# Chemical calculations: timed practice

Student activity • calculation workshop

YEAR 10 / LESSON 48 / CHEMISTRY + SCIENCE (DOUBLE AWARD)

## The question

**Can you show a complete method under timed conditions?**

Attempt six original four-mark questions, then use the separate guidance to diagnose mistakes. This is a 24-mark classroom practice set, not a past paper or predicted examination.

## Equipment

- Booklet, calculator, periodic table and timer

Desk activity only; no chemicals or heating.

Course coverage: Shared-core practice: 1.25–1.33 and 1.36. No Chemistry-only molar gas-volume or solution-concentration questions.

## Plan, model or apparatus sketch

**Use this space for rough working before writing final answers.**

# Method and reasoning

Read the whole sequence before starting

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**1.** Read the six questions and the reference values. You have 30 minutes for the initial independent attempt; show equations, substitutions and final units.

**2.** Allocate about five minutes per question. If stuck, write the valid steps you know and move on; return after attempting the others.

**3.** Keep initial answers unchanged when the time ends. Use the separate staff guidance to award method credit and record each question's mark.

**4.** Write one correction with a reason for each lost mark. Distinguish a conceptual mistake from an arithmetic slip.

**5.** Retry one weak question without looking at the model answer, then complete the exit task: 0.0750 mol $CaCO_3$ can make how much CaO when heated completely?

**6.** Compare the retry with the first attempt and choose one specific next practice task. Keep the first score and correction separate.

## 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, Ca 40. n=m/M; yield=actual/theoretical×100. All masses below are invented practice data. Question 4 uses $CaCO_3 \rightarrow CaO + CO_2$. This is a desk activity; no heating is carried out.

| Question | Initial mark / 4 | Correction / next step |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |

**Show your calculations, labelled model or correction here.**

# Explain and evaluate

Use evidence and show calculation steps where relevant

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**1.** (4 marks) Balance $N_2 + H_2 \rightarrow NH_3$. State the $H_2$:$NH_3$ mole ratio and calculate $NH_3$ amount from 0.600 mol $H_2$ with excess $N_2$.

**2.** (4 marks) Calculate $M_r$ of $Mg(NO_3)_2$. State M in g $mol^{-1}$ and calculate the mass of 0.0500 mol.

**3.** (4 marks) An invented oxide sample contains 0.72 g Mg and 0.48 g O. Calculate each amount, the simplest ratio and the empirical formula.

**4.** (4 marks) 5.00 g pure $CaCO_3$ decomposes fully. Calculate the theoretical CaO mass. A separate run gives 2.24 g CaO: calculate its percentage yield using that same initial mass.

**5.** (4 marks) A molecular compound contains 40.0% C, 6.7% H and 53.3% O by mass, with $M_r$ = 180. Determine its empirical and molecular formulae; show the ratio method.

**6.** (4 marks) Explain why the MgO crucible has a lid, why air is admitted briefly, why it is cooled before weighing, and how loss of oxide affects the inferred oxygen mass.