Thermal decomposition: copper carbonate evidence

Teacher / technician

YEAR 10 / LESSON 65 / CHEMISTRY + SCIENCE (DOUBLE AWARD)

Staff preparation and answer guidance. Keep separate from student sheets. A single-carbonate evidence investigation, not a quantitative comparison of decomposition temperatures.

Coverage and delivery

Shared core: 2.12. Copper carbonate decomposition and carbon dioxide identification; the simplified syllabus equation is distinguished from basic copper carbonate stock.

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 / delivery apparatus	Complete checked set per pair	15 sets; 30 eye protectors
Copper carbonate / limewater	0.20 g / 3 cm^3 per pair	4.0 g / 60 cm^3 including spare

Immediate safety

Wear eye protection; avoid copper-compound dust and contact. Keep the gas path open. Remove delivery outlet from limewater before stopping heat; leave hot glass clamped to cool.

Preparation and delivery

Read alongside the student method

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1. For 15 pairs, issue 0.20 g school copper carbonate per pair (3.0 g total; prepare 4.0 g including spare) and 3 cm^3 limewater each (45 cm^3 total; prepare 60 cm^3). Staff verify the bottle identity and current SDS/local assessment.

2. Provide 15 dry heat-resistant boiling tubes and checked delivery assemblies, stands, burners/mats and receiver tubes; 30 eye protectors. Demonstrate an open gas path, stable clamping and the outlet-first shutdown before issuing flame.

3. Copper compounds must not be ingested; avoid dust and collect solid residues separately as copper-containing waste. Limewater can irritate eyes/skin; hot glass can burn or crack. Use the school spill and waste procedures.

4. Trial the selected small-scale setup locally; if it is not approved or available, use recorded evidence and label it accordingly. Do not add lead carbonate, acid or sealed gas collection.

5. Allow 10 minutes briefing, 20 investigation/cooling, 20 explanation and 10 cleanup/correction. Do not touch apparently cold glass until checked by staff.

Close of lesson

• Staff collect cooled copper-containing solids and receiver liquid under the local waste plan. Do not put copper waste down the sink. Wash hands after cleanup.

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 green-to-black solid and cloudy limewater; accept actual observations including an inconclusive test, and discuss faults.

• $CuCO_3$ → CuO + CO_2; copper(II) oxide.

• Insoluble calcium carbonate forms as CO_2 reacts with calcium hydroxide solution.

• Withdraw the outlet from limewater before stopping heat: cooling gas contracts and can draw liquid into hot glass, risking breakage.

• Basic copper carbonate contains hydroxide and produces water; it is not pure $CuCO_3$.

• Gas flow, sample amount/particle size, heating rate, leaks and limewater conditions affect the time; one tube does not establish a fair stability comparison.

References and provenance

Pearson Chemistry specification

RSC carbonate decomposition

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.