# Stochiometric Relationships

Calculations based on quantitative relationships in a balanced chemical equation are called stoichiometry. Stoichiometric calculations are based on several assumptions. It is assumed that the reaction has no side reactions, the reaction goes to completion, and the reactants are completely consumed. One type of problem that can be solved stoichiometrically is based on the mole ratios of a balanced equation. A sample problem is shown below.
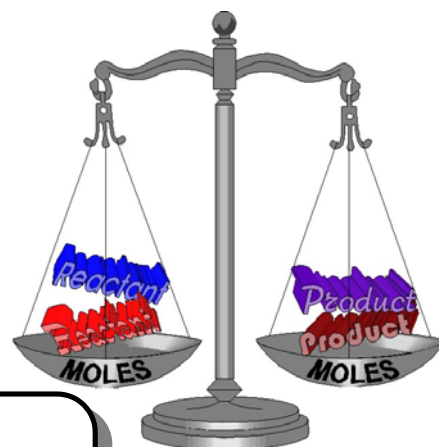
Sample Problem

How many moles of oxygen are consumed when 0.6 moles of hydrogen burns to produce water?

Step 1: Write a balanced equation and determine the mole ratios from the equation

Step 2: Identify the known and the unknown
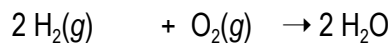
	$2\,H_2(g)$	$+\ O_2(g)$	$\rightarrow 2\,H_2O$
mole ratio	2	1	2
moles	$\dfrac{known}{0.6}$	$\dfrac{unknown}{x}$	

Step 3: Set up a proportion and solve for the unknown
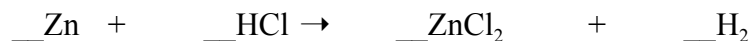
- $\dfrac{2}{0.6mol} = \dfrac{1}{x}$
- $2x = 0.6mol$
- $x = 0.3mol$

Answer the questions below using the procedure described in the sample problem above.

1.   How many moles of oxygen will be produced from the decomposition of 3 moles of $KClO_3$?

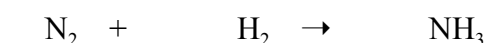$$\_\_KClO_3 \quad \rightarrow \quad \_\_KCl + \quad \_\_O_2$$

2.   How many moles of Zn will be needed to completely react with 0.4 moles of HCl?

$$\_\_Zn \ + \quad \_\_HCl \rightarrow \quad \_\_ZnCl_2 \quad + \quad \_\_H_2$$

3. How many moles of oxygen will be needed to completely oxidize 4 moles of CH_4?

$$\_\_CH_4 + \quad \_\_O_2 \rightarrow \quad \_\_CO_2 + \quad \_\_H_2O$$

4. How many moles of hydrogen will be needed to react with 2 moles of nitrogen according to the following?

$$\_\_N_2 + \quad \_\_H_2 \rightarrow \quad \_\_NH_3$$

5. Using the above reaction how many moles of NH_3 will be formed if 18 moles of H_2 is used?

6. How many moles of sulfur will be needed to oxidize 3 moles of zinc to zinc sulfide?

$$\_\_Zn + \quad \_\_S \rightarrow \quad \_\_ZnS$$

7. How many moles of silver chloride will be produced if 2 moles of silver is allowed to react with an unlimited amount of chlorine?

$$\_\_Ag^+ + \quad \_\_Cl^- \rightarrow \quad \_\_AgCl(s)$$