

# Balancing Redox Equations

## SECTION 2

### OBJECTIVES

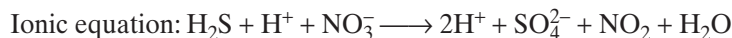
- Explain what must be conserved in redox equations.
- Balance redox equations by using the half-reaction method.

**E**quations for simple redox reactions can be balanced by inspection, which you learned to do in Chapter 8. Most redox equations, however, require more systematic methods. The equation-balancing process requires the use of oxidation numbers. In a balanced equation, both charge and mass are conserved. Although oxidation and reduction half-reactions occur together, their reaction equations are balanced separately and then combined to give the balanced redox-reaction equation.

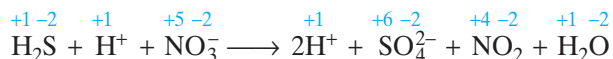
### Half-Reaction Method

The *half-reaction method*, or ion-electron method, for balancing redox equations consists of seven steps. Oxidation numbers are assigned to all atoms and polyatomic ions to determine which species are part of the redox process. The oxidation and reduction equations are balanced separately for mass and charge. They are then added together to produce a complete balanced equation. These seven steps are applied to balance the reaction of hydrogen sulfide and nitric acid. Sulfuric acid, nitrogen dioxide, and water are the products of the reaction.

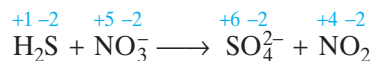
1. **Write the formula equation if it is not given in the problem. Then write the ionic equation.**



2. **Assign oxidation numbers. Delete substances containing only elements that do not change oxidation state.**



The sulfur changes oxidation state from  $-2$  to  $+6$ . The nitrogen changes oxidation state from  $+5$  to  $+4$ . The other substances are deleted.



The remaining species are used in step 3.

### extension

#### CROSS-DISCIPLINARY

Go to [go.hrw.com](http://go.hrw.com) for a full-length article on redox reactions in photosynthesis.



**Keyword:** HC60XRX