Solutions and Gases Map

OCR A Level Chemistry A · 2.1.3 Amount of substance · Solutions and gases

1 Concentration

2.1.3 (e)(iii)

- **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 in 2.1.4



2 Standard solutions

2.1.3 (e)(iii)

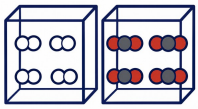
- Weigh by difference
- Dissolve; transfer **with rinsings**
- **Volumetric flask**: make up to the mark
- Invert to mix
- Dilution: **moles unchanged**

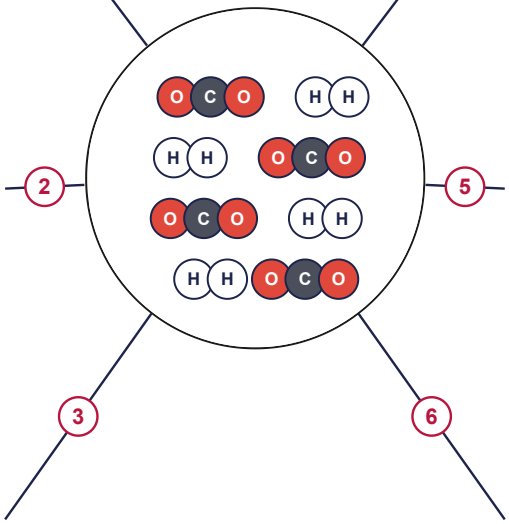


3 Molar gas volume

2.1.3 (a)(v), (e)(ii)

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





4 The ideal gas equation

2.1.3 (f)

- **pV = nRT**, R = 8.314 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



5 Measuring mass and volumes

2.1.3 (i)

- Weigh **by difference**; heat to **constant mass**
- 2 d.p. balance: ±0.005 g per reading
- **Pipette**: one fixed volume
- **Burette**: ±0.05 cm³ per reading
- Bottom of the meniscus, at eye level



6 Measuring gas volumes

2.1.3 (i)

- Weighed solid + **excess** reagent; seal at once
- **Gas syringe** (CO_2 dissolves in water)
- Molar gas volume = V ÷ n
- Let the gas cool; record T and p
- 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)
Gas amount	dm³ at RTP	mol	÷ 24.0 dm³ mol⁻¹
Uncertainty	± per reading	%	total uncertainty ÷ value × 100

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 RTP

pV = nRT

- 250 cm³, 101 kPa, 25 °C
- (101 000 × 2.50 × 10⁻⁴) ÷ (8.314 × 298)
- **0.0102 mol**

Concentrations and gas volumes return in titrations (2.1.4) and in enthalpy changes (3.2.1).

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