

How to work out percentage mass

The mass of a compound is its molecular mass in grams. To find the percentage mass of an element in a compound, we need to know the following:

- The formula of the compound.
- The relative atomic mass of each element in the compound.

We then use the following formula to calculate the percentage mass of the element:

$$\text{percentage mass} = \frac{\text{relative mass of element in compound}}{\text{relative molecular mass of compound}} \times 100 \%$$

Worked example

Calculate the percentage mass of copper in copper sulfate, CuSO_4 .

- Look up the relative atomic masses for the elements in the compound.

$$\text{Cu} = 63.5 \quad \text{S} = 32 \quad \text{O} = 16$$

- Work out the relative molecular mass of the compound.

$$\text{relative mass of copper} = 63.5 \text{ g}$$

$$\text{relative molecular mass of CuSO}_4 = 159.5 \text{ g}$$

- Use the equation to calculate the percentage mass of copper in copper sulfate.

$$\begin{aligned} \text{percentage mass of copper} &= \frac{63.5}{159.5} \times 100 \% \\ &= \mathbf{39.8 \%} \end{aligned}$$

Task

For this exercise, you will need to use a copy of the periodic table in order to find the atomic masses of the elements. Give your answers to three significant figures.

1. Calculate the percentage mass of carbon in methane CH_4 .
2. Calculate the percentage mass of oxygen in magnesium oxide, MgO .
3. Calculate the percentage mass of magnesium in magnesium chloride, MgCl_2 .
4. Calculate the percentage mass of nitrogen in nitric acid, HNO_3 .
5. Calculate the percentage mass of sulfur in sulfur trioxide, SO_3 .
6. Calculate the percentage mass of sulfur in sulfuric acid, H_2SO_4 .
7. Calculate the percentage mass of aluminium in aluminium oxide, Al_2O_3 .
8. Calculate the percentage mass of potassium in potassium carbonate, K_2CO_3 .
9. Calculate the percentage mass of calcium in calcium hydroxide, Ca(OH)_2 .
10. Calculate the percentage mass of nitrogen in calcium nitrate, $\text{Ca(NO}_3)_2$.

Answers

1. 75.0 %
2. 40.0 %
3. 25.5 %
4. 22.2 %
5. 40.0 %
6. 32.4 %
7. 52.9 %
8. 56.5 %
9. 54.1 %
10. 17.1 %