

### Predicting Whether a Reaction Will Occur

- “Forces” that drive a reaction
- Formation of a solid
- Formation of water
- Transfer of electrons
- Formation of a gas
- When chemicals (dissolved in water) are mixed and one of these 4 things can occur, the reaction will generally happen.

Copyright © Houghton Mifflin Company. All rights reserved.

7 | 3

### Basic Ways to Classify Reactions

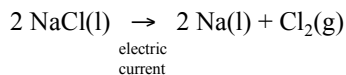
- **Synthesis reactions:** reactions in which chemicals combine to make *one product*
  - Metal + Nonmetal reactions can be classified as synthesis reactions.
$$2 \text{Na(s)} + \text{Cl}_2\text{(g)} \rightarrow 2 \text{NaCl(s)}$$
  - Reactions of Metals or Nonmetals with  $\text{O}_2$  can be classified as synthesis reactions.
$$\text{N}_2\text{(g)} + \text{O}_2\text{(g)} \rightarrow 2 \text{NO(g)}$$
- These two types of synthesis reactions are also subclasses of oxidation-reduction reactions.

Copyright © Houghton Mifflin Company. All rights reserved.

7 | 4

### Basic Ways to Classify Reactions

- **Decomposition reactions:** reactions in which *one reactant* breaks down into smaller molecules
- Generally initiated by addition of energy
  - Addition of electric current or heat
- Opposite of a synthesis reaction



Copyright © Houghton Mifflin Company. All rights reserved.

7 | 5

### Basic Ways to Classify Reactions

- **Combustion reactions:**
- $\text{O}_2\text{(g)}$  is a reactant
  - Subclass of oxidation-reduction reactions
- Release a lot of energy (heat & light) rapidly
- Produces oxides - often  $\text{CO}_2\text{(g)}$  and  $\text{H}_2\text{O(g)}$

Copyright © Houghton Mifflin Company. All rights reserved.

7 | 6

## Basic Ways to Classify Reactions

- **Combustion reactions:** reactions in which  $O_2(g)$  is reacted with a carbon compound
  - Release a lot of energy
  - Subclass of oxidation-reduction reactions
- Combustion of carbon compounds produces  $CO_2(g)$
- Combustion of compounds that contain hydrogen produces  $H_2O(g)$   
 $C_3H_8(g) + 5 O_2(g) \rightarrow 3 CO_2(g) + 4 H_2O(g)$

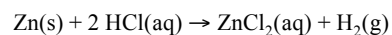
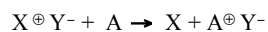
Copyright © Houghton Mifflin Company. All rights reserved.

7 | 7

## Basic Ways to Classify Reactions

### Single replacement reaction:

- Reactions that involve an ion being transferred from one cation to another



Copyright © Houghton Mifflin Company. All rights reserved.

7 | 8

## Basic Ways to Classify Reactions

### Double Replacement Reactions

- Two ionic compounds exchange ions
- $X^{\oplus} Y^{-} (aq) + A^{\oplus} B^{-} (aq) \rightarrow XB + AY$
- $BaCl_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s) + NaCl(aq)$
- Reaction will not occur unless one of the products either (1) precipitates, or (2) is water

Copyright © Houghton Mifflin Company. All rights reserved.

7 | 9