

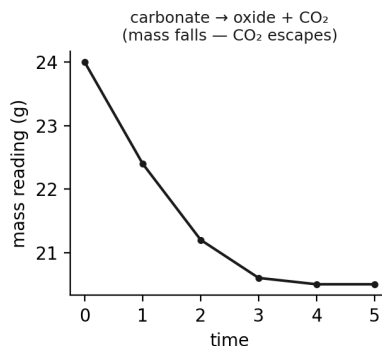
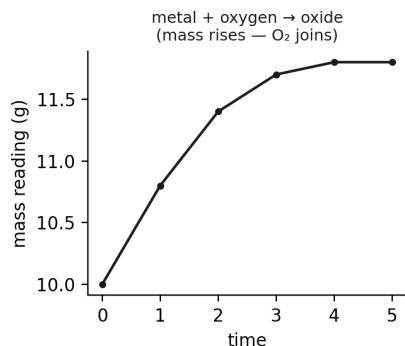
Exercise walk-through

3.2

Moles – amount of substance and reacting masses (4.3.2)

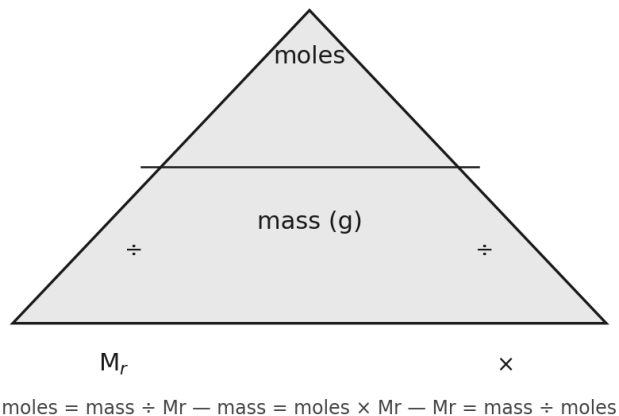
AQA · GCSE · Chemistry

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 How many moles are in 8.0 g of sodium hydroxide, NaOH (Na = 23, O = 16, H = 1)? [2]

2.2 What mass is 0.25 mol of CaCO_3 (Mr = 100)? [1]

2.3 0.2 mol of HCl is mixed with 0.2 mol of NaOH. Why does neither remain in excess? [1]

Exercises 2.1·2.3

2.1 How many moles are in 8.0 g of sodium hydroxide, NaOH (Na = 23, O = 16, H = 1)? [2]

2.1 $\text{Mr}(\text{NaOH}) = 40$; moles = $8.0 \div 40 = 0.2$.

2.2 What mass is 0.25 mol of CaCO_3 (Mr = 100)? [1]

2.2 $0.25 \times 100 = 25$ g.

2.3 0.2 mol of HCl is mixed with 0.2 mol of NaOH. Why does neither remain in excess? [1]

2.3 The equation ratio NaOH : HCl is 1 : 1, and the moles are equal, so both are fully used.

Exercises 3.1·3.3

3.1 Calculate the mass of carbon dioxide produced when 10.0 g of calcium carbonate decomposes: $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ (Ca = 40, C = 12, O = 16). [4]

3.2 6.0 g of magnesium reacts with 4.0 g of oxygen: $2 \text{Mg} + \text{O}_2 \rightarrow 2 \text{MgO}$. Identify the limiting reactant and calculate the mass of MgO formed (Mg = 24, O = 16). [5]

3.3 (*HT*) 250 cm³ of sodium chloride solution contains 3.5 g of solute. Calculate the

Exercises 3.1·3.3

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3.1 $\text{Mr}(\text{CaCO}_3) = 100$, moles = $10.0 \div 100 = 0.10$; ratio 1 : 1, so 0.10 mol CO_2 ; $\text{Mr}(\text{CO}_2) = 44$; mass = $0.10 \times 44 = 4.4$ g.

3.2 6.0 g of magnesium reacts with 4.0 g of oxygen: $2 \text{Mg} + \text{O}_2 \rightarrow 2 \text{MgO}$. Identify the limiting reactant and calculate the mass of MgO formed (Mg = 24, O = 16). [5]

3.2 Moles Mg = $6.0 \div 24 = 0.25$; moles $\text{O}_2 = 4.0 \div 32 = 0.125$; ratio needs 2 Mg per 1 O_2 , so 0.125 mol O_2 requires 0.25 mol Mg – exactly what is present: neither is limiting / both fully react; moles MgO = 0.25; mass = $0.25 \times 40 = 10.0$ g.

3.3 (HT) 250 cm³ of sodium chloride solution contains 3.5 g of solute. Calculate the

3.3 g/dm³: 3.5 g in 0.250 dm³ $\rightarrow 3.5 \div 0.25 = 14$ g/dm³; $\text{Mr}(\text{NaCl}) = 58.5$; mol/dm³ =