**Seven Things That Indicate a Chemical Change Is Occurring**

* Gas Bubbles Appear. Gas bubbles appear after a chemical reaction has occurred and the mixture becomes saturated with gas. ...
* Formation of a Precipitate. ...
* Color Change. ...
* Temperature Change. ...
* Production of Light. ...
* Volume Change. ...
* Change in Smell or Taste.
* Rust on metal

**Types of Chemical Reactions**

The vast number of chemical reactions can be classified in any number of ways. Under one scheme they can be categorized either as oxidation-reduction (electron transfer) reactions or non-oxidation-reduction reactions. Another completely different but common classification scheme recognizes four major reaction types:

(1) combination or synthesis reactions

(2) decomposition reactions

(3) substitution or single displacement reactions

(4) metathesis or double displacement reactions

(5) combustion – hydrocarbon is burned using oxygen

**The Five Major Types of Reactions**

**Name General Reaction Pattern**

Synthesis A + B ----> AB

Decomposition AB ----> A + B

Substitution or Single Displacement A + BC ----> B + AC

Metathesis or Double Displacement AB + CD ----> AD + CB

Combination or Synthesis Reactions: Two or more reactants unite to form a single product.

S + O2 ---------> SO2

sulphur oxygen sulphur dioxide

2 S + 3 O2 ---------> 2 SO3

sulphur oxygen sulphur trioxide

2 Fe + O2 ---------> 2 FeO

iron oxygen iron (II) oxide

Decomposition Reactions A single reactant is decomposed or broken down into two or more

products.

CaCO3 ----------> CaO + CO2

calcium carbonate calcium oxide carbon dioxide

2 H2O -----------> 2 H2 + O2

water hydrogen oxygen

2 KClO3 -----------> 2 KCl + 3 O2

potassium chlorate potassium chloride oxygen

Substitution or Single Replacement Reactions A single free element replaces or is substituted for one of the elements in a compound. The free element is more reactive than the one its replaces.

Zn + 2 HCl ----------> H2 + ZnCl2

zinc hydrochloric acid hydrogen zinc chloride

Cu + 2 AgNO3 -----------> 2 Ag + Cu(NO3)2

copper silver nitrate silver copper (II) nitrate

H2 + 2 AgNO3 -----------> 2 Ag + 2 HNO3

hydrogen silver nitrate silver nitric acid

2 Na + 2 H2O -----------> 2 NaOH + H2

sodium water sodium hydroxide hydrogen

Metathesis or Double Displacement Reactions This reaction type can be viewed as an "exchange of partners." For ionic compounds, the positive ion in the first compound combines with the negative ion in the second compound, and the positive ion in the second compound combines with the negative ion in the first compound.

HCl + NaOH -----------> NaCl + HOH

hydrochloric sodium sodium water

acid hydroxide chloride

BaCl2 + 2 AgNO3 ----------> 2 AgCl + Ba(NO3)2

barium silver silver barium

chloride nitrate chloride nitrate

(precipitate)

CaCO3 + 2 HCl -----------> CaCl2 + H2CO3

calcium hydrochloric calcium carbonic

carbonate acid chloride acid

Combustion reactions

Hydrocarbon (Fuel) +O2 🡪 CO2 + H20

Also get heat and light energy.

These are exothermic reactions. It takes a little activation energy to get the fire going but once you have it, there is more heat (therm) exiting (exo) than you had to put into it.

*Reactions have to be balanced using coefficients because of the Law of Conservation of Matter and the Law of Conservation of Mass. Neither can be created nor destroyed. The number of atoms and bonds in the reactants has to be the same as the number of atoms and bonds in the products!*

<http://www2.ucdsb.on.ca/tiss/stretton/CHEM1/stoich2.html>