Pearson

Chapter Summary and Review

Key Learning Outcomes

CHAPTER OBJECTIVES	ASSESSMENT
Balance Chemical Equations (7.3)	• Examples 7.1, 7.2, 7.3 For Practice 7.1, 7.2, 7.3 Exercises 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34
Make Calculations Involving the Stoichiometry of a Reaction (7.4)	• Examples 7.4, 7.5 For Practice 7.4, 7.5 Exercises 35, 36, 37, 38, 39, 40, 41, 42, 43, 44
Determine the Limiting Reactant and Calculate Theoretical and Percent Yield (7.5)	• Examples 7.6, 7.7 For Practice 7.6, 7.7 Exercises 45, 46, 47, 48, 49, 50, 53, 54, 57, 58, 59, 60
Determine the Amount of Reactant in Excess (7.5)	• Example 7.8 For Practice 7.8 Exercises 51, 52, 55, and 56
Write Equations for Combustion Reactions (7.6)	• Example 7.9 For Practice 7.9 Exercises 61, 62
Write Reactions for Alkali Metal and Halogen Reactions (7.6)	• Example 7.10 For Practice 7.10 Exercises 63, 64, 65, 66, 67, 68

Key Terms

Section 7.2

chemical change
physical changes
chemical property
physical property

Section 7.3

chemical reaction
chemical equation
reactants
products

Section 7.4

stoichiometry

Section 7.5

limiting reactant
theoretical yield
actual yield
percent yield

Section 7.6

combustion reaction

Key Concepts

Climate Change and the Combustion of Fossil Fuels (7.1)

- Greenhouse gases warm Earth by trapping some of the sunlight that penetrates Earth's atmosphere. Increases in atmospheric carbon dioxide levels (a major greenhouse gas) have led to global warming.
- The largest source of atmospheric carbon dioxide is the burning of fossil fuels. This can be verified by reaction stoichiometry.

Chemical Change (7.2)

- Changes in matter in which composition changes are chemical changes. Changes in matter in which composition does not change are physical changes.
- We classify the properties of matter into two types: physical and chemical. Matter displays its physical properties without changing its composition.

Writing and Balancing Chemical Equations (7.3)

- In chemistry, we represent chemical reactions with chemical equations. The substances on the left-hand side of a chemical equation are the reactants, and the substances on the right-hand side are the products.
- Chemical equations are balanced when the number of each type of atom on the left side of the equation is equal to the number on the right side.

Reaction Stoichiometry (7.4)

- Reaction stoichiometry refers to the numerical relationships between the reactants and products in a balanced chemical equation.
- Reaction stoichiometry allows us to predict, for example, the amount of product that can form from a given amount of reactant, or how much of one reactant is required to react with a given amount of another.

Limiting Reactant, Theoretical Yield, Percent Yield, and Reactact in Excess (7.5)

- When a chemical reaction actually occurs, the reactants are usually not present in the exact stoichiometric ratios specified by the balanced chemical equation. The limiting reactant is the one that is available in the smallest stoichiometric quantity—it is completely consumed in the reaction, and it limits the amount of product that can be made.
- Any reactant that does not limit the amount of product is said to be in excess. The reactant in excess occurs in a quantity greater than is required to completely react with the limiting reactant.
- The amount of product that can be made from the limiting reactant is the theoretical yield.
- The actual yield—always equal to or less than the theoretical yield—is the amount of product that is actually made when the reaction is carried out.

- The percentage of the theoretical yield that is actually produced is the percent yield.

Combustion, Alkali Metal, and Halogen Reactions (7.6)

- In a combustion reaction a substance reacts with oxygen—emitting heat and forming one or more oxygen-containing products. The alkali metals react with nonmetals, losing electrons in the process.
- The halogens react with many metals to form metal halides. They also react with hydrogen to form hydrogen halides and with one another to form interhalogen compounds.

Key Equations and Relationships

Mass-to-Mass Conversion: Stoichiometry (7.4)

mass A → amount A (in moles) → amount B (in moles) → mass B

Percent Yield (7.5)

$$\% \text{ yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100\%$$