

2 **PLAN** number of atoms of Cu  $\longrightarrow$  amount of Cu in moles  $\longrightarrow$  mass of Cu in grams

As indicated in Figure 3-11, the given number of atoms must first be converted to amount in moles by dividing by Avogadro's number. Amount in moles is then multiplied by molar mass to yield mass in grams.

$$\text{Cu atoms} \times \frac{\text{moles Cu}}{\text{Avogadro's number of Cu atoms}} \times \frac{\text{grams Cu}}{\text{moles Cu}} = \text{grams Cu}$$

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

$$1.20 \times 10^8 \text{ Cu atoms} \times \frac{1 \text{ mol Cu}}{6.022 \times 10^{23} \text{ Cu atoms}} \times \frac{63.55 \text{ g Cu}}{\text{mol Cu}} = 1.27 \times 10^{-14} \text{ g Cu}$$

4 **EVALUATE** Units cancel correctly to give the answer in grams. The size of the answer is reasonable— $10^8$  has been divided by about  $10^{24}$  and multiplied by about  $10^2$ .

### PRACTICE

- |                                                                                       |                                                        |
|---------------------------------------------------------------------------------------|--------------------------------------------------------|
| 1. What is the mass in grams of $7.5 \times 10^{15}$ atoms of nickel, Ni?             | <i>Answer</i><br>$7.3 \times 10^{-7} \text{ g Ni}$     |
| 2. How many atoms of sulfur, S, are in 4.00 g of sulfur?                              | <i>Answer</i><br>$7.51 \times 10^{22} \text{ atoms S}$ |
| 3. What mass of gold, Au, contains the same number of atoms as 9.0 g of aluminum, Al? | <i>Answer</i><br>$66 \text{ g Au}$                     |

## SECTION REVIEW

- Define each of the following:
  - atomic number
  - mass number
  - relative atomic mass
  - average atomic mass
  - mole
  - Avogadro's number
  - molar mass
  - isotope
- Determine the number of protons, electrons, and neutrons in each of the following isotopes:
  - sodium-23
  - calcium-40
  - $^{64}_{29}\text{Cu}$
  - $^{108}_{47}\text{Ag}$
- Write the nuclear symbol and hyphen notation for each of the following isotopes:
  - mass number of 28 and atomic number of 14
  - 26 protons and 30 neutrons
  - 56 electrons and 82 neutrons
- To two decimal places, what is the relative atomic mass and the molar mass of the element potassium, K?
- Determine the mass in grams of the following:
  - 2.00 mol N
  - $3.01 \times 10^{23}$  atoms Cl
- Determine the amount in moles of the following:
  - 12.15 g Mg
  - $1.50 \times 10^{23}$  atoms F
- Determine the number of atoms in the following:
  - 2.50 mol Zn
  - 1.50 g C