Reversible reactions: dehydration and return

Teacher / technician

YEAR 11 / LESSON 87 / CHEMISTRY + SCIENCE (DOUBLE AWARD)

Staff preparation and answer guidance. Keep separate from student sheets. Small-scale hydration/dehydration; ammonium chloride remains a written reference example.

Coverage and delivery

Shared core: 3.17–3.18. Copper sulfate practical; ammonium chloride is discussed as a reference example only.

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
Heating / transfer sets	1 per pair	15 sets; 30 goggles
Hydrated $CuSO_4$	0.50 g per pair	10 g including spare
Water droppers	1 per pair	15 small labelled droppers

Immediate safety

Wear eye protection; avoid copper-salt dust/contact. Heat gently in an open tube, point away from people, and cool fully before dropwise water addition.

Preparation and delivery

Read alongside the student method

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1. Provide 0.50 g hydrated $CuSO_4$ per pair: 7.5 g for 15 pairs, prepare 10 g including spare. Provide 15 heating/transfer sets and 30 eye protectors; a small labelled water dropper per pair.

2. Staff demonstrate gentle heating and test the selected scale locally. Avoid overheating, which can cause further decomposition and fumes; the target is dehydration only.

3. Copper salts are harmful if swallowed and hazardous to aquatic life. Avoid dust/contact and collect all copper-containing solid/liquid residues; keep the tube open and handle hot glass only with suitable equipment.

4. Rehydration releases heat: use only a small cooled portion on an open watch glass, add water dropwise and never invite skin-temperature testing. No ammonia/HCl generation is performed in this lesson.

5. Allow 10 minutes briefing, 20 heating/cooling, 10 rehydration, 15 explanation and 5 cleanup. If cooling is incomplete, delay the water step rather than rush it.

Close of lesson

- Collect all copper-containing residues as labelled metal waste; leave hot glass to cool 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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- Expected blue hydrated solid becomes pale/white; blue returns on hydration. Record what actually occurs.
- The reaction can proceed in both directions under suitable conditions.
- Hot glass may crack on contact with water, and rehydration itself releases heat.
- Water is part of the hydrated crystalline structure, not simply surface moisture.
- Ammonia and hydrogen chloride.
- Material can escape; equal opposing rates and constant composition in a closed system have not been established.

References and provenance

Pearson Chemistry specification

RSC reversible copper sulfate reaction

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.