

Name _____ Section _____ Date _____

Worksheet 8D

Chemical Quantities

Extra Practice Problems

Percent Composition (section 8.5, Zumdahl page 235)

Chemists often have to determine the percent composition of a compound. Percent composition refers to the number of grams of each element in a compound present in 100 g of that compound. Knowing a compound's percent composition is the first step in determining the formula of that compound. Percent composition is determined in the laboratory by analyzing a sample of the compound to see what mass of each element is present in the compound. Then for each element mass of element

$$\text{Percent of element present} = \frac{\text{mass of element}}{\text{total mass of compound}} \times 100\%$$

Example A

A compound analyzed in a chemistry laboratory consists of 5.34 g of carbon, 0.42 g of hydrogen, and 47.08 g of chlorine. What is the percent composition of this compound?

Solution The total mass of the compound is equal to the sum of the masses of the three elements that make it up. Mass of compound = mass of C + mass of H + mass of Cl
 $= 5.34\text{g} + 0.42\text{g} + 47.08\text{g} = 52.84\text{ g}$

Then the percent of each element in the compound is calculated as follows.

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

$$\text{Percent C} = \frac{5.34\text{ g C}}{52.84\text{ g compound}} \times 100\% = 10.1\% \text{ C}$$

$$\text{Percent H} = \frac{0.42\text{ g H}}{52.84\text{ g compound}} \times 100\% = 0.79\% \text{ H}$$

$$\text{Percent Cl} = \frac{47.08\text{ g Cl}}{52.84\text{ g compound}} \times 100\% = 89.1\% \text{ Cl}$$

You Try It

1. Find the percent composition of a compound containing tin and chlorine if 18.35 g of the compound contains 5.74 g of tin. Your Solution

Example B

Determine the percent composition of ammonia from its formula, NH_3 .

Solution In this problem, you can determine the percent composition from the gram atomic masses of the elements and the gram molecular mass of the compound.

$$\begin{aligned}\text{Molecular mass of NH}_3 &= \text{gam of N} + (3 \times \text{gam of H}) \\ &= 14.0 \text{ g} + (3 \times 1.0 \text{ g}) \\ &= 14.0 \text{ g} + 3.0 \text{ g} = 17.0 \text{ g}\end{aligned}$$

Then the percent of each element in ammonia is calculated below

$$\text{Percent of Element} = \frac{\text{total atomic mass of element in compound}}{\text{molecular mass of compound}} \times 100\%$$

$$\text{percent N} = \frac{14.0 \text{ g N}}{17.0 \text{ g NH}_3} \times 100\% = 82.4\% \text{N}$$

$$\text{percent H} = \frac{3.0 \text{ g H}}{17.0 \text{ g NH}_3} \times 100\% = 17.6\% \text{H}$$

You Try It

2. Calculate the percent of each element present in potassium phosphate from its formula, K_3PO_4 .
Your Solution

Problems For You To Try

3. Determine the percent composition of a compound that consists of 3.907g of carbon and 0.874g of hydrogen.

4. From the formula for calcium acetate, $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$, calculate the mass of carbon that can be obtained from 65.3 g of the compound.