

Reaction Types (Hints on Reaction Prediction)

There are 5 main types of reactions. Each type has several representative categories (“subtypes”).

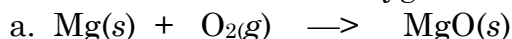
I. Synthesis reactions - 2 or more elements are joined together

A. General Form:

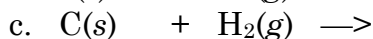
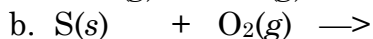
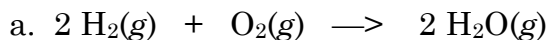


B. Subtypes:

1. Reaction of elements with oxygen to form oxides

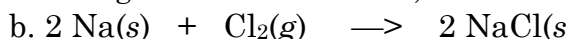


2. Reactions of 2 nonmetals to form a covalent compound

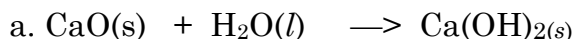


3. Metals react with nonmetals (other than oxygen) to form salts

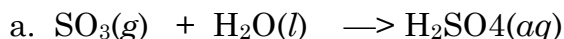
a. Halogens + alkali metals, alkaline earth metals, transition metals



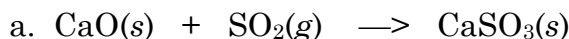
4. Metallic oxides react with water to produce metal hydroxides



5. Nonmetallic oxides react with water to form oxyacids

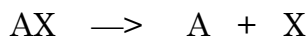


6. Some metal oxides react with some nonmetallic oxides to form salts



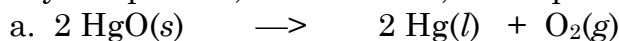
II. Decomposition - opposite of synthesis - compound is broken into elements or simpler compounds.

A. General form:

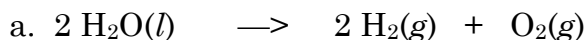


B. Subtypes:

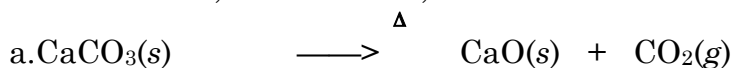
1. Binary compounds, when heated, decompose into their elemental forms



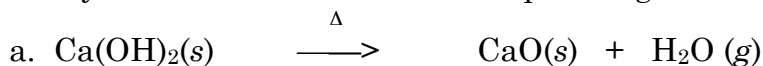
2. Some binary compounds decompose when an electric current passes through them.



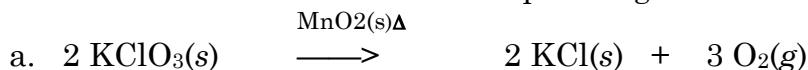
3. Metal carbonates, when heated, break down into metal oxides and CO₂.



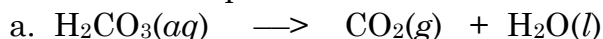
4. Metal hydroxides when heated decompose to give metal oxides + water.



5. Metallic chlorates when heated decompose to give a metal chloride + O₂.

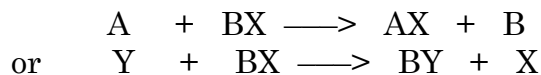


6. Some acids decompose to nonmetallic oxides and water.



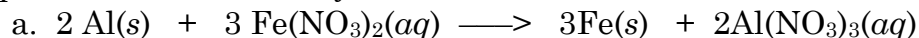
III. Single Replacement - one element replaces a similar element in a compound. Usually take place in an aqueous solution.

A. General Form:

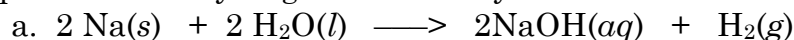


B. Subtypes:

1. Replacement of a metal by a more active metal



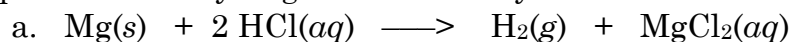
2. Replacement of hydrogen in water by a metal



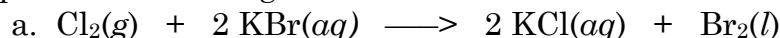
More active metals react with water.

Less active metals (Fe) react with steam.

3. Replacement of hydrogen in an acid by a metal

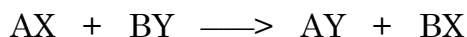


4. Replacement of halogens



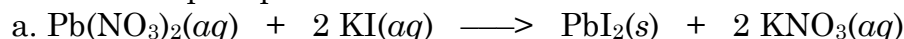
IV. Double Replacement Reactions (Ionic reactions) - ions of 2 compounds change places. Usually take place in water, where one compound is generally soluble and the other forms a precipitate.

A. General form:

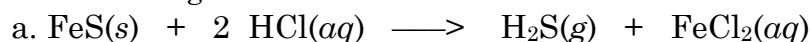


B. Subtypes:

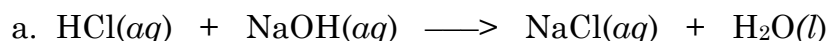
1. Formation of a precipitate



2. Formation of a gas



3. Formation of water



IV. Combustion Reactions - a substance combines with oxygen, releasing a large amount of energy as light and heat.

A. Hydrocarbons react with oxygen to give carbon dioxide and water.

