# Types of Chemical Reactions PowerPoint 6.1 

## Six Common Types of Reactions to Know

1. Synthesis (Combination) Reactions
2. Decomposition Reactions
3. Single Replacement
4. Double Replacement
5. Neutralization (Acid-Base) Reactions
6. Combustion Reactions

## 1. Synthesis (Combination) Reaction

The elements can be either metals or non-metals
Metals transfer electrons to non-metals to form an ionic compound

$$
\begin{aligned}
& 2 \mathrm{Li}+\mathrm{F}_{2} \rightarrow 2 \mathrm{LiF}
\end{aligned}
$$

Metal + Non-metal $\rightarrow$ Ionic Compound
Non-metals can also react to form covalent compounds, molecules.

$$
2 \mathrm{~N}_{2}+\mathrm{O}_{2} \rightarrow 2 \mathrm{~N}_{2} \mathrm{O}
$$

## 2. Decomposition Reaction

$$
\mathrm{AB} \rightarrow \mathrm{~A}+\mathbb{B}
$$

Generally, compound $\rightarrow$ element + element
> The reverse of a synthesis reaction



$$
\text { Example, } 2 \mathrm{H}_{2} \mathrm{O} \rightarrow \mathrm{O}_{2}+2 \mathrm{H}_{2}
$$

In the decomposition of an ionic compound, electrons are transferred back to the metal, leaving neutral elements as products.

Example, $2 \mathrm{NaCl} \rightarrow 2 \mathrm{Na}+\mathrm{Cl}_{2}$

## 3. Single Replacement Reaction

$$
\begin{aligned}
& \mathrm{A}+\mathrm{CB} \rightarrow \mathrm{~B}+\mathrm{AC} \\
& \mathrm{~A}+\mathrm{CB} \rightarrow \mathrm{C}+\mathrm{AB}
\end{aligned}
$$

Generally, element + compound $\rightarrow$ element + compound
$>$ One of the elements in the compound is replaced by another element.

$$
\text { Example, } 2 \mathrm{Al}+3 \mathrm{CuCl}_{2} \rightarrow 3 \mathrm{Cu}+2 \mathrm{AlCl}_{3}
$$

Example, $\mathrm{F}_{2}+2 \mathrm{NaI} \rightarrow \mathrm{I}_{2}+2 \mathrm{NaF}$

## 4. Double Replacement Reaction

$$
\mathrm{AB}_{(\mathrm{aq})}+\mathrm{CD}_{(\mathrm{aq})} \rightarrow \mathrm{AC}_{(\mathrm{s})}+\mathrm{BD}_{(\mathrm{aq})}
$$

Usually involves two ionic solutions that react to produce two other ionic compounds.

One of the new compound often forms a precipitate.

An insoluble solid

## 5. Neutralization (Acid-Base) Reaction



$$
\text { Acid }+ \text { Base } \rightarrow \text { Water }+ \text { Salt }
$$

Example, $\mathrm{HCl}+\mathrm{NaOH} \rightarrow \mathrm{H}_{2} \mathrm{O}+\mathrm{NaCl}$

## 6. Combustion Reaction

Generally, Organic Compound + Oxygen $\rightarrow$ Carbon dioxide + Water


The rapid reaction of a compound or element with oxygen to form an oxide and to produce heat.

$$
\text { Example, } \mathrm{CH}_{4}+2 \mathrm{O}_{2} \rightarrow \mathrm{CO}_{2}+2 \mathrm{H}_{2} \mathrm{O}
$$

## Summary

1. Synthesis (Combination) Reactions

$$
\text { element + element } \rightarrow \text { compound }
$$

2. Decomposition Reactions

$$
\text { compound } \rightarrow \text { element + element }
$$

3. Single Replacement

$$
\mathrm{A}+\mathrm{CB} \rightarrow \mathrm{~B}+\mathrm{AC} \text { or } \mathrm{A}+\mathrm{CB} \rightarrow \mathrm{C}+\mathrm{AB}
$$

4. Double Replacement

$$
\mathrm{AB}_{(\mathrm{aq})}+\mathrm{CD}_{(\mathrm{aq})} \rightarrow \mathrm{AC}_{(\mathrm{s})}+\mathrm{BD}_{(\mathrm{aq})}
$$

5. Neutralization (Acid-Base) Reactions

$$
\mathrm{HX}+\mathrm{MOH} \rightarrow \mathrm{H}_{2} \mathrm{O}+\mathrm{MX}
$$

6. Combustion Reactions

Organic Compound $+\mathrm{O}_{2} \rightarrow \mathrm{CO}_{2}+\mathrm{H}_{2} \mathrm{O}$

