

PREDICTING REACTIONS

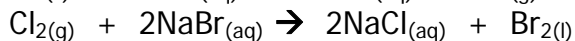
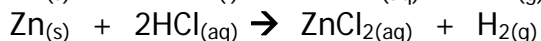
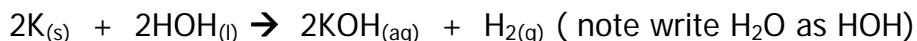
- **chemical reaction:** process by which one or more substances change into new substances.
- **Compound:** substance composed of two or more elements.
- **decomposition reaction:** reaction that results in two or more substances being formed from a single substance.
- **double replacement reaction:** reaction in which the positive ions of two compounds are exchanged. "Displacement" is a synonym for "replacement."
- **Element:** substance that cannot be decomposed into a simpler substance.
- **Mixture:** two or more substances that are not chemically combined and does not have a fixed set of properties.
- **Precipitate:** solid formed in a chemical reaction involving solutions.
- **single replacement reaction:** reaction in which one element replaces another.
- **Solution:** homogeneous mixture.
- **Substance:** sample of matter that has a uniform set of properties and a definite composition. Examples of substances are elements and compounds.
- **synthesis reaction:** two or more substances form a single substance in a reaction. Synonyms are "composition" and "combination."

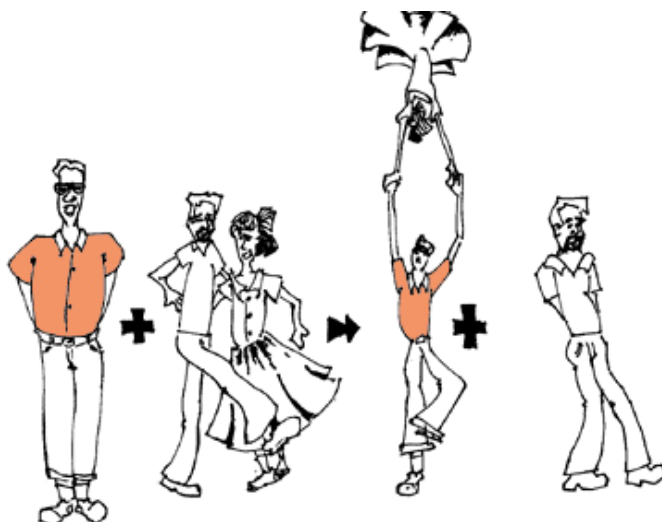
1. Single Displacement:

a more active element takes the place of another element in a compound and sets the less active one free.

element + compound → new element + new compound

Basic form: $M + AX \rightarrow MX + A$ or $AX + N \rightarrow AN + X$





More Examples:

Element + Compound → Element + Compound

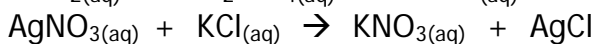
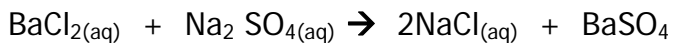
1. Iron(III) carbide + oxygen →
2. Aluminum + Sulfuric acid →
3. Copper(II) sulfate + Iron →
4. Sodium + Water →
5. lithium iodide reacts with chlorine →

2. Double Displacement:

metals switch anions

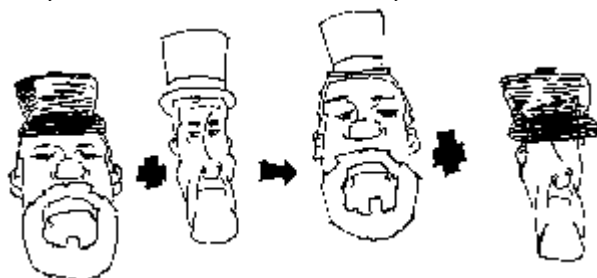
compound + compound → new compound + new compound

Basic form: $MX + BN \rightarrow MN + BX$



More Examples:

Two compounds → Two new compounds



1. Sodium carbonate + Calcium hydroxide
2. Iron(II) sulfide + Hydrochloric acid →
3. Magnesium hydroxide + Sulfuric acid →
4. Copper(II) nitrate + Sodium hydroxide →

3. Synthesis (composition):

two or more elements or compounds may combine to form a more complex compound.

two reactants → single product

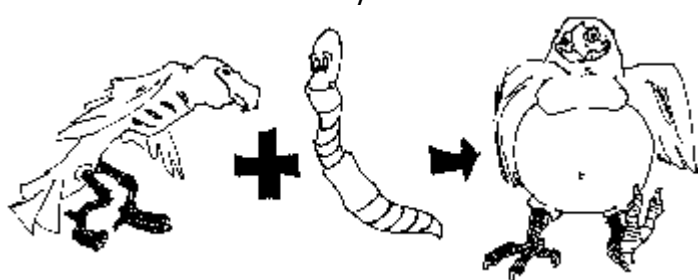
Basic form: $A + X \rightarrow AX$

Types of synthesis reactions:

- Nonmetal oxide + metallic oxide → nonbinary compound
 $CO_2(g) + Na_2O(s) \rightarrow Na_2CO_3(s)$
- Metal oxide + water → metallic hydroxide
 $CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(s)$
- Nonmetallic oxide + water → acid
 $SO_2(g) + H_2O(l) \rightarrow H_2SO_3(aq)$
- Metal + nonmetal → salt
 $2 Na(s) + Cl_2(g) \rightarrow 2NaCl(s)$

More Examples:

Element + Element → Compound



1. Iron + Sulfur →
2. Mercury + Oxygen →
3. Potassium hydroxide reacts with water →
4. Magnesium oxide + Carbon dioxide →
5. Sulfur dioxide + Water →

4. Decomposition:

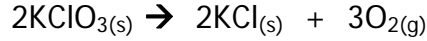
A single compound breaks down into its component parts or simpler compounds.

one reactant → more than one product

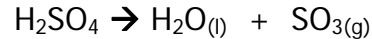
Basic form: $AX \rightarrow A + X$

Types of decomposition reactions:

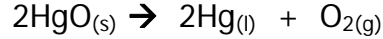
- Metallic carbonates, when heated, form metallic oxides and $CO_2(g)$.
 $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$
- Most metallic hydroxides, when heated, decompose into metallic oxides and water.
 $Ca(OH)_2(s) \rightarrow CaO(s) + H_2O(g)$
- Metallic chlorates, when heated, decompose into metallic chlorides and oxygen.



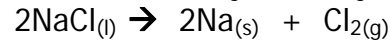
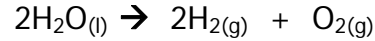
- Some acids, when heated, decompose into nonmetallic oxides and water.



- Some binary compounds, when heated, decompose into the elements that form them



decomposition can be accomplished by Adding electricity



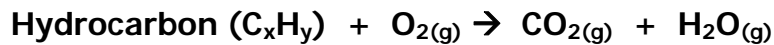
More Examples:

Compound → *Two or more simpler substances*



1. Water →
2. Calcium carbonate →
3. Sodium chlorate →
4. Copper(II) hydroxide →
5. carbonic acid →

5. Combustion of Hydrocarbons:



Heating does not indicate combustion.

The phrase "to burn" does indicate combustion