TYPES OF REACTIONS

Most chemical reactions can be grouped into five categories:

- synthesis
- decomposition
- combustion
- single displacement
- double displacement

SYNTHESIS

- ⇨ Involves the combination of smaller atoms and /or molecules into larger molecules
- ⇨ Two or more reactants combine to make one product
- ⇨ The general equation for a synthesis reaction is: $A + B \rightarrow AB$
- ⇨ Examples:

$$H_2 + I_2 \rightarrow 2\ HI$$

$$2\ Na + Cl_2 \rightarrow 2\ NaCl$$

$$HCl + NH_3 \rightarrow NH_4Cl$$

DECOMPOSITION

- ⇨ Opposite to synthesis
- ⇨ Involves the splitting of a large molecule into elements or smaller molecules
- ⇨ One reactant breaks apart into two or more products
- ⇨ The general equation for a decomposition reaction is: $AB \rightarrow A + B$
- ⇨ Examples:

$$2\ H_2O \rightarrow 2\ H_2 + O_2$$

$$NH_4NO_3 \rightarrow N_2O + NH_3$$

$$2\ HCl \rightarrow H_2 + Cl_2$$

COMBUSTION

- ⇨ Involves a compound that is made up of carbon and hydrogen – called a hydrocarbon.
- ⇨ The hydrocarbon reacts with oxygen (O_2)
- ⇨ ALWAYS produces carbon dioxide and water

- ⇨ The general equation for a double displacement reaction is:

$$C_xH_y + O_2 \rightarrow CO_2 + H_2O$$

Examples

$$CH_4 + O_2 \text{ ---> } CO_2 + H_2O$$

$$C_2H_6 + O_2 \text{ ---> } CO_2 + H_2O$$

SINGLE DISPLACEMENT

- ⇨ Involves one element replacing or displacing a second element in a compound
- ⇨ A metal element will only displace a metal in a compound.
- ⇨ A non-metal will only displace a non-metal in a compound.
- ⇨ The general equation for a single displacement reaction is:

$$A + XY \rightarrow AY + X \text{ (where A is a metal)}$$

e.g. $2\ Na + ZnCl_2 \rightarrow 2\ NaCl + Zn$

$$B + XY \rightarrow XB + Y \text{ (where B is a non-metal)}$$

e.g. $2\ NaCl + F_2 \rightarrow 2NaF + Cl_2$

- ⇨ Examples:

$$3\ CuCl_2 + 2\ Al \rightarrow 2\ AlCl_3 + 3\ Cu$$

$$Br_2 + CaI_2 \rightarrow I_2 + CaBr_2$$

DOUBLE DISPLACEMENT

- ⇨ Involves both elements in different compounds displacing each other or exchanging places.
- ⇨ The metals switch places and the non-metals switch places
- ⇨ Analogy - two couples dancing and they switch partners

- ⇨ The general equation for a double displacement reaction is:

$$AB + XY \rightarrow AY + XB$$

- ⇨ Examples:

$$2\ FeCl_3 + 3\ Na_2S \rightarrow 6\ NaCl + Fe_2S_3$$

$$AgNO_3 + NaCl \rightarrow NaNO_3 + AgCl$$

$$Pb(NO_3)_2 + 2\ KI \rightarrow 2\ KNO_3 + PbI_2$$

TYPES OF REACTIONS

Most chemical reactions can be grouped into five categories:

-
-
-
-
-

SYNTHESIS

- ⇨ Involves the combination of smaller atoms and /or molecules into larger molecules
- ⇨ Two or more reactants combine to make one product
- ⇨ The general equation for a synthesis reaction is: $A + B \rightarrow AB$
- ⇨ Examples:

DECOMPOSITION

- ⇨ Opposite to synthesis
- ⇨ Involves the splitting of a large molecule into elements or smaller molecules
- ⇨ One reactant breaks apart into two or more products
- ⇨ The general equation for a decomposition reaction is: $AB \rightarrow A + B$
- ⇨ Examples:

COMBUSTION

- ⇨ Involves a compound that is made up of carbon and hydrogen – called a hydrocarbon.
- ⇨ The hydrocarbon reacts with oxygen (O_2)
- ⇨ ALWAYS produces carbon dioxide and water

- ⇨ The general equation for a double displacement reaction is:

$$C_xH_y + O_2 \rightarrow CO_2 + H_2O$$

Examples

SINGLE DISPLACEMENT

- ⇨ Involves one element replacing or displacing a second element in a compound
- ⇨ A metal element will only displace a metal in a compound.
- ⇨ A non-metal will only displace a non-metal in a compound.
- ⇨ The general equation for a single displacement reaction is:

$$A + XY \rightarrow AY + X \text{ (where A is a metal)}$$

$$B + XY \rightarrow XB + Y \text{ (where B is a non-metal)}$$

- ⇨ Examples:

DOUBLE DISPLACEMENT

- ⇨ Involves both elements in different compounds displacing each other or exchanging places.
- ⇨ The metals switch places and the non-metals switch places
- ⇨ Analogy - two couples dancing and they switch partners

- ⇨ The general equation for a double displacement reaction is:

$$AB + XY \rightarrow AY + XB$$

- ⇨ Examples: