CRITICAL THINKING

17. Predicting Outcomes The balanced equation for a rapid homogeneous reaction between two gases is as follows: $4A + B \longrightarrow 2C + 2D$. Because the simultaneous collision of four molecules of one reactant with one molecule of the other reactant is extremely improbable, what would you predict about the nature of the reaction mechanism for this reaction system?

18. Evaluating Ideas

a. How can you justify calling the reaction pathway that is shown in **Figure 4** the minimum-energy pathway for reaction?

b. What significance is associated with the maximum-energy region of this minimum-energy pathway?

19. Applying Models Explain why there is a danger of explosion in places such as coal mines, sawmills, and grain elevators, where large amounts of dry, powdered combustible materials are present.

20. Evaluating Methods What property would you measure to determine the reaction rate for the following reaction? Justify your choice.

$$2NO_2(g) \longrightarrow N_2O_4(g)$$

RESEARCH & WRITING

21. Look for situations around your house in which processes are speeded up by an increase in temperature or slowed down by a decrease in temperature. Make a list, and discuss the different processes.

ALTERNATIVE ASSESSMENT

22. Boilers are sometimes used to heat large buildings. Deposits of $CaCO_3$, $MgCO_3$, and $FeCO_3$ can hinder the boiler operation. Aqueous solutions of hydrochloric acid are commonly used to remove these deposits. The general equation for the reaction is written below.

$$MCO_3(s) + 2H_3O^+(aq) \longrightarrow M^{2+}(aq) + 3H_2O(l) + CO_2(g)$$

In the equation, M stands for Ca, Mg, or Fe. Design an experiment to determine the effect of various HCl concentrations on the rates of this reaction. Present your design to the class.

extension

Graphing Calculator

Reaction Orders

Go to **go.hrw.com** for a graphing calculator exercise that asks you to calculate the order of a reaction from the reaction rates and concentrations.

Keyword: HC6RXKX