

Percent Composition by Mass

- when a new compound is discovered or made, an analytical chemist must determine the composition of the compound. They experimentally determine the percent of each element by mass.

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

Examples

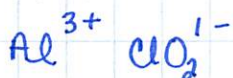
1. Determine the % of each element in aluminum chlorite?
unknown given

1st - determine the formula for the compound

2nd - calculate the molar mass of the compound

3rd - use the equation above for each element in the compound

aluminum chlorite



Molar Mass

$$1 \text{ Al} \times 26.98 \text{ g} = 26.98 \text{ g} \leftarrow \text{mass of Al}$$

$$2 \text{ Cl} \times 35.45 \text{ g} = 70.90 \text{ g} \leftarrow \text{mass of Cl}$$

$$6 \text{ O} \times 16.00 \text{ g} = +96.00 \text{ g} \leftarrow \text{mass of O}$$

$$193.88 \text{ g} \leftarrow \text{molar mass}$$

$$\% \text{ Al} = \frac{26.98 \text{ g}}{193.88 \text{ g}} \times 100 = 13.91582422 = 13.92\% \text{ Al}$$

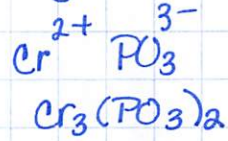
$$\% \text{ Cl} = \frac{70.90 \text{ g}}{193.88 \text{ g}} \times 100 = 36.56901176 = 36.57\% \text{ Cl}$$

$$\% \text{ O} = \frac{96.00 \text{ g}}{193.88 \text{ g}} \times 100 = 49.51516402 = 49.52\% \text{ O}$$

2. Calculate the % of each element in chromium (II) phosphite.

unknown

given



Molar Mass - $\text{Cr}_3(\text{PO}_3)_2$

$$\begin{aligned} 3 \text{ Cr} \times 52.00\text{g} &= 156.00\text{g} \leftarrow \text{mass of Cr} \\ 2 \text{ P} \times 30.97\text{g} &= 61.94\text{g} \leftarrow \text{mass of P} \\ 6 \text{ O} \times 16.00\text{g} &= + 96.00\text{g} \leftarrow \text{mass of O} \\ &= 313.94\text{g} \leftarrow \text{molar mass} \end{aligned}$$

$$\% \text{ Cr} = \frac{156.00\text{g}}{313.94\text{g}} \times 100 = 49.69102376 = 49.69\% \text{ Cr}$$

$$\% \text{ P} = \frac{61.94\text{g}}{313.94\text{g}} \times 100 = 19.72988469 = 19.73\% \text{ P}$$

$$\% \text{ O} = \frac{96.00\text{g}}{313.94\text{g}} \times 100 = 30.57909155 = 30.58\% \text{ O}$$