



FIGURE 11 The diagram shows the relationship between mass in grams, amount in moles, and number of atoms of an element in a sample.

Gram/Mole Conversions

Chemists use molar mass as a conversion factor in chemical calculations. For example, the molar mass of helium is 4.00 g He/mol He. To find how many grams of helium there are in two moles of helium, multiply by the molar mass.

$$2.00 \text{ mol He} \times \frac{4.00 \text{ g He}}{1 \text{ mol He}} = 8.00 \text{ g He}$$

Figure 11 shows how to use molar mass, moles, and Avogadro's number to relate mass in grams, amount in moles, and number of atoms of an element.

SAMPLE PROBLEM B

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

What is the mass in grams of 3.50 mol of the element copper, Cu?

SOLUTION

1 ANALYZE

Given: 3.50 mol Cu

Unknown: mass of Cu in grams

2 PLAN

amount of Cu in moles \longrightarrow mass of Cu in grams

According to **Figure 11**, the mass of an element in grams can be calculated by multiplying the amount of the element in moles by the element's molar mass.

$$\text{moles Cu} \times \frac{\text{grams Cu}}{\text{moles Cu}} = \text{grams Cu}$$

3 COMPUTE

The molar mass of copper from the periodic table is rounded to 63.55 g/mol.

$$3.50 \text{ mol Cu} \times \frac{63.55 \text{ g Cu}}{1 \text{ mol Cu}} = 222 \text{ g Cu}$$

4 EVALUATE

Because the amount of copper in moles was given to three significant figures, the answer was rounded to three significant figures. The size of the answer is reasonable because it is somewhat more than 3.5 times 60.