Example 2.10

A sample of an ore was analyzed for Cu^{2+} as follows. A 1.25-gram sample of the ore was dissolved in acid and diluted to volume in a 250-mL volumetric flask. A 20-mL portion of the resulting solution was transferred by pipet to a 50-mL volumetric flask and diluted to volume. An analysis of this solution gives the concentration of Cu^{2+} as 4.62 μg/mL. What is the weight percent of Cu in the original ore?

Solution

Substituting known volumes (with significant figures appropriate for pipets and volumetric flasks) into equation 2.2

$$(C_{Cu})_o \times 20.00 \text{ mL} = 4.62 \ \mu\text{g/mL } Cu^{2+} \times 50.00 \text{ mL}$$

and solving for $(C_{Cu})_o$ gives the original concentration as 11.55 μg/mL Cu^{2+} . To calculate the grams of Cu^{2+} we multiply by the total volume

$$\frac{11.55 \ \mu\text{g } Cu^{2+}}{\text{mL}} \times 250.0 \text{ mL} \times \frac{1 \text{ g}}{10^6 \ \mu\text{g}} = 2.888 \times 10^{-3} \text{ g } Cu^{2+}$$

The weight percent Cu is

$$\frac{2.888 \times 10^{-3} \text{ g } Cu^{2+}}{1.25 \text{ g sample}} \times 100 = 0.231\% \text{ w/w } Cu^{2+}$$