

CHAPTER REVIEW

For more practice, go to the Problem Bank in Appendix D.

Introduction to Stoichiometry

SECTION 1 REVIEW

1. a. Explain the concept of mole ratio as used in reaction stoichiometry problems.
b. What is the source of this ratio?
2. For each of the following balanced chemical equations, write all possible mole ratios:
 - a. $2\text{Ca} + \text{O}_2 \longrightarrow 2\text{CaO}$
 - b. $\text{Mg} + 2\text{HF} \longrightarrow \text{MgF}_2 + \text{H}_2$

PRACTICE PROBLEMS

3. Given the chemical equation $\text{Na}_2\text{CO}_3(aq) + \text{Ca}(\text{OH})_2 \longrightarrow 2\text{NaOH}(aq) + \text{CaCO}_3(s)$, determine to two decimal places the molar masses of all substances involved. Then, write the molar masses as conversion factors.

Ideal Stoichiometric Calculations

SECTION 2 REVIEW

4. a. What is molar mass?
b. What is its role in reaction stoichiometry?

PRACTICE PROBLEMS

5. Hydrogen and oxygen react under a specific set of conditions to produce water according to the following: $2\text{H}_2(g) + \text{O}_2(g) \longrightarrow 2\text{H}_2\text{O}(g)$.
 - a. How many moles of hydrogen would be required to produce 5.0 mol of water?
 - b. How many moles of oxygen would be required? (Hint: See Sample Problem A.)
6. a. If 4.50 mol of ethane, C_2H_6 , undergo combustion according to the unbalanced equation $\text{C}_2\text{H}_6 + \text{O}_2 \longrightarrow \text{CO}_2 + \text{H}_2\text{O}$, how many moles of oxygen are required?
b. How many moles of each product are formed?
7. Sodium chloride is produced from its elements through a synthesis reaction. What mass of each reactant would be required to produce 25.0 mol of sodium chloride?

8. In a blast furnace, iron(III) oxide is used to produce iron by the following (unbalanced) reaction: $\text{Fe}_2\text{O}_3(s) + \text{CO}(g) \longrightarrow \text{Fe}(s) + \text{CO}_2(g)$
 - a. If 4.00 kg Fe_2O_3 are available to react, how many moles of CO are needed?
 - b. How many moles of each product are formed?
9. Methanol, CH_3OH , is an important industrial compound that is produced from the following (unbalanced) reaction: $\text{CO}(g) + \text{H}_2(g) \longrightarrow \text{CH}_3\text{OH}(g)$. What mass of each reactant would be needed to produce 100.0 kg of methanol? (Hint: See Sample Problem E.)
10. Nitrogen combines with oxygen in the atmosphere during lightning flashes to form nitrogen monoxide, NO, which then reacts further with O_2 to produce nitrogen dioxide, NO_2 .
 - a. What mass of NO_2 is formed when NO reacts with 384 g O_2 ?
 - b. How many grams of NO are required to react with this amount of O_2 ?
11. As early as 1938, the use of NaOH was suggested as a means of removing CO_2 from the cabin of a spacecraft according to the following (unbalanced) reaction: $\text{NaOH} + \text{CO}_2 \longrightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O}$.
 - a. If the average human body discharges 925.0 g CO_2 per day, how many moles of NaOH are needed each day for each person in the spacecraft?
 - b. How many moles of each product are formed?
12. The double-replacement reaction between silver nitrate and sodium bromide produces silver bromide, a component of photographic film.
 - a. If 4.50 mol of silver nitrate react, what mass of sodium bromide is required?
 - b. What mass of silver bromide is formed?
13. In a soda-acid fire extinguisher, concentrated sulfuric acid reacts with sodium hydrogen carbonate to produce carbon dioxide, sodium sulfate, and water.
 - a. How many moles of sodium hydrogen carbonate would be needed to react with 150.0 g of sulfuric acid?
 - b. How many moles of each product would be formed?