SAMPLE PROBLEM A

The average atmospheric pressure in Denver, Colorado, is 0.830 atm. Express this pressure in (a) millimeters of mercury (mm Hg) and (b) kilopascals (kPa).

SOLUTION

1 ANALYZE

Given: P of atmosphere = 0.830 atm

760 mm Hg = 1 atm (definition); 101.325 kPa = 1 atm (definition)

Unknown: **a.** P of atmosphere in mm Hg; **b.** P of atmosphere in kPa

2 PLAN

a. atm $\longrightarrow$ mm Hg; $\cancel{\text{atm}} \times \dfrac{760 \text{ mm Hg}}{\cancel{\text{atm}}} = \text{mm Hg}$

b. atm $\longrightarrow$ kPa; $\cancel{\text{atm}} \times \dfrac{101.325 \text{ kPa}}{\cancel{\text{atm}}} = \text{kPa}$

3 COMPUTE

a. $0.830\ \cancel{\text{atm}} \times \dfrac{760 \text{ mm Hg}}{\cancel{\text{atm}}} = 631 \text{ mm Hg}$

b. $0.830\ \cancel{\text{atm}} \times \dfrac{101.325 \text{ kPa}}{\cancel{\text{atm}}} = 84.1 \text{ kPa}$

4 EVALUATE

Units have canceled to give the desired units, and answers are expressed to the correct number of significant figures. The known pressure and the calculated pressures are about 80% of the atmospheric pressure, as expressed in the new units.

PRACTICE

Answers in Appendix E

1. Convert a pressure of 1.75 atm to kPa and to mm Hg.
2. The critical pressure of carbon dioxide is 72.7 atm. What is this value in units of pascals?

extension

Go to **go.hrw.com** for more practice problems that ask you to convert between units of pressure.

Keyword: HC6GASX

Dalton's Law of Partial Pressures

John Dalton, the English chemist who proposed the atomic theory, also studied gas mixtures. The pressure exerted by each gas in an unreactive mixture is independent of that exerted by other gases present. *The pressure of each gas in a mixture is called the* **partial pressure** *of that gas.* **Dalton's law of partial pressures** *states that the total pressure of a gas mixture is the sum of the partial pressures of the component gases.* The law is true regardless of the number of different gases that are present. Dalton's law may be expressed as follows.

$$P_T = P_1 + P_2 + P_3 + \ldots$$

P_T is the total pressure of the mixture. P_1, P_2, P_3, and so on are the partial pressures of component gases 1, 2, 3, and so on.