

Chapter 7 Chemical Reactions: An Introduction

7.1 Evidence for a Chemical Reaction

Summary

We sometimes can see when a chemical reaction (change) has occurred because chemical reactions often result in visible effects. However, not every chemical reaction produces visible changes. Sometimes the only sign that a chemical reaction has occurred is a change in temperature.

7.2 Chemical Equations

Key Terms

chemical reaction
products

chemical equation
balanced the chemical equation

reactants

Summary

A *chemical reaction* is a chemical change that occurs when compounds or elements interact with one another. A chemical reaction always involves a rearrangement of the ways in which the atoms are grouped. A *chemical equation* is used to represent a chemical reaction. A chemical equation shows the chemicals present before the reaction, called the *reactants*, and the chemicals formed by the reaction, called the *products*, as well as the relative numbers of atoms of each. An arrow indicates the direction of the change. The reactants are written to the left of the arrow, and the products are written to the right of the arrow. A chemical equation also often shows the physical states of the reactants and products, that is, whether the chemicals are solids, liquids, gases or aqueous (dissolved in water).

7.3 Balancing Chemical Equations

Key Terms

coefficients

Summary

A chemical reaction changes only the way the atoms in the reactants are grouped. Atoms are neither created nor destroyed. Therefore, a chemical equation must show the same number of each type of atom on the product side as on the reactant side. An equation that obeys this rule is a *balanced chemical equation*.

A chemical equation can be balanced by means of the following four-step process: (1) Identify the reactants and products and write the formulas. (2) Write the unbalanced equation. (3) Balance by trial and error, starting with the most complicated molecules. Without changing the formulas of any of the molecules, determine how many of each type of molecules needs to be on each side of the equation. The numbers that show the numbers of molecules are called

coefficients. The best balanced equation has the smallest coefficients. (4) Double-check to make sure that the number and types of atoms are the same on each side of the equation.

Additional Active Reading Questions

1. What are some of the signs indicating that a chemical reaction has taken place?
2. What is a chemical reaction?
3. Identify the reactant(s) and the product(s) in the following reaction:
 $\text{P}_4(s) + 10 \text{Br}_2(l) \rightarrow 4 \text{PBr}_5(s)$. Is the equation balanced?
4. What does the arrow stand for in a chemical equation?
5. Describe a balanced equation.
6. What is the name for the numbers that show how many molecules need to be on each side of an equation for the equation to be balanced?