

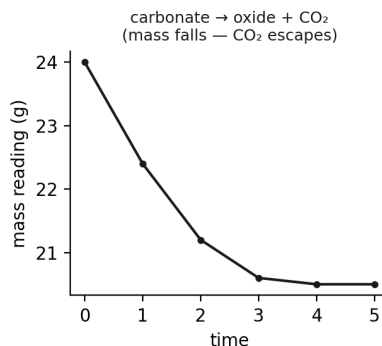
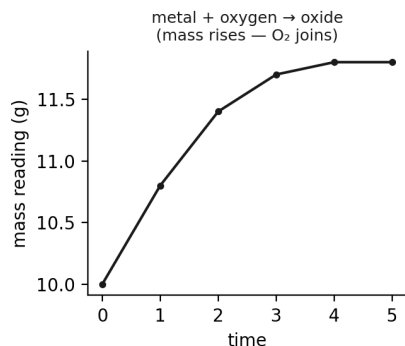
Exercise walk-through

3.1

Measurements, conservation of mass and equations (4.3.1.1–4.3.1.3)

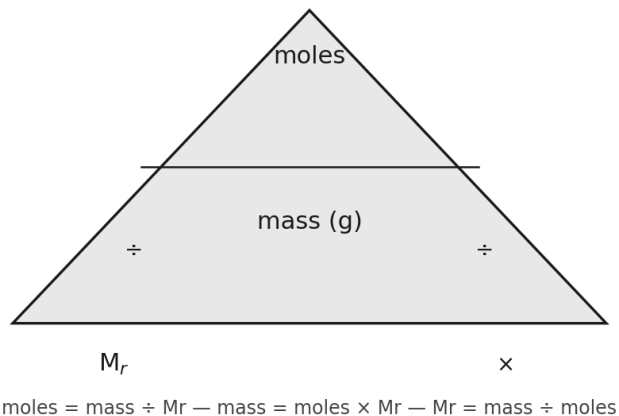
AQA · GCSE · Chemistry

Conservation of mass and Mr



- Conservation of mass and equations.
- Mass of products equals mass of reactants.
- Mr sums the atomic masses; percentage by mass follows.
- Gases explain any apparent mass change.

The mole



- Moles and reacting masses.
- One mole in grams = M_r ;
Avogadro constant 6.02×10^{23} .
- moles = mass divided by M_r .
- Ratio chain — mass to moles,
ratio, moles to mass.

Exercises 2.1·2.3

2.1 Balance: ____ Al + ____ O₂ → ____ Al₂O₃. [1]

2.2 Calculate the Mr of ammonium sulfate, (NH₄)₂SO₄ (N = 14, H = 1, S = 32, O = 16). [2]

2.3 A marble chip reaction loses 2.2 g. Suggest what left the flask. [1]

Exercises 2.1·2.3

2.1 Balance: ____ Al + ____ O₂ → ____ Al₂O₃. [1]

2.1 4 Al + 3 O₂ → 2 Al₂O₃.

2.2 Calculate the Mr of ammonium sulfate, (NH₄)₂SO₄ (N = 14, H = 1, S = 32, O = 16). [2]

2.2 $2 \times (14 + 4) + 32 + 64 = 36 + 32 + 64 = 132$.

2.3 A marble chip reaction loses 2.2 g. Suggest what left the flask. [1]

2.3 Carbon dioxide gas.

Exercises 3.1·3.3

3.1 A student heats 5.00 g of copper in air and obtains 5.63 g of black copper oxide. Explain the mass change and show it obeys conservation of mass. [4]

3.2 Calculate the percentage by mass of sulfur in sulfuric acid, H_2SO_4 ($\text{H} = 1$, $\text{S} = 32$, $\text{O} = 16$). [3]

3.3 (*HT*) Four titration readings for the same titration are 24.10, 24.30, 24.20 and 24.80 cm^3 . Give the mean volume and its uncertainty. [3]

Exercises 3.1·3.3

3.1 A student heats 5.00 g of copper in air and obtains 5.63 g of black copper oxide. Explain the mass change and show it obeys conservation of mass. [4]

3.1 Copper combines with oxygen from the air; the oxygen's mass adds to the solid; mass gain = $5.63 - 5.00 = 0.63$ g of oxygen; total reactant mass (copper + oxygen) equals product mass – conservation of mass holds once the gas is counted.

3.2 Calculate the percentage by mass of sulfur in sulfuric acid, H_2SO_4 ($\text{H} = 1$, $\text{S} = 32$, $\text{O} = 16$). [3]

3.2 $\text{Mr}(\text{H}_2\text{SO}_4) = 2 + 32 + 64 = 98$; sulfur contributes 32; $\% \text{S} = 32/98 \times 100 = 32.65$ % ≈ 32.7 %.

3.3 (*HT*) Four titration readings for the same titration are 24.10, 24.30, 24.20 and 24.80 cm^3 . Give the mean volume and its uncertainty. [3]

3.3 The anomalous 24.80 is excluded; mean = $(24.10 + 24.20 + 24.30) \div 3 = 24.20 \text{ cm}^3$; uncertainty $\pm \text{range}/2 = \pm 0.10 \text{ cm}^3$.