

### Ch. 3 Stoichiometry

**. What is stoichiometry?**

- Stoichiometry calculations are used to convert grams, moles, and volume using molarity by relating amounts of reactants and products in a balanced chemical equation.
- Molarity (mol/L) is a relation between moles of a solute and volume of the solution and is a useful conversion factor in stoichiometry.
- Mole ratios (mol/mol) between reactants and products are also useful conversion factors.

**. General steps of how to set up conversions**

- *Always* balance your equation first (make sure that there is an equal amount of reactants and products in your equation)
- For a balanced equation,  
 $a A + b B \rightarrow c C + d D$

To go from a given grams of A to grams of B use moles of A and then moles of B,

Grams of A	Moles of A	Moles of B	Grams of B
Starting point. Use molar mass (g/mol) of A to convert to moles of A	Use coefficients (lowercase letters) from the balanced chemical equation to convert moles of A to moles of B	Use molar mass (g/mol) of B to convert to grams of B	Goal

$$\text{grams A} \times \frac{\text{mol A}}{\text{grams A}} \times \frac{\text{mol b (coefficient)}}{\text{mol a (coefficient)}} \times \frac{\text{grams B}}{\text{mol B}} = \text{grams B}$$

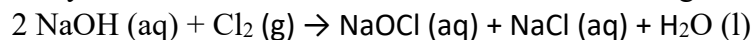
**. Practice**

Convert 0.355 moles of NaCl to grams.

$$0.355 \text{ mol NaCl} \times \frac{58.44 \text{ g NaCl}}{1 \text{ mol NaCl}} = ?$$

**. Practice**

Aqueous solutions of sodium hypochlorite (NaOCl), bleach, are prepared by reacting sodium hydroxide with chlorine. How many grams of NaOH are needed to react with 30.0 g of Cl<sub>2</sub>? How many moles of NaOH are needed to react with 30.0 g of Cl<sub>2</sub>?



$$30.0 \text{ g Cl}_2 \times \frac{1 \text{ mol Cl}_2}{70.9 \text{ g Cl}_2} \times \frac{? \text{ mol NaOH}}{? \text{ mol Cl}_2} \frac{40.0 \text{ g NaOH}}{1 \text{ mol NaOH}} = ?$$

## Solutions

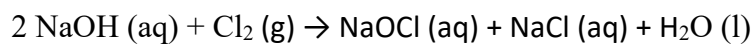
### . Practice

Convert 0.355 moles of NaCl to grams:

$$0.355 \text{ mol NaCl} \times \frac{58.44 \text{ g NaCl}}{1 \text{ mol NaCl}} = 20.7 \text{ g NaCl}$$

### . Practice

Aqueous solutions of sodium hypochlorite (NaOCl), bleach, are prepared by reacting sodium hydroxide with chlorine. How many grams of NaOH are needed to react with 30.0 g of Cl<sub>2</sub>?



$$30.0 \text{ g Cl}_2 \times \frac{1 \text{ mol Cl}_2}{70.9 \text{ g Cl}_2} \times \frac{2 \text{ mol NaOH}}{1 \text{ mol Cl}_2} \frac{40.0 \text{ g NaOH}}{1 \text{ mol NaOH}} = 33.9 \text{ g NaOH needed to react with 30.0 g of Cl}_2.$$

$$33.9 \text{ g NaOH} \times \frac{1 \text{ mol NaOH}}{40.0 \text{ g NaOH}} = 0.848 \text{ mol NaOH are needed to react with 30.0 g of Cl}_2.$$