Core practical: energy changes on dissolving

Teacher / technician

YEAR 11 / LESSON 81 / CHEMISTRY + SCIENCE (DOUBLE AWARD)

Staff preparation and answer guidance. Keep separate from student sheets. Two-salt temperature investigation; not a determination of standard molar enthalpies.

Coverage and delivery

Shared core: 3.1–3.2 and 3.8, salts dissolving in water. Equal-mass comparison is not a molar enthalpy comparison.

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
Cups / lids / supports	2 of each per pair	30 of each
Probe / cylinder / stirrer	1 per pair	15 sets; shared balances
Anhydrous $CaCl_2$ / KCl	2.00 g each per pair	40 g each including spare
Water / eye protection	50 cm^3 per pair; protector each	1.0 L + wash water; 30 protectors

Immediate safety

Wear eye protection. Avoid dust, splashes and ingestion; use only named staff-issued salts. Do not seal cups or use flames.

Preparation and delivery

Read alongside the student method

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1. For 15 pairs, supply 2.00 g each salt per pair: 30 g anhydrous $CaCl_2$ and 30 g KCl; prepare 40 g of each including repeats/spare. Water use is 750 cm^3 for two runs; provide 1.0 L plus wash water.

2. Provide 30 cups with lids/supporting beakers, 15 probes/cylinders/stirrers and shared balances; 30 eye protectors. Staff check $CaCl_2$ hydration state and keep the hygroscopic stock sealed.

3. Avoid dust and ingestion; calcium chloride can irritate eyes and heat on wetting. Issue small weighed portions; no hot/cold pack is cut open and no unidentified domestic mixture is substituted.

4. Trial the selected cup/probe arrangement locally. The method uses smaller concentration than some teaching demonstrations; no target temperature is guaranteed.

5. Allow 10 minutes briefing, 25 measurement, 15 interpretation and 10 cleanup. Collect solutions under the school disposal procedure.

Close of lesson

- Staff direct collection/disposal of labelled salt solutions; 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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• Use actual signed temperature differences; a result smaller than measurement uncertainty may be inconclusive.

• Anhydrous $CaCl_2$ is expected to warm the solution (exothermic); KCl to cool it (endothermic). Discuss actual departures honestly.

• Physical processes including dissolving can transfer energy; identify substances and other evidence rather than using temperature alone.

• Controls: water volume, salt mass, initial temperature and method; limitation: heat exchange, probe lag or incomplete dissolution.

• The salts have different molar masses; equal grams represent different mole amounts.

• Repeat to assess consistency; a lid/insulation reduces unwanted heat transfer. Neither removes every systematic error.

References and provenance

Pearson Chemistry specification

ACS temperature changes on dissolving

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.