

Reactions Involving a Transfer of Electrons

Major Types of Chemical Reactions and Evidence of a Reaction:

B. Oxidation-Reduction Reactions (Transfer of electrons. Oxidation numbers change) *Chapter 8*

- Recall that metals lose e^- (cation) and non-metals gain e^- (anion).
- Clues; Metal and Non-metal to produce an ionic compound, rusting, fuel burning, thermite!
- Review of periodic table: major trends of ions

Column I	Column II	Column III		Column VI	Column VII
Lose 1 electron	Lose 2 electrons	Lose 3 electrons		Gain 2 electrons	Gain 1 electron
$+1$ cation	$+2$ cation	$+3$ cation		-2 anion	-1 anion

- Synthesis (Combination):** 2 pure elements or small compounds that create a larger compound on the product side.
 Ex. $2 \text{Na}_{(s)} + \text{Cl}_{2(g)} \rightarrow 2 \text{NaCl}_{(s)}$, Uncharged neutral atoms develop a charge in compound.
 Demo: Write for burning of magnesium ribbon with phase notation: $\text{Mg}_{(s)} + \text{O}_{2(g)} \rightarrow \text{MgO}_{(s)}$
- Decomposition (Analysis):** A compound (never an element) is broken down into simpler substances, usually accomplished with heat or electric current.
 Ex. $2 \text{HgO}_{(s)} \rightarrow 2 \text{Hg}_{(l)} + \text{O}_{2(g)}$
 Demo: Write for decomposition by heating of KClO_3 . $2 \text{KClO}_{3(s)} \rightarrow 2 \text{KCl}_{(s)} + 3 \text{O}_{2(g)}$
- Combustion:** Involve oxygen and produce heat so rapidly that a flame results.
 Ex. $\text{CH}_{4(g)} + 2\text{O}_{2(g)} \rightarrow \text{CO}_{2(g)} + 2\text{H}_2\text{O}_{(g)}$
 Demo: Gummy Bear into the hot KCl / O_2 from decomposition.
 $\text{C}_6\text{H}_{12}\text{O}_6(s) + 6\text{O}_{2(g)} \rightarrow 6\text{CO}_{2(g)} + 6\text{H}_2\text{O}_{(g)}$
- Single Displacement Reaction:** Element and compound combine. The element replaces the similar type of ion in the compound. $\text{A} + \text{BC} \rightarrow \text{AC} + \text{B}$, A and B are metals.
 Ex. $\text{Zn}_{(s)} + 2\text{HCl}_{(aq)} \rightarrow \text{ZnCl}_{2(aq)} + \text{H}_{2(g)}$ With metal element as reactant
 Ex. $\text{F}_{2(g)} + \text{KCl}_{(aq)} \rightarrow \text{KF}_{(aq)} + \text{Cl}_{2(g)}$ With non-metal element as reactant
 Demo: Write for Cu wire in solution of silver nitrate. $\text{Cu}_{(s)} + \text{AgNO}_{3(aq)} \rightarrow \text{Cu}(\text{NO}_3)_2 + \text{Ag}_{(s)}$