Core practical: neutralisation calorimetry

Teacher / technician

YEAR 11 / LESSON 82 / CHEMISTRY + SCIENCE (DOUBLE AWARD)

Staff preparation and answer guidance. Keep separate from student sheets. Simple classroom calorimetry; the calculated value is approximate, not a certified standard enthalpy.

Coverage and delivery

Shared core: 3.2–3.4 and 3.8, neutralisation calorimetry. No titration or Chemistry-only concentration assessment is required.

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
Insulated calorimetry set	1 per pair	15 sets; 30 cylinders
0.500 M HCl / NaOH	25.0 cm^3 each per pair	500 cm^3 each including spare
Eye protection	1 per person	30 protectors

Immediate safety

Wear eye protection; avoid acid/alkali splashes and report spills. Use staff-prepared dilute solutions; no flames or sealed vessels.

Preparation and delivery

Read alongside the student method

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1. For 15 pairs, one run needs 375 cm^3 of each 0.500 M solution; prepare 500 cm^3 each including spare. Provide 15 complete insulated-cup/lid/support/probe/stirrer sets, 30 labelled cylinders and 30 eye protectors.

2. Staff prepare working solutions under the school procedure; do not have pupils dilute concentrated stocks or dissolve NaOH pellets. Check labels and current SDS. Allow solutions to equilibrate to room temperature.

3. Dilute acid/alkali can splash and irritate, especially eyes; use goggles and the school spill response. There is no burner and the cup remains vented.

4. The resource uses a fixed equal-volume reaction rather than a variable-volume titration. Require total mixed-solution mass and limiting amount, not the mass of one reagent only.

5. Allow 10 minutes setup, 20 measurement, 20 calculations and 10 cleanup/evaluation. Local trial and risk assessment remain necessary.

Close of lesson

- Staff assess the mixed solution and direct waste disposal under the local plan; rinse equipment and wash hands.

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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- Example $\Delta T = 3.0\ °C$; $m \approx 50.0\ g$; $q = 50.0 \times 4.18 \times 3.0 = 627\ J$.
- $0.500 \times 0.0250 = 0.0125$ mol of each reactant; 1:1 ratio.
- $-627 / 0.0125 = -50160\ J\ mol^{-1} \approx -50.2\ kJ\ mol^{-1}$ (round consistently with data).
- The reaction transfers energy to the solution; the reaction system loses enthalpy.
- Some released energy is not counted in the solution rise, so the estimate is normally less negative in magnitude.
- Density/specific heat treated as water values; cup/probe heat capacity neglected; negligible heat exchange assumed; complete reaction and uniform temperature.

References and provenance

Pearson Chemistry specification

RSC neutralisation temperature-change practical

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.