Solutions and Gases Map

Cambridge International AS & A Level Chemistry · Topic 2 Atoms, molecules and stoichiometry

1 Concentration

2.4.1(c)

- **c = n ÷ V**, V in dm³ (cm³ ÷ 1000)
- **n = c × V**
- g dm⁻³ = mol dm⁻³ × M
- Ions: $CaCl_2$ gives 2 × Cl^-
- Diluting: moles unchanged



2 Standard solutions

2.4.1(c)

- Weigh by difference
- Dissolve; transfer **with rinsings**
- **Volumetric flask**: make up to the mark
- Invert to mix
- 25.0 cm³ portion = 1/10 of 250 cm³

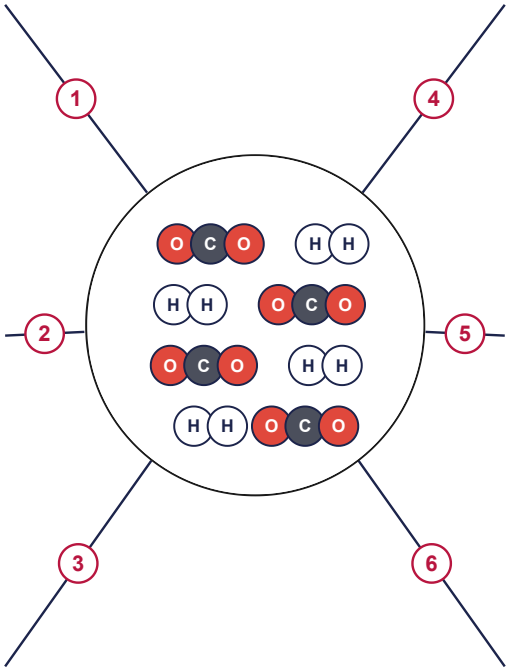


3 Titrations

2.4.1(c), (e)

- Burette: **n = c × V**
- **Ratio** from the equation
- Pipette portion: **c = n ÷ V**
- **Concordant**: within 0.10 cm³
- Mole ratio gives the equation or x

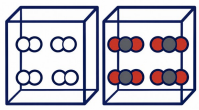




4 Molar volume

2.4.1(b)

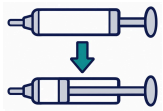
- **Avogadro**: equal volumes, equal molecules
- **24.0 dm³ mol⁻¹** room; 22.4 at s.t.p.
- V = n × 24.0; n = V ÷ 24.0
- Gas coefficients = **volume ratios**
- Leave out liquids; add leftover gas



5 Burning hydrocarbons

2.4.1(b)

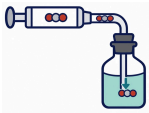
- $C_xH_y + (x + y/4)O_2 \rightarrow xCO_2 + y/2\ H_2O$
- Cooled: **water is a liquid**
- Gas left: excess O_2 + CO_2
- **Contraction** = before − after
- Per cm³ burned: 1 + y/4



6 A formula from volumes

2.4.1(e)

- **KOH(aq)** absorbs the CO_2
- CO_2 ÷ hydrocarbon = **x**
- O_2 used ÷ hydrocarbon = **x + y/4**
- Solve for y
- Mixtures: one equation per fact



Units and conversions

convert every quantity before substituting; give answers to the data's significant figures

Quantity	Given in	Calculate in	Convert
Volume	cm³	dm³	÷ 1000
Concentration	g dm⁻³	mol dm⁻³	÷ M (× M to go back)
Amount in solution	cm³ and mol dm⁻³	mol	c × V ÷ 1000
Portion to whole	25.0 cm³ of 250 cm³	mol in all	× 10
Gas amount	dm³ at room conditions	mol	÷ 24.0 dm³ mol⁻¹
Gas amount	dm³ at s.t.p.	mol	÷ 22.4 dm³ mol⁻¹

Worked examples

A dilution

- 25.0 cm³ of 0.100 mol dm⁻³
- made up to 250 cm³
- **0.0100 mol dm⁻³**

Gas from a mass

- 5.00 g $CaCO_3$: 0.0500 mol
- CO_2 1 : 1
- **1.20 dm³** at room conditions

A titration

- 22.50 cm³ of 0.100 mol dm⁻³ HCl
- 2.25 × 10⁻³ mol NaOH in 25.0 cm³
- **0.0900 mol dm⁻³**

Concentrations and gas volumes return in energetics, equilibria and the ideal gas equation (Topic 4).

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