SAMPLE PROBLEM G

a. What volume does 0.0685 mol of gas occupy at STP?
b. What quantity of gas, in moles, is contained in 2.21 L at STP?

SOLUTION

a. Multiply the amount in moles by the conversion factor, $\frac{22.4\ \text{L}}{1\ \text{mol}}$.

$$0.0685\ \cancel{\text{mol}} \times \frac{22.4\ \text{L}}{1\ \cancel{\text{mol}}} = 1.53\ \text{L}$$

b. Multiply the volume in liters by the conversion factor, $\frac{1\ \text{mol}}{22.4\ \text{L}}$.

$$2.21\ \cancel{\text{L}} \times \frac{1\ \text{mol}}{22.4\ \cancel{\text{L}}} = 0.0987\ \text{mol}$$

PRACTICE

Answers in Appendix E

1. At STP, what is the volume of 7.08 mol of nitrogen gas?
2. A sample of hydrogen gas occupies 14.1 L at STP. How many moles of the gas are present?

extension

Go to **go.hrw.com** for more practice problems that ask you to calculate molar volume.

Keyword: HC6GASX

Gas Stoichiometry

You can apply the discoveries of Gay-Lussac and Avogadro to calculate the stoichiometry of reactions involving gases. For gaseous reactants or products, the coefficients in chemical equations not only indicate molar amounts and mole ratios but also reveal volume ratios, assuming conditions remain the same. For example, consider the reaction of carbon monoxide with oxygen to give carbon dioxide.

$$2CO(g) + O_2(g) \longrightarrow 2CO_2(g)$$

2 molecules	1 molecule	2 molecules
2 mol	1 mol	2 mol
2 volumes	1 volume	2 volumes

extension

Chemical Content

Go to **go.hrw.com** for more information on gas stoichiometry.

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The possible volume ratios can be expressed in the following ways.

a. $\frac{2\ \text{volumes CO}}{1\ \text{volume } O_2}$ or $\frac{1\ \text{volume } O_2}{2\ \text{volumes CO}}$

b. $\frac{2\ \text{volumes CO}}{2\ \text{volumes } CO_2}$ or $\frac{2\ \text{volumes } CO_2}{2\ \text{volumes CO}}$

c. $\frac{1\ \text{volume } O_2}{2\ \text{volumes } CO_2}$ or $\frac{2\ \text{volumes } CO_2}{1\ \text{volume } O_2}$