

Exercise 7.3c

Mole Conversions & Percentage by Mass

Name: _____

Date: _____ Per: _____

The percent composition (or "percentage composition" or "percentage by mass") represents how much weight each element contributes to the overall mass of a compound.

- To find the percentage composition, divide the atomic mass of each element by the formula mass and multiply by 100.
- One percentage is calculated for each individual element that appears in the compound's formula.
- The percentages must add to 100% (or very close).

$$\frac{\text{Mass of element}}{\text{Mass of compound}} \times 100 = \text{percent by mass}$$

Example: Calculate the percentage by mass of Na_2CO_3 .

$$\text{Total Mass} = 2(22.990) + 12.011 + 3(15.999) = 105.988 \text{ amu}$$

$$\text{Na: } \frac{45.980}{105.988} \times 100 = 43.38\% \quad \text{C: } \frac{12.011}{105.988} \times 100 = 11.33\% \quad \text{O: } \frac{47.997}{105.988} \times 100 = 45.29\%$$

DIRECTONS: Complete the following in the space provided. Show all work.

1. Calculate the percent composition of Al_2S_3 .
2. Calculate the percent composition of K_2SO_4 .
3. Calculate the percent composition of $\text{Al}_2(\text{SO}_4)_3$.
4. Convert 0.249 mol $\text{C}_2\text{H}_5\text{OH}$ into grams. (*Review*)
5. Calculate the percent composition of $(\text{NH}_4)_2\text{C}_2\text{O}_4$.
6. How many molecules of H_2 are present in a 34.566 gram sample of H_2 ? How many atoms are present in the sample? (*Review*)

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The Law of Definite Proportions states that a given chemical compound always contains the same elements in the exact same proportions by mass. For example, water is 11.2% hydrogen by mass and 88.8% oxygen by mass regardless of how much water is present.

Example: How many grams of hydrogen are present in 500. g of water?

$$\frac{500. \text{ g H}_2\text{O}}{100. \text{ g H}_2\text{O}} \left| \frac{11.2 \text{ g H}}{100. \text{ g H}_2\text{O}} \right. = 56.0 \text{ g H}$$

(This is basically a calculation of 11.2% of 500. grams.)

7. How many grams of Ba are present in 1.00×10^3 grams of $\text{Ba}(\text{CN})_2$?

8. What mass of oxygen is present in 3.50 mol H_2O ?

9. Calculate the percent composition of $\text{Cu}(\text{ClO}_4)_2$.
 - a. What mass of chlorine is present in 100. grams of $\text{Cu}(\text{ClO}_4)_2$?

 - b. What mass of oxygen is present in 200. grams of $\text{Cu}(\text{ClO}_4)_2$?

10. A compound contains only the elements nitrogen and oxygen. A 3.5000×10^2 gram sample of the compound contains 106.56 grams of nitrogen.
 - a. What is the percent by mass of oxygen in the compound?

 - b. How many grams of nitrogen are present in a 5.0000×10^2 gram sample?

11. How many grams of each element are present in 450.g of $(\text{NH}_4)_2\text{C}_2\text{O}_4$?