

materials

Heating and cooling: reversible or not?

Lesson at a glance

Hold up a real ice cube and chocolate square and ask what gentle heat will do, and whether either change can be undone. Model melting ice in a front warm-water dish, then pupils predict on the Investigation Journal before groups melt ice and chocolate side by side and cool melted chocolate on a saucer. A teacher-only toast demo supplies the irreversible contrast. Close with the sorting-tree interactive and a kitchen-example talk.

Learning objectives

- Predict, observe and record melting of ice and chocolate
- Observe a teacher demonstration of an irreversible change (toasting bread)
- Classify changes as reversible or irreversible with reasons
- Explain that some changes can be undone and some cannot

Before the bell – prep

Day before: allergy-check chocolate; break equal squares; ice in a cool box; one cool saucer per group. Lesson start: jug or thermos of hand-warm water only — fill group trays during the prediction step so baths stay warm. Toaster and bread kept out of sight until the demo.

**Materials**

Item	Qty	Per	Source	Low-cost substitute
ice cubes	1	group	supermarket	fresh snow, or ice frozen in bags or bottles overnight (do not use gel cool packs)
plain chocolate squares	1	group	supermarket	a small piece of plain dairy-free cooking fat or vegetable shortening that softens in hand-warm water, checked against the class allergy list (do not use candle wax or beeswax)
small clear dishes or yoghurt pots	2	group	classroom	bottle lids or bottle bottoms cut safely by an adult in advance
shallow tray of warm water	1	group	classroom	a deep plate or roasting tin shared by two groups
cool saucers or plates	1	group	classroom	a clean cool windowsill spot or spare saucer shared by two groups
white bread slice	1	class	supermarket	any plain sliced bread
toaster	1	class	school kit	teacher-only toasting under a grill in a staff area, then bring the cooled toast in to show
heatproof plate	1	class	classroom	a saucer set aside only for the cooled toast
paper towels or cloths for spills	1	group	classroom	a shared class roll of kitchen paper
Investigation Journal page	1	pupil	provided printable	plain paper with teacher-led headings said aloud

Safety watch-point

Hand-warm water only; wipe spills at once. Toaster is teacher-demo only — pupils well back, leads tidy, toast cooled before close look. No tasting; wash hands after chocolate dishes.

Teaching moves

- **Reversible or irreversible?:** Project the three terms, then drop one ice cube in the front warm-water dish for about two minutes. Name solid shrinking and clear liquid forming. Voice that melting ice is reversible from known freezing — no new material was made — and that melted ice is not gone.
- **What do you predict?:** Hand out Investigation Journal pages before any group tray is filled. Think-pair-share one ice and one chocolate prediction with a short reason; jot a few on the board to return to later. Keep the toaster hidden so focus stays on melting.
- **Melting ice and chocolate:** Pace setup (2), hands-off watch (7–8), focus choice, chocolate cool-back, then reversible decision. Circulate for solid/liquid/soft/runny language; top up trays from the jug if they cool. Keep ice reverse as inference from freezing and chocolate reverse as cool-back clues — say both standards aloud.
- **Toasting bread:** Pupils stand well back; 30–60 seconds for a toast prediction line, then you operate the toaster only. After the reveal, talk track: browner, firmer, new material called toast — cooling will not un-toast it. Compare with the two melting evidence trails.
- **Record what we saw:** Coach observation versus inference before classify lines: clear liquid is seen; reversible ice is inferred from freezing; chocolate reasons should mention cool-back firming if seen; toast browning supports a new material. Head off ‘we didn’t freeze it, so irreversible’ for ice.
- **Sort the changes:** Open the sorting-tree interactive in explore mode. Class decides; you move the six cards. After each placement demand a reason tied to today’s evidence. Revoice anyone sorting by hot/cold instead of can-it-be-undone.

What it should show

Ice usually melts faster into clear water; chocolate slower into a brown liquid that often firms or loses its runny shine on the cool saucer. Toast goes brown and firmer and stays toast. Sort key: reversible — melting ice, melting chocolate, freezing water; irreversible — toasting bread, cooking an egg, burning paper. Still-solid chocolate at ~10 minutes is valid data, not a failed test.

Misconceptions & interventions

- **Pupils say the melted ice is ‘gone’ or has disappeared.** — Point at the clear liquid in the dish: same material, new state. Remind them freezing is how we get ice back — the change is reversible.
- **Pupils sort by ‘hot or cold’ — anything heated must be irreversible.** — Hold ice-melt and toast side by side: both used heat, only toast made a new material. Revoice the guide questions on the sorting-tree interactive.
- **Pupils mark melting ice irreversible because the class did not freeze the water today.** — Name the evidence standard aloud: ice reverse is inferred from known freezing; chocolate reverse used the cool-back they ran. Observation and inference stay on separate journal lines.

**Differentiation**

Emerging	Developing	Proficient
• Watch and record ice first, then chocolate; teacher table supports the observation-versus-inference split on the journal. • Offer oral labels (solid/liquid, clear/brown) while a partner scribes the journal lines.	• Add why ice and chocolate melt at different speeds using only what they saw in the shared bath. • Write one everyday kitchen example of each change type ready for the sorting step.	• Critique the two reverse-check standards — inferred freezing versus cool-back — and say which evidence is stronger and why. • For a sorting-tree card, argue both a weak and a strong reason so the class hears the can-it-be-undone test.

Cross-curricular hook

Link to Home Economics / kitchen science — freezing leftovers versus baking or toasting as reversible and irreversible pairs.