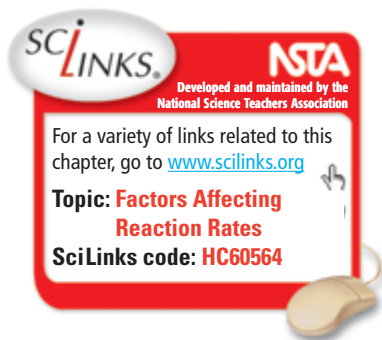


SECTION 2

OBJECTIVES

- Define *chemical kinetics*, and explain the two conditions necessary for chemical reactions to occur.
- Discuss the factors that influence reaction rate.
- Define *catalyst*, and discuss two different types.
- Relate the order of a reaction to the rate law for the reaction.
- Explain and write rate laws for chemical reactions.



Reaction Rate

The change in concentration of reactants per unit time as a reaction proceeds is called the **reaction rate**. The study of reaction rates is concerned with the factors that affect the rate and with the mathematical expressions that reveal the specific dependencies of the rate on concentration. *The area of chemistry that is concerned with reaction rates and reaction mechanisms is called **chemical kinetics**.*

Rate-Influencing Factors

For reactions other than simple decompositions to occur, particles must come into contact in a favorable orientation and with enough energy for activation. Thus, the rate of a reaction depends on the collision frequency of the reactants and on the collision efficiency. Any change in reaction conditions that affects the collision frequency, the collision efficiency, or the collision energy affects the reaction rate. At least five important factors influence the rate of a chemical reaction.

Nature of Reactants

Substances vary greatly in their tendencies to react. For example, hydrogen combines vigorously with chlorine under certain conditions. Under the same conditions, it may react only weakly with nitrogen. Sodium and oxygen combine much more rapidly than iron and oxygen under similar conditions. Bonds are broken and other bonds are formed in reactions. The rate of reaction depends on the particular reactants and bonds involved.

Surface Area

Gaseous mixtures and dissolved particles can mix and collide freely; therefore, reactions involving them can occur rapidly. In heterogeneous reactions, the reaction rate depends on the area of contact of the reaction substances. **Heterogeneous reactions** *involve reactants in two different phases*. These reactions can occur only when the two phases are in contact. Thus, the surface area of a solid reactant is an important factor in determining rate. An increase in surface area increases the rate of heterogeneous reactions.

Solid zinc reacts with aqueous hydrochloric acid to produce zinc chloride and hydrogen gas according to the following equation.

