

GENERAL CHEMISTRY

STANDARD 8.3

8.3: Identify and differentiate among synthesis, decomposition, single-replacement, double-replacement, and combustion reactions

DEFINITIONS

- Types of Chemical Reactions:
 - **Synthesis:** The chemical combination of two atoms into one compound
 - **Decomposition:** The chemical breaking apart of a compound into individual atoms or smaller molecules
 - **Single Replacement:** A reaction where one element is substituted for another element in a compound
 - **Double Replacement:** A reaction where two compounds react and the cations and anions switch places, forming two new products
 - **Combustion:** An energy-releasing reaction that results in the reaction of a hydrocarbon with oxygen, resulting in the products of carbon dioxide and water
- **Hydrocarbon:** A compound with hydrogen and oxygen

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TYPES OF CHEMICAL REACTIONS

- **Synthesis:** $A + B \rightarrow AB$
- **Decomposition:** $AB \rightarrow A + B$
- **Single Replacement:** $A + BC \rightarrow B + AC$
- **Double Replacement:** $AB + CD \rightarrow AD + BC$
- **Combustion:** $C_xH_y + O_2 (g) \rightarrow CO_2 (g) + H_2O (g)$

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EXAMPLES OF REACTIONS

- **Synthesis:** $\text{H}_2 (\text{g}) + \text{O}_2 (\text{g}) \rightarrow \text{H}_2\text{O} (\text{g})$
- **Decomposition:** $\text{KClO}_3 (\text{aq}) \rightarrow \text{KCl} (\text{aq}) + \text{O}_2 (\text{g})$
- **Single Replacement:** $\text{Zn} (\text{s}) + \text{CuCl}_2 (\text{aq}) \rightarrow \text{Cu} (\text{s}) + \text{ZnCl}_2 (\text{aq})$
- **Double Replacement:** $\text{NaOH} (\text{aq}) + \text{HCl} (\text{aq}) \rightarrow \text{NaCl} (\text{aq}) + \text{H}_2\text{O} (\text{l})$
- **Combustion:** $\text{C}_3\text{H}_8 + \text{O}_2 (\text{g}) \rightarrow \text{CO}_2 (\text{g}) + \text{H}_2\text{O} (\text{g})$

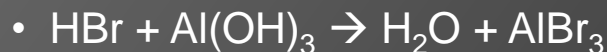
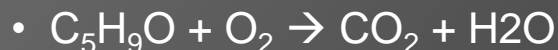
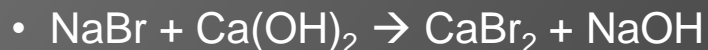
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EXAMPLES OF REACTIONS

- Classify the following chemical equations:
 - $\text{NaBr} + \text{Ca(OH)}_2 \rightarrow \text{CaBr}_2 + \text{NaOH}$
 - $\text{NH}_3 + \text{H}_2\text{SO}_4 \rightarrow (\text{NH}_4)_2\text{SO}_4$
 - $\text{C}_5\text{H}_9\text{O} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
 - $\text{Pb} + \text{H}_3\text{PO}_4 \rightarrow \text{H}_2 + \text{Pb}_3(\text{PO}_4)_2$
 - $\text{HBr} + \text{Al(OH)}_3 \rightarrow \text{H}_2\text{O} + \text{AlBr}_3$

EXAMPLES SOLUTIONS

- Classify the following chemical equations:



Double Replacement
Synthesis

Combustion

Single Replacement

Double Replacement