Solutions and Gases Map

Edexcel International A Level Chemistry · Unit 1 · Topic 1E Calculations with Solutions and Gases

1 Concentration 1.5

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



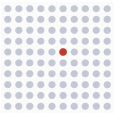
2 Standard solutions 1.5

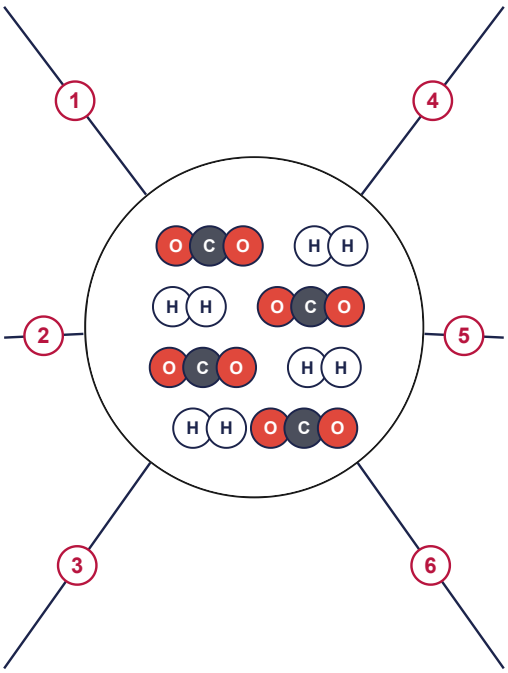
- Weigh by difference
- Dissolve; transfer **with rinsings**
- **Volumetric flask**: make up to the mark
- Invert to mix
- Dilution: **moles unchanged**



3 Parts per million 1.4 iv

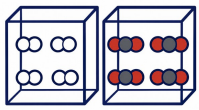
- **ppm**: parts in 10^6 parts
- By mass: m ÷ total m × 10^6
- Water: **1 ppm = 1 mg dm⁻³**
- Gases: **by volume**
- 1 % = 10 000 ppm; CO_2 about 420 ppm





4 Molar volume 1.8 i-ii

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



5 The ideal gas equation 1.8 iii

- **pV = nRT**, R = 8.31 J mol⁻¹ K⁻¹
- p in **Pa**, V in **m³**, T in **K**
- cm³ × 10^{-6}; dm³ × 10^{-3}; °C + 273
- Rearrange before substituting
- Volatile liquid: M = m ÷ n



6 Core Practical 1 1.11

- Mg + excess HCl; collect H_2
- **Gas syringe** (CO_2 dissolves in water)
- Molar volume = V ÷ n
- Graph: **gradient × A_r(Mg)**
- Oxide or lost gas: too low; warm gas: too high



Units and conversions

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

Quantity	Given in	Calculate in	Convert
Volume	cm³ or dm³	m³	cm³ × 10^{-6}; dm³ × 10^{-3}; dm³ = cm³ ÷ 1000
Pressure	kPa	Pa	kPa × 1000
Temperature	°C	K	°C + 273
Concentration	g dm⁻³	mol dm⁻³	÷ M (× M to go back)
Trace level	ppm	mg dm⁻³ (water)	the same number in dilute water
Gas amount	dm³ at r.t.p.	mol	÷ 24.0 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 r.t.p.

pV = nRT

- 250 cm³, 101 kPa, 25 °C
- (101 000 × 2.50 × 10^{-4}) ÷ (8.31 × 298)
- **0.0102 mol**

Concentrations and gas volumes return in titrations (Unit 2) and in energetics and equilibria.

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