

Decomposition (D): in a decomposition reaction one compound breaks apart into two or more substances. These substances may be elements or simpler compounds.

General Reaction: $AB \rightarrow A + B$
More Complex $\rightarrow$ Less Complex

Comments:

1. Binary compounds break down into their component elements.
2. Carbonates break into a metal oxide and carbon dioxide.
3. Bases (-OH) break down into a metal oxide and water.
4. Acids break down into a nonmetal oxide and water.

Sample Reactions:

- a. $2\text{NaCl} \rightarrow 2\text{Na} + \text{Cl}_2$
- b. $\text{Na}_2\text{CO}_3 \rightarrow \text{Na}_2\text{O} + \text{CO}_2$
- c. $\text{Ca}(\text{OH})_2 \rightarrow \text{CaO} + \text{H}_2\text{O}$
- d. $2\text{H}_3\text{PO}_4 \rightarrow \text{P}_2\text{O}_5 + 3\text{H}_2\text{O}$

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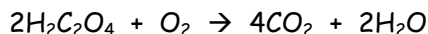
Combustion (C): the combining of oxygen with a compound composed of carbon and hydrogen. A synonym for combustion is burning.

General Reaction: $\text{C}_x\text{H}_y + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$

Comments:

1. A reaction involving a hydrocarbon and oxygen will be combustion.
2. The products will always be carbon dioxide and water.
3. Even though some compounds that contain carbon and hydrogen also contain oxygen, the products are still always carbon dioxide and water.

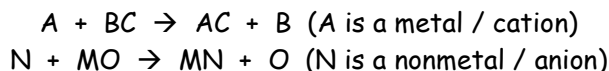
Sample Reactions: $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$



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Single Replacement (SR): In these reactions, a free element reacts with a compound to form another compound and release one of the elements of the original compound in a free elemental state.

For instance: one cation (+ ion) replaces another OR
one anion (- ion) replaces another



Sample Reactions: $2\text{K} + \text{CaCl}_2 \rightarrow 2\text{KCl} + \text{Ca}$
 $2\text{NaBr} + \text{Cl}_2 \rightarrow 2\text{NaCl} + \text{Br}_2$

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Synthesis (S): the combining of two different molecules or atoms to form a single new substance.

General Reaction: $A + B \rightarrow AB$

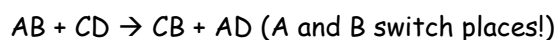
- Comments:**
1. The direct combining of two elements will produce a binary compound.
 2. Metallic oxides and carbon dioxide react to form carbonates.
 3. Metallic oxides and water react to produce a base.
 4. Nonmetallic oxides and water react to produce an acid.

Sample Reactions:

- a. $2Mg + O_2 \rightarrow 2MgO$ (Simplest form of syntheses two elements)
- b. $Na_2O + CO_2 \rightarrow Na_2CO_3$ (Metal Oxide and Carbon Dioxide - carbonate)
- c. $Na_2O + H_2O \rightarrow 2NaOH$ (Metal Oxide in water will make a base)
- d. $N_2O_5 + H_2O \rightarrow 2HNO_3$ (Non-Metal Oxide in water will make an acid)

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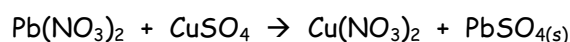
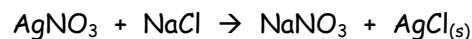
Double Replacement (DR): During double replacement reactions, the cations and anions of two different compounds in solution switch.



Comments:

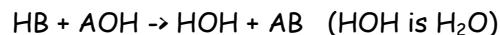
- (1) In these reactions, there is never a change in oxidation state (charge).
- (2) NO single elements, CO_2 or H_2O as reactants!!!

Sample Reactions:



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Acid Base Reactions (AB): A strong acid (H) will react with a strong base (OH) to form water as one of the products. (Is an important type of double replacement!)



Comments:

- (1) The most common strong acids are dissolved in water (aq)

Sample Reactions:

