

## SECTION 3

### OBJECTIVES

- Relate chemical activity to oxidizing and reducing strength.
- Explain the concept of disproportionation.

# Oxidizing and Reducing Agents

A **reducing agent** is a substance that has the potential to cause another substance to be reduced. Reducing agents lose electrons; they attain a more positive oxidation state during an oxidation-reduction reaction. Therefore, the reducing agent is the oxidized substance.

An **oxidizing agent** is a substance that has the potential to cause another substance to be oxidized. Oxidizing agents gain electrons and attain a more negative oxidation state during an oxidation-reduction reaction. The oxidizing agent is the reduced substance. **Table 2** helps clarify the terms describing the oxidation-reduction process.

## Strengths of Oxidizing and Reducing Agents

Different substances can be compared and rated by their relative potential as reducing and oxidizing agents. For example, the order of the elements in the activity series (see **Table 3** on page 286) is related to each element's tendency to lose electrons. Elements in this series lose electrons to the positively charged ions of any element below them in the series. The more active an element is, the greater its tendency to lose electrons and the better a reducing agent it is. The greater the distance is between two elements in the list, the more likely it is that a redox reaction will take place between them.

These elements and some other familiar substances are arranged in **Table 3** according to their activity as oxidizing and reducing agents. The fluorine atom is the most highly electronegative atom. It is also the most

**TABLE 2** Oxidation-Reduction Terminology

Term	Change in oxidation number	Change in electron population
Oxidation	in a positive direction	loss of electrons
Reduction	in a negative direction	gain of electrons
Oxidizing agent	in a negative direction	gains electrons
Reducing agent	in a positive direction	loses electrons