c. moles $C_{13}H_{18}O_2 \longrightarrow$ moles C $\longrightarrow$ grams C

To find the mass of carbon present in the ibuprofen, the two conversion factors needed are the amount of carbon in moles per mole of $C_{13}H_{18}O_2$ and the molar mass of carbon.

$$\text{mol } C_{13}H_{18}O_2 \times \frac{13 \text{ mol C}}{\text{mol } C_{13}H_{18}O_2} \times \frac{12.01 \text{ g C}}{\text{mol C}} = \text{g C}$$

3 COMPUTE

a. $33 \text{ g } C_{13}H_{18}O_2 \times \frac{1 \text{ mol } C_{13}H_{18}O_2}{206.31 \text{ g } C_{13}H_{18}O_2} = 0.16 \text{ mol } C_{13}H_{18}O_2$

b. $0.16 \text{ mol } C_{13}H_{18}O_2 \times \frac{6.022 \times 10^{23} \text{ molecules}}{\text{mol}} = 9.6 \times 10^{22} \text{ molecules } C_{13}H_{18}O_2$

c. $0.16 \text{ mol } C_{13}H_{18}O_2 \times \frac{13 \text{ mol C}}{\text{mol } C_{13}H_{18}O_2} \times \frac{12.01 \text{ g C}}{\text{mol C}} = 25 \text{ g C}$

The bottle contains 0.16 mol of ibuprofen, which is 9.6×10^{22} molecules of ibuprofen. The sample of ibuprofen contains 25 g of carbon.

4 EVALUATE

Checking each step shows that the arithmetic is correct, significant figures have been used correctly, and units have canceled as desired.

PRACTICE *Answers in Appendix E*

1. How many moles of compound are there in the following?
   a. 6.60 g $(NH_4)_2SO_4$
   b. 4.5 kg $Ca(OH)_2$
2. How many molecules are there in the following?
   a. 25.0 g H_2SO_4
   b. 125 g of sugar, $C_{12}H_{22}O_{11}$
3. What is the mass in grams of 6.25 mol of copper(II) nitrate?

extension
Go to **go.hrw.com** for more practice problems that ask you to use molar mass as a conversion factor.
Keyword: HC6FRMX

Percentage Composition

It is often useful to know the percentage by mass of a particular element in a chemical compound. For example, suppose the compound potassium chlorate, $KClO_3$, were to be used as a source of oxygen. It would be helpful to know the percentage of oxygen in the compound. To find the mass percentage of an element in a compound, one can divide the mass of the element in a sample of the compound by the total mass of the sample, then multiply this value by 100.

$$\frac{\text{mass of element in sample of compound}}{\text{mass of sample of compound}} \times 100 = \text{\% element in compound}$$