

## Chemistry Lecture #54: Percent Composition

Percent composition gives the percent by mass of each element in a compound.

Find the percent composition of  $\text{Ca}_3(\text{PO}_4)_2$ .

Answer:

First, find the molar mass of  $\text{Ca}_3(\text{PO}_4)_2$ .

$$\text{Ca: } 3 \times 40.1 = 120$$

$$\text{P: } 2 \times 31.0 = 62.0$$

$$\text{O: } 8 \times 16.0 = 128$$

310 g/mole rounded to 3 figures.

Next, divide the amount of each element by the molar mass and multiply by 100.

$$\text{Ca: } \frac{120}{310} \times 100 = 38.709 = 38.7 \% \text{ Ca}$$

$$\text{P: } \frac{62.0}{310} \times 100 = 20.0 = 20.0 \% \text{ P}$$

$$\text{O: } \frac{128}{310} \times 100 = 41.29 = 41.3 \% \text{ O}$$

Thus, if you had 100 g of  $\text{Ca}_3(\text{PO}_4)_2$ , 38.7 g of it would be Ca, 20.0 g would be P, and 41.3 g would be O.

Notice that  $38.7 + 20.0 + 41.3 = 100$ .

There are some problems where you are not given the formula for the compound, but you still have to find the percent composition.

A compound is made of magnesium and oxygen. When 13.60g of it is decomposed, you obtain 5.40 g of oxygen. Find the percent composition.

Answer:

$$\text{mass Mg} + \text{mass O} = 13.60 \text{ g}$$

$$\text{mass Mg} + 5.40 \text{ g} = 13.60 \text{ g}$$

$$\text{mass Mg} = 13.60 \text{ g} - 5.40 \text{ g} = 8.20 \text{ g}$$

$$\text{Mg: } \frac{8.20}{13.60} \times 100 = 60.2941 = 60.3 \% \text{ Mg}$$

$$\text{O: } \frac{5.40}{13.60} \times 100 = 39.7058 = 39.7 \% \text{ O}$$

Note that  $60.3 + 39.7 = 100$ .

A compound is formed when 1.40 g of N combines with 0.300 g of H. Find the percent composition.

mass N + mass H = total mass

1.40 g + 0.300 g H = total mass

Total mass = 1.70 g

$$\text{N: } \frac{1.40}{1.70} \times 100 = 82.3529 = 82.4 \% \text{ N}$$

$$\text{H: } \frac{0.300}{1.70} \times 100 = 17.6470 = 17.6 \% \text{ H}$$

Notice that  $82.4 + 17.6 = 100$