85. Write a summary describing how Gay-Lussac's work on combining volumes relates to Avogadro's study of gases. Explain how certain conclusions about gases followed logically from consideration of the work of both scientists.

USING THE HANDBOOK

86. Review the melting point data in the properties tables for each group of the *Elements Handbook*. What elements on the periodic table exist as gases at room temperature?

87. Review in the *Elements Handbook* the listing of the top 10 chemicals produced in the United States. Which of the top 10 chemicals are gases?

88. Most elements from Groups 1, 2, and 13 will react with water, acids, or bases to produce hydrogen gas. Review the common reactions information in the *Elements Handbook* and answer the following questions:

a. What is the equation for the reaction of barium with water?

b. What is the equation for the reaction between cesium and hydrochloric acid?

c. What is the equation for the reaction of gallium with hydrofluoric acid?

d. What mass of barium would be needed to react with excess water to produce 10.1 L H_2 at STP?

e. What masses of cesium and hydrochloric acid would be required to produce 10.1 L H_2 at STP?

89. Group 1 metals react with oxygen to produce oxides, peroxides, or superoxides. Review the equations for these common reactions in the *Elements Handbook,* and answer the following:

a. How do oxides, peroxides, and superoxides differ?

b. What mass of product will be formed from a reaction of 5.00 L O_2 with excess sodium? The reaction occurs at 27°C and 1 atm.

ALTERNATIVE ASSESSMENT

90. The air pressure of car tires should be checked regularly for safety reasons and for prevention of uneven tire wear. Find out the units of measurement on a typical tire gauge, and determine how gauge pressure relates to atmospheric pressure.

91. During a typical day, record every instance in which you encounter the diffusion or effusion of gases (for example, when smelling perfume).

92. **Performance** Qualitatively compare the molecular masses of various gases by noting how long it takes you to smell them from a fixed distance. Work only with materials that are not dangerous, such as flavor extracts, fruit peels, and onions.

93. **Performance** Design an experiment to gather data to verify the ideal gas law. If your teacher approves of your plan, carry it out. Illustrate your data with a graph, and determine if the data are consistent with the ideal gas law.

extension

Graphing Calculator

Using the Ideal Gas Law

Go to **go.hrw.com** for a graphing calculator exercise that asks you to use the ideal gas law.

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