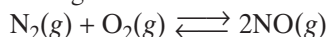


- 47. Predicting Outcomes** When gasoline burns in an automobile engine, nitric oxide is formed from oxygen and nitrogen. Nitric oxide is a major air pollutant. High temperatures such as those found in a combustion engine are needed for the following reaction:



K for the reaction is 0.01 at 2000°C. If 4.0 mol of N_2 , 0.1 mol of O_2 , and 0.08 mol of NO are placed in a 1.0 L vessel at 2000°C, predict which reaction will be favored.

- 51.** Carry out library research on the use of catalysts in industrial processes. Explain what types of catalysts are used for specific processes, such as the Haber process.

ALTERNATIVE ASSESSMENT

- 52.** Research nitrogen narcosis in the library. What causes nitrogen narcosis, and how does it relate to Le Châtelier's principle?

USING THE HANDBOOK

- 48.** An equilibrium system helps maintain the pH of the blood. Review the material on the carbon dioxide–bicarbonate ion equilibrium system in Group 14 of the *Elements Handbook*, and answer the following.
- Write the equation for the equilibrium system that responds to changes in H_3O^+ concentration.
 - Use Le Châtelier's principle to explain how hyperventilation affects this system.
 - How does this system maintain pH when acid is added?
- 49.** The reactions used to confirm the presence of transition metal ions often involve the formation of precipitates. Review the analytical tests for the transition metals in the *Elements Handbook*. Use that information and **Table 3** to determine the minimum concentration of Zn^{2+} needed to produce a precipitate that confirms the presence of Zn. Assume enough sulfide ion reagent is added to the unknown solution in the test tube to produce a sulfide ion concentration of 1.4×10^{-20} M.

extension



Graphing Calculator Chemical Equilibrium

Go to go.hrw.com for a graphing calculator exercise that asks you to calculate the percent ionization for an acid equilibrium.



Keyword: HC6EQUX

RESEARCH & WRITING

- 50.** Find photos of several examples of stalagmites and stalactites in various caves. Investigate the equilibrium processes involved in the formation of stalagmites and stalactites.