Reacting amounts and titration calculations

Teacher / technician

YEAR 10 / LESSON 59 / CHEMISTRY + SCIENCE (DOUBLE AWARD)

Staff preparation and answer guidance. Keep separate from student sheets. Shared reacting-mass practice plus Chemistry-only concentration extension; original data, no laboratory work.

Coverage and delivery

Shared core: 1.29, steps 1–2 and questions 1–2. Chemistry-only: 1.34C, steps 3–6 and questions 3–6. All values are original invented practice data.

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 calculator each; table per pair	30 calculators; 15 tables

Immediate safety

Desk activity only; equations do not authorise mixing chemicals.

Preparation and delivery

Read alongside the student method

YEAR 10 / LESSON 59 / CHEMISTRY + SCIENCE (DOUBLE AWARD)

1. Provide 30 booklets/calculators and 15 periodic tables. The task is entirely written; no titration reagents are needed.

2. Shared learners complete the two reacting-mass examples, compare solution routes and correct units. Chemistry learners continue to the titration dataset. Keep the existing shared 1.29 content visible.

3. Model the sequence: measured volume → dm^3 → known amount → equation ratio → unknown amount → concentration. Avoid shortcuts that hide a non-1:1 ratio.

4. For the invented HCl dataset, do not average 20.70 with the concordant values. Keep 20.025 cm^3 internally; the reporting convention may round the displayed mean to 20.03 cm^3.

5. Allow 10 minutes recall, 25 calculation, 15 error analysis and 10 corrections. Require a labelled answer unit and reasonable magnitude.

Close of lesson

• Keep corrections and 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

YEAR 10 / LESSON 59 / CHEMISTRY + SCIENCE (DOUBLE AWARD)

- $Mg + 2HCl \rightarrow MgCl_2 + H_2$. Mg=1.20/24=0.0500 mol; HCl=0.100 mol; mass=0.100×36.5=3.65 g.
- $CaCO_3$=5.00/100=0.0500 mol; CO_2 ratio 1:1; mass=0.0500×44=2.20 g.
- 20.00 and 20.05 cm^3 differ by 0.05; mean 20.025 cm^3 (20.03 to 2 d.p.). 20.70 is not concordant.
- V(HCl)=0.020025 dm^3; n=0.150×0.020025=0.00300375 mol. NaOH concentration=0.00300375/0.0250=0.12015, or 0.120 mol dm^{-3} to 3 s.f.
- $H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$. Acid=0.100×0.0200=0.00200 mol; NaOH=0.00400 mol; c=0.00400/0.0250=0.160 mol dm^{-3}.
- Using cm^3 with mol dm^{-3} makes the calculated amount 1000 times too large. The requested original NaOH concentration uses its pipetted volume, not the mixture volume.

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.