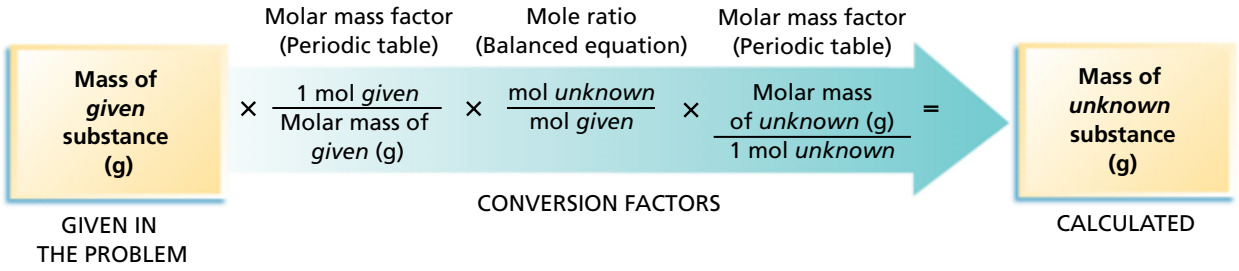

FIGURE 4 This is a solution plan for problems in which the given quantity is expressed in grams and the unknown quantity is also expressed in grams.

Mass-Mass Calculations

Mass-mass calculations are more practical than other mole calculations you have studied. You can never measure moles directly. You are generally required to calculate the amount in moles of a substance from its mass, which you can measure in the lab. Mass-mass problems can be viewed as the combination of the other types of problems. The plan for solving mass-mass problems is

mass of *given* substance (g) ⟶ amount of *given* substance (mol) ⟶ amount of *unknown* substance (mol) ⟶ mass of *unknown* substance (g)

Three additional pieces of data are needed to solve mass-mass problems: the molar mass of the *given* substance, the mole ratio, and the molar mass of the *unknown* substance.

SAMPLE PROBLEM E

For more help, go to the Math Tutor at the end of this chapter.

Tin(II) fluoride, SnF_2, is used in some toothpastes. It is made by the reaction of tin with hydrogen fluoride according to the following equation.

$$Sn(s) + 2HF(g) \longrightarrow SnF_2(s) + H_2(g)$$

How many grams of SnF_2 are produced from the reaction of 30.00 g HF with Sn?

SOLUTION

1 ANALYZE

Given: amount of HF = 30.00 g
Unknown: mass of SnF_2 produced (g)

2 PLAN

The conversion factors needed are the molar masses of HF and SnF_2 and the mole ratio of SnF_2 to HF.

$$\text{g HF} \times \overset{\text{molar mass factor}}{\frac{\text{mol HF}}{\text{g HF}}} \times \overset{\text{mol ratio}}{\frac{\text{mol } SnF_2}{\text{mol HF}}} \times \overset{\text{molar mass factor}}{\frac{\text{g } SnF_2}{\text{mol } SnF_2}} = \text{g } SnF_2$$