Exercise 1.67

A sample of ascorbic acid (vitamin C) is synthesized in the laboratory. It contains 1.50 g of carbon and 2.00 g of oxygen. Another sample of ascorbic acid isolated from citrus fruits contains 6.35 g of carbon. According to the law of constant composition, how many grams of oxygen does it contain?

Solution

There are 1.50 g of carbon associated with every 2.00 g of oxygen. The law of constant composition states that

$$\frac{1.50 \text{ g C}}{2.00 \text{ g O}} = \frac{6.35 \text{ g C}}{x \text{ g O}}.$$

Solve for x by first inverting both sides

$$\frac{2.00 \text{ g O}}{1.50 \text{ g C}} = \frac{x \text{ g O}}{6.35 \text{ g C}}$$

and then multiplying both sides by 6.35 g C.

$$x = \frac{2.00 \text{ g O}}{1.50 \cancel{\text{g C}}}(6.35 \cancel{\text{g C}}) \approx 8.47 \text{ g O}$$