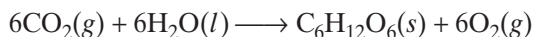


- 2 PLAN** You must start with a balanced equation.



Given the amount in mol of  $\text{H}_2\text{O}$ , you need to get the mass of  $\text{C}_6\text{H}_{12}\text{O}_6$  in grams. Two conversion factors are needed—the mole ratio of  $\text{C}_6\text{H}_{12}\text{O}_6$  to  $\text{H}_2\text{O}$  and the molar mass of  $\text{C}_6\text{H}_{12}\text{O}_6$ .

$$\text{mol H}_2\text{O} \times \frac{\text{mol ratio}}{\text{mol H}_2\text{O}} \times \frac{\text{molar mass factor}}{\text{mol C}_6\text{H}_{12}\text{O}_6} = \text{g C}_6\text{H}_{12}\text{O}_6$$

- 3 COMPUTE** Use the periodic table to compute the molar mass of  $\text{C}_6\text{H}_{12}\text{O}_6$ .

$$\text{C}_6\text{H}_{12}\text{O}_6 = 180.18 \text{ g/mol}$$

$$3.00 \text{ mol H}_2\text{O} \times \frac{1 \text{ mol C}_6\text{H}_{12}\text{O}_6}{6 \text{ mol H}_2\text{O}} \times \frac{180.18 \text{ g C}_6\text{H}_{12}\text{O}_6}{1 \text{ mol C}_6\text{H}_{12}\text{O}_6} = 90.1 \text{ g C}_6\text{H}_{12}\text{O}_6$$

- 4 EVALUATE** The answer is correctly rounded to three significant figures, to match those in 3.00 mol  $\text{H}_2\text{O}$ . The units cancel in the problem, leaving g  $\text{C}_6\text{H}_{12}\text{O}_6$  as the units for the answer, which matches the unknown. The answer is reasonable because it is one-half of 180.

### SAMPLE PROBLEM C

For more help, go to the **Math Tutor** at the end of this chapter.

What mass of carbon dioxide, in grams, is needed to react with 3.00 mol  $\text{H}_2\text{O}$  in the photosynthetic reaction described in Sample Problem B?

### SOLUTION

- 1 ANALYZE** **Given:** amount of  $\text{H}_2\text{O} = 3.00 \text{ mol}$   
**Unknown:** mass of  $\text{CO}_2$  (g)

The chemical equation from Sample Problem B is

- 2 PLAN** 
$$6\text{CO}_2(\text{g}) + 6\text{H}_2\text{O}(\text{l}) \longrightarrow \text{C}_6\text{H}_{12}\text{O}_6(\text{s}) + 6\text{O}_2(\text{g}).$$

Two conversion factors are needed—the mole ratio of  $\text{CO}_2$  to  $\text{H}_2\text{O}$  and the molar mass factor of  $\text{CO}_2$ .

- 3 COMPUTE** 
$$\text{mol H}_2\text{O} \times \frac{\text{mol ratio}}{\text{mol H}_2\text{O}} \times \frac{\text{molar mass factor}}{\text{mol CO}_2} = \text{g CO}_2$$

Use the periodic table to compute the molar mass of  $\text{CO}_2$ .

$$\text{CO}_2 = 44.01 \text{ g/mol}$$

- 4 EVALUATE** 
$$3.00 \text{ mol H}_2\text{O} \times \frac{6 \text{ mol CO}_2}{6 \text{ mol H}_2\text{O}} \times \frac{44.01 \text{ g CO}_2}{1 \text{ mol CO}_2} = 132 \text{ g CO}_2$$

The answer is rounded correctly to three significant figures to match those in 3.00 mol  $\text{H}_2\text{O}$ . The units cancel to leave g  $\text{CO}_2$ , which is the unknown. The answer is close to an estimate of 120, which is  $3 \times 40$ .