Formula	+2Charge	Formula	+3 Charge	Formula
Name of ion		Name of ion		Name of ion	
Copper ion	Cu^+	Barium ion	Ba^{2+}	Aluminium ion	Al^{3+}
(Cuprous ion)		Cobalt ion	Co^{2+}	Auric ion	Au^{3+}
Potassium ion	K^+	Strontium ion	Sr^{2+}	Chromium (III) ion	Cr^{3+}
Silver ion	Ag^+	Iron (II) ion	Fe^{2+}	Iron (III) ion	Fe^{3+}
		(Ferrous ion)		(Ferric ion)	
Sodium ion	Na^+	*Copper (II) ion	Cu^{2+}	Scandium ion	Sc^{3+}
Lithium ion	Li^+	*Lead (II) ion	Pb^{2+}	Arsenic ion	As^{3+}
		Cadmium ion	Cd^{2+}	Bismuth ion	Bi^{3+}
		Magnesium ion	Mg^{2+}	Antimony ion	Sb^{3+}
Aurous	Au^+	Manganese (II) ion	Mn^{2+}		
		*Mercury (I) ion	Hg_2^{2+}		
		Zinc ion	Zn^{2+}		

– 1 Charge	Formula	– 2Charge	Formula	– 3 Charge	Formula
Name of ion		**Name of ion**		**Name of ion**	
Bromide ion	Br^-	Oxide ion	O^{2-}	Nitride ion	N^{3-}
Chloride ion	Cl^-	Sulphide ion	S^{2-}	Phosphide ion	P^{3-}
Fluoride ion	F^-			Boride ion	B^{3-}
Iodide ion	I^-				

- These elements show more than one valency. So a Roman numeral shows their valency in a bracket.

Some Common Polyatomic Ions

– 1 Charge	Formula	– 2Charge	Formula	– 3 Charge	Formula
Name of ion		**Name of ion**		**Name of ion**	
Hydrogen carbonate or bicarbonate ion	HCO_3^-	Carbonate ion Manganate ion	CO_3^{2-} MnO_4^{2-}	Phosphate ion Arsenate ion	PO_4^{3-} AsO_4^{3-}
Hydrogen sulphate or (bisulphate ion)	HSO_4^-	Thiosulphate ion Silicate ion	$S_2O_3^{2-}$ SiO_3^{2-}	Arsenite ion	AsO_3^{3-}
Hydroxide ion	OH^-	Sulphate ion	SO_4^{2-}	Phosphite ion	PO_3^{3-}
Nitrate ion	NO_3^-	Sulphite ion	SO_3^{2-}		
Chlorate ion	ClO_3^-	Chromate ion	CrO_4^{2-}	Borate ion	BO_3^{3-}
Nitrite ion	NO_2^-	Dichromate ion	$Cr_2O_7^{2-}$	Ferricyanide ion	$[Fe(CN)_6]^{3-}$
Permanganate ion	MnO_4^-	Hydrogen phosphate ion	HPO_4^{2-}		
Acetate ion	CH_3COO^-	Oxalate ion	$C_2O_4^{2-}$		
Cyanide ion	CN^-				
Hypophosphite ion	$H_2PO_2^-$				– 4 Charge
Meta aluminate ion	AlO_2^-			Carbide ion	C^{4-}
	+1 Charge			Ferrocyanide ion	$[Fe(CN)_6]^{4-}$
Ammonium ion	NH_4^+				