mass of 1.01 g, and a mole of oxygen atoms has a mass of 16.00 g. The molar mass of water is calculated as follows.

$$2 \text{ mol H} \times \frac{1.01 \text{ g H}}{\text{mol H}} = 2.02 \text{ g H}$$

$$1 \text{ mol O} \times \frac{16.00 \text{ g O}}{\text{mol O}} = 16.00 \text{ g O}$$

$$\text{molar mass of } H_2O = 18.02 \text{ g/mol}$$

Figure 3 shows a mole of water as well as a mole of several other substances.

You may have noticed that *a compound's molar mass is numerically equal to its formula mass*. For instance, in Sample Problem F the formula mass of $KClO_3$ was found to be 122.55 amu. Therefore, because molar mass is numerically equal to formula mass, we know that the molar mass of $KClO_3$ is 122.55 g/mol.

FIGURE 3 Every compound has a characteristic molar mass. Shown here are one mole each of nitrogen (in balloon), water (in graduated cylinder), cadmium sulfide, CdS (yellow substance), and sodium chloride, NaCl (white substance).

SAMPLE PROBLEM G

What is the molar mass of barium nitrate, $Ba(NO_3)_2$?

SOLUTION

One mole of barium nitrate contains exactly one mole of Ba^{2+} ions and two moles of NO_3^- ions. The two moles of NO_3^- ions contain two moles of N atoms and six moles of O atoms. Therefore, the molar mass of $Ba(NO_3)_2$ is calculated as follows.

$$1 \text{ mol Ba} \times \frac{137.33 \text{ g Ba}}{\text{mol Ba}} = 137.33 \text{ g Ba}$$

$$2 \text{ mol N} \times \frac{14.01 \text{ g N}}{\text{mol N}} = 28.02 \text{ g N}$$

$$6 \text{ mol O} \times \frac{16.00 \text{ g O}}{\text{mol O}} = 96.00 \text{ g O}$$

$$\text{molar mass of } Ba(NO_3)_2 = 261.35 \text{ g/mol}$$

PRACTICE *Answers in Appendix E*

1. How many moles of atoms of each element are there in one mole of the following compounds?
   a. Al_2S_3
   b. $NaNO_3$
   c. $Ba(OH)_2$
2. Find the molar mass of each of the compounds listed in item 1.

extension
Go to **go.hrw.com** for more practice problems that ask you to calculate molar mass.
Keyword: HC6FRMX