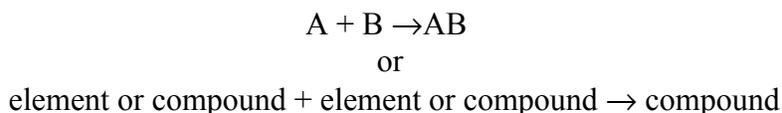


Types of Chemical Reactions

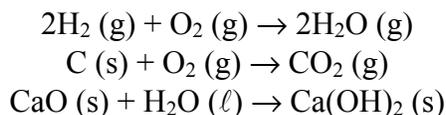
Chemists have identified millions of different compounds, so there must be millions of different chemical reactions to form them. When scientists are confronted with an overwhelming number of things, they tend to classify them into groups, in order to make them easier to study and understand. One popular classification scheme for chemical reactions breaks them up into five major categories or types. Some of these types have been given more than one name, so you need to learn them all. You need to recognize each name, as you may encounter different names in different places.

Types of Chemical Reactions:

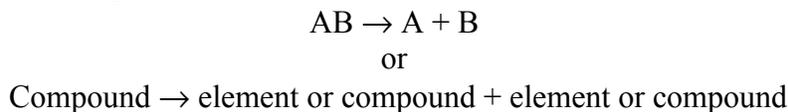
1. **Synthesis** (Combination) - A synthesis reaction involves two or more substances combining to make a more complex substance. The reactants may be elements or compounds, and the product will always be a compound. The general formula for this type of reaction can be shown as:



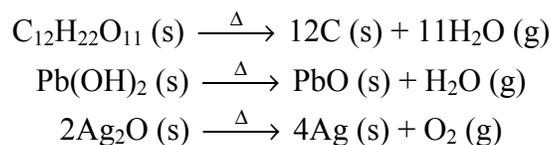
Some examples of synthesis reactions are shown below;



2. **Decomposition** (Analysis) - In a decomposition reaction, one substance is broken down (often by heating) into two or more, simpler substances. This type of reaction is the opposite of a synthesis reaction, as shown by the general formula below:

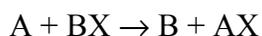


Some examples of decomposition reactions are shown below:

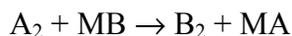


3. **Single Replacement** (also called Single Displacement) - In this type of reaction, a neutral element becomes an ion as it replaces another ion in a compound. The general forms of this equation can be written as:

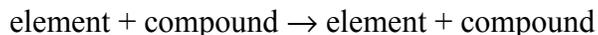
Type I: metal or H₂ (A) replaces metal ion or H⁺ (B)



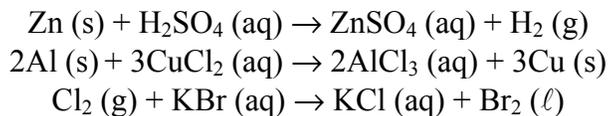
Type II: halogen (A₂) replaces halide ion (B):



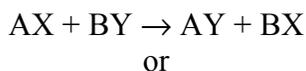
In either case we have:



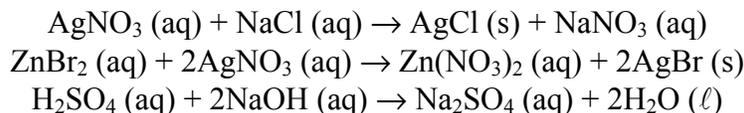
Some examples of single displacement reactions are shown below (note whether the positive ion or negative ion is being replaced):



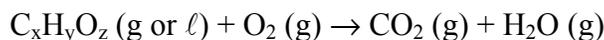
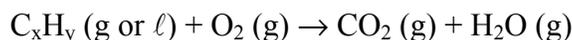
4. **Double Replacement** (also called Double Displacement) - Like dancing couples, the ionic compounds in this type of reaction exchange partners. The basic form for this type of reaction is shown below:



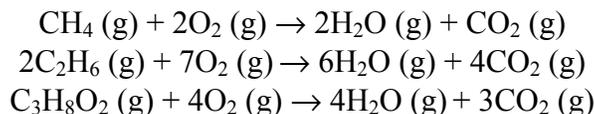
Some examples of double displacement reactions are shown below:



5. **Combustion** – Any element reacting with O_2 to form its oxide can be considered combustion. Usually, though, we think of organic compounds burning as fuel as combustion reactions. When organic compounds like propane (a hydrocarbon, which is a compound containing carbon and hydrogen) are burned, they react with the oxygen in the air to **form carbon dioxide and water**. The reason why these combustion reactions will stop when all available oxygen is used up is because oxygen is one of the reactants. The basic form of the combustion reaction is shown below:



Some examples of combustion reactions are:



When any element reacts with oxygen at high temperature, it is both a combustion reaction and a synthesis reaction:

