Worksheet: Types of Chemical Reactions

- Write a balanced chemical equation to represent each of the following chemical equations.
- Classify each reaction as a synthesis, decomposition, single displacement, or double displacement reaction.

1. water $\rightarrow$ hydrogen + oxygen

$$2H_2O \rightarrow 2H_2 + O_2$$  Decomposition Reaction

2. aluminum + oxygen $\rightarrow$ aluminum oxide

$$4\text{Al} + 3\text{O}_2 \rightarrow 2\text{Al}_2\text{O}_3$$  Synthesis Reaction

3. aluminum + hydrogen sulfate $\rightarrow$ aluminum sulfate + hydrogen

$$2\text{Al} + 3\text{H}_2\text{SO}_4 \rightarrow \text{Al}_2(\text{SO}_4)_3 + 3\text{H}_2$$  Single displacement reaction

4. potassium bromide + aluminum nitrate $\rightarrow$ potassium nitrate + aluminum bromide

$$3\text{KBr} + \text{Al(NO}_3\text{)}_3 \rightarrow 3\text{KNO}_3 + \text{AlBr}_3$$  Double displacement reaction

5. calcium phosphate + aluminum sulfate $\rightarrow$ calcium sulfate + aluminum phosphate

$$\text{Ca}_3(\text{PO}_4)_2 + \text{Al}_2(\text{SO}_4)_3 \rightarrow 3\text{CaSO}_4 + 2\text{AlPO}_4$$  Double displacement reaction

6. calcium + aluminum chloride $\rightarrow$ calcium chloride + aluminum

$$3\text{Ca} + 2\text{AlCl}_3 \rightarrow 3\text{CaCl}_2 + 2\text{Al}$$  Single displacement

7. nitrogen + hydrogen $\rightarrow$ ammonia

$$N_2 + 3H_2 \rightarrow 2NH_3$$  Synthesis Reaction

8. butane (C$_4$H$_4$) + oxygen $\rightarrow$ carbon dioxide + water

$$C_4H_4 + O_2 \rightarrow CO_2 + H_2O$$  Combustion Reaction
9. sodium + iodine → sodium iodide
   \[ 2\text{Na} + \text{I}_2 \rightarrow 2\text{NaI} \]
   Synthesis Reaction

10. potassium hydroxide → potassium oxide + water
    \[ 2\text{KOH} \rightarrow \text{K}_2\text{O} + \text{H}_2\text{O} \]
    Decomposition Reaction

11. magnesium + water → magnesium hydroxide + hydrogen
    \[ \text{Mg} + 2\text{H}_2\text{O} \rightarrow \text{Mg(OH)}_2 + \text{H}_2 \]
    *Single Displacement Reaction*

12. sodium carbonate + calcium hydroxide → sodium hydroxide + calcium carbonate
    \[ \text{Na}_2\text{CO}_3 + \text{Ca(OH)}_2 \rightarrow 2\text{NaOH} + \text{CaCO}_3 \]
    Double Displacement Reaction

13. aluminum sulfate + calcium hydroxide → aluminum hydroxide + calcium sulfate
    \[ \text{Al}_2(\text{SO}_4)_3 + 3\text{Ca(OH)}_2 \rightarrow 2\text{Al(OH)}_3 + 3\text{CaSO}_4 \]
    Double Displacement Reaction

14. calcium oxide + water → calcium hydroxide
    \[ \text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 \]
    Synthesis

15. potassium carbonate + barium chloride → potassium chloride + barium carbonate
    \[ \text{K}_2\text{CO}_3 + \text{BaCl}_2 \rightarrow 2\text{KCl} + \text{BaCO}_3 \]
    double displacement