Chemical calculations: diagnose and improve

Student activity • calculation workshop

YEAR 10 / LESSON 47 / CHEMISTRY + SCIENCE (DOUBLE AWARD)

The question

Can you explain why a calculation works?

Use a short diagnostic set to find errors in equations, quantities and formulae. Show the reasoning, check with the teacher, and attempt a fresh question after correcting your work.

Equipment

- Booklet, calculator, periodic table and earlier corrected work

Desk activity only; no chemicals or heating.

Course coverage: Shared-core review: 1.25–1.33 and 1.36. Gas-volume and molar-concentration calculations are excluded from this common review.

Plan, model or apparatus sketch

Map one calculation route and identify a mistake to avoid.

Method and reasoning

Read the whole sequence before starting

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1. Without notes, write the difference between a coefficient and a subscript, and between M_r and molar mass M.

2. Attempt questions 1–6 independently. Use the reference values supplied and write units with every calculated quantity.

3. Use the diagnosis table to record one difficulty in each area. Keep your initial attempt visible.

4. Discuss one uncertain step with a partner, then use the teacher's separate answer guidance to check the reasoning.

5. Correct in another colour and explain the cause of each error: equation, quantity, units, ratio or arithmetic.

6. Complete the fresh exit calculation: what MgO mass can form from 1.20 g Mg with excess oxygen? State one specific practice target.

Cleanup

- Keep your workings and corrections; return shared materials.

Record your evidence

Blank spaces are for your own work

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Reference and task data

Use A_r: H 1, C 12, N 14, O 16, Mg 24, S 32, Ca 40. n = m/M. Percentage yield = actual/theoretical × 100. All numerical datasets are invented calculation exercises, not class measurements.

Area	What I first thought	Correction and reason
Equations / formulae		
Mass / amount / units		
Ratios / yield / evidence		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. Balance Al + O_2 → Al_2O_3 using coefficients only, and explain why changing a subscript is invalid.

2. Calculate M_r of $Ca(OH)_2$ and $(NH_4)_2SO_4$; state whether these values have units.

3. Calculate the mass of 0.150 mol CO_2 and the amount in 7.20 g Mg.

4. For $2Mg + O_2 \rightarrow 2MgO$, calculate the theoretical MgO mass from 2.40 g Mg with excess O_2. If 3.20 g is collected, find the percentage yield.

5. A made-up oxide contains 0.48 g Mg and 0.32 g O. Find its empirical formula; explain why mass ratio alone is insufficient.

6. A molecular substance has empirical formula CH_2O and M_r = 60. Find the molecular formula and explain one reason real oxide-practical data may not give an exact integer ratio.