Chemical calculations: diagnose and improve

Teacher / technician

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

Staff preparation and answer guidance. Keep separate from student sheets. Original shared-core diagnostic questions; no official exam questions or grade claims.

Coverage and delivery

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

Allow about 60 minutes. Follow the student sequence and use the answers to check reasoning.

Requisition • class of 30, working in 15 pairs

Item	Per pair / setup	Class total
Booklet / writing tools	1 per learner	30 sets
Calculator / periodic table	1 each; table per pair	30 calculators; 15 tables

Immediate safety

Desk activity only; no chemicals or heating.

Preparation and delivery

Read alongside the student method

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1. Supply 30 booklets/calculators and 15 periodic tables. Keep the staff key separate until the independent attempt is complete. No apparatus or chemicals.

2. Allow 5 minutes retrieval, 20 independent work, 15 paired explanation, 15 feedback and 5 exit work. Use errors to decide follow-up teaching; do not invent a grade boundary.

3. The six original questions cover shared content only. Do not require molar-volume or concentration equations from Chemistry-only lessons 44–45.

4. Check that corrections explain a reason, not just a replacement number. The final MgO question is fresh, so it tests transfer beyond copying the key.

Close of lesson

• Keep your workings and corrections; return shared materials.

Check before teaching

Check the cards, reference data and quantities against this requisition. Keep the staff answer guide separate until the checking stage. Supplied numerical practice datasets are labelled examples; they are not class measurements.

Answers and teaching notes

Expected explanations • do not give as experimental observations

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• $4Al + 3O_2 \rightarrow 2Al_2O_3$. Coefficients change particle counts; a subscript changes the substance.

• $Ca(OH)_2$: 40 + 2(16+1) = 74. $(NH_4)_2SO_4$: 2(14+4) + 32 + 64 = 132. Relative formula masses are dimensionless.

• $M(CO_2)$=44 g mol^{-1}, so mass = 0.150×44 = 6.60 g. Mg amount = 7.20/24 = 0.300 mol.

• 2.40/24 = 0.100 mol Mg → 0.100 mol MgO; M(MgO)=40 g mol^{-1}, theoretical mass 4.00 g. Yield = 3.20/4.00×100 = 80.0%.

• 0.48/24 = 0.020 mol Mg; 0.32/16 = 0.020 mol O; MgO. Atomic masses differ, so use amounts rather than the raw mass ratio.

• CH_2O has relative mass 30; multiplier 2 gives $C_2H_4O_2$. Product loss, incomplete reaction or measurement uncertainty can disturb an experimental ratio. Exit: 1.20/24×40 = 2.00 g MgO.

References and provenance

Pearson Chemistry specification

Prepared 22 November 2026. Original wording, tables and questions. Sources inform the concepts and technique; the lesson scope and classroom quantities are explicitly described here. No laboratory trial or final school risk approval is claimed.