

Classification of Chemical Reactions

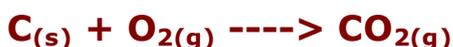
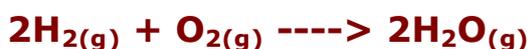
Chemists have identified millions of different compounds, so there must be millions of different chemical reactions to form them. When scientists are confronted with an overwhelming number of things, they tend to classify them into groups, in order to make them easier to study and understand. One popular 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. Even if your teacher prefers one name over another, you need to recognize each name, as you may encounter different names in different places.

Types of Chemical Reactions:

1. **Synthesis** (also called Direct 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** (also called Analysis) - In a decomposition reaction, one substance is broken down into two or more, simpler substances. This type of reaction is the opposite of a synthesis reaction, as shown by the general formula below;



or

Compound -----> element or compound + element or compound

Some examples of decomposition reactions are shown below;



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

In the case of a positive ion being replaced: $\text{A} + \text{BC} \text{ ----> B} + \text{AC}$

or

In the case of a negative ion being replaced: $\text{A} + \text{BC} \text{ ----> C} + \text{BA}$

in either case we have;

element + compound ----> element + compound

Some examples of single displacement reactions are shown below:



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



or



Some examples of double displacement reactions are shown below;



5. Combustion - When organic compounds like propane 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;

