2 PLAN

number of atoms of Cu ⟶ amount of Cu in moles ⟶ mass of Cu in grams

As indicated in **Figure 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.

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

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

Answers in Appendix E

1. What is the mass in grams of 7.5×10^{15} atoms of nickel, Ni?
2. How many atoms of sulfur, S, are in 4.00 g of sulfur?
3. What mass of gold, Au, contains the same number of atoms as 9.0 g of aluminum, Al?

extension

Go to **go.hrw.com** for more practice problems that ask you to convert among atoms, grams, and moles.

Keyword: HC6ATMX

SECTION REVIEW

1. Define each of the following:
   - **a.** atomic number
   - **b.** mass number
   - **c.** relative atomic mass
   - **d.** average atomic mass
   - **e.** mole
   - **f.** Avogadro's number
   - **g.** molar mass
   - **h.** isotope
2. Determine the number of protons, electrons, and neutrons in each of the following isotopes:
   - **a.** sodium-23
   - **b.** calcium-40
   - **c.** $^{64}_{29}\text{Cu}$
   - **d.** $^{108}_{47}\text{Ag}$
3. Write the nuclear symbol and hyphen notation for each of the following isotopes:
   - **a.** mass number of 28 and atomic number of 14
   - **b.** 26 protons and 30 neutrons
4. To two decimal places, what is the relative atomic mass and the molar mass of the element potassium, K?
5. Determine the mass in grams of the following:
   - **a.** 2.00 mol N
   - **b.** 3.01×10^{23} atoms Cl
6. Determine the amount in moles of the following:
   - **a.** 12.15 g Mg
   - **b.** 1.50×10^{23} atoms F

Critical Thinking

7. **ANALYZING DATA** Beaker A contains 2.06 mol of copper, and Beaker B contains 222 grams of silver. Which beaker contains the larger mass? Which beaker has the larger number of atoms?