materials

Heating and cooling: reversible or not?

Lesson at a glance

Hold up an ice cube and a chocolate square and ask what heating will do and whether either change can be undone. Model ice melting in a front warm-water dish and name it reversible. Groups predict on the Investigation Journal, then melt ice and chocolate side by side in warm baths and cool melted chocolate on a saucer. You toast bread as the irreversible demo. Pupils finish observations, sort six cards on the sorting-tree interactive, and close with a display-only talk on reversible versus irreversible.

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

Ready a jug or thermos of hand-warm water — fill group trays only during predictions so they stay warm. Break equal chocolate squares; ice in a cool box; one cool saucer per group. Check chocolate allergies (dairy-free cooking fat if needed). Keep the toaster out of sight until the demo.

Lesson 10

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

Water hand-warm only; wipe spills; no tasting; hands off dishes. Toaster is teacher-only — tidy leads, pupils well back, cool toast before close look. Wash hands after chocolate.

Teaching moves

- **Getting Started:** Hold up one real ice cube and one chocolate square only — leave trays packed away. Take three or four unjudged guesses so pupils stay willing to predict later. Steer talk toward heating changing materials and some changes maybe being undone.
- **Reversible or irreversible?:** Project the short board words. Drop one ice cube in your front warm-water dish and name stages aloud: solid shrinking, clear liquid forming. Say melting ice is reversible because freezing turns water back to ice — no new material was made. Keep group trays closed.
- **What do you predict?:** Hand out Investigation Journal pages before any group melting. Think-pair-share: one ice prediction and one chocolate prediction with a short reason. Capture a few on the board to return to later. Keep the toaster hidden.
- **Melting ice and chocolate:** Pace set-up, hands-off watch, cool-back, then reversible decision on the board. Walk tables feeding solid/liquid, soft/runny, clear/brown language; stop poking fingers. Keep ice evidence (what freezers do) distinct from chocolate cool-back on the saucer so groups do not blur the two standards.
- **Toasting bread:** You run the toaster; pupils stay well back. Give 30–60 seconds for the toast prediction, then a show of hands on three board options before switching on. After reveal: bread went brown and firmer — a new material called toast that cooling will not undo. Link to melting: ice and chocolate can reverse; toast cannot.
- **Record what we saw:** Coach observation versus inference before classify lines: clear liquid water; cool-back firming for chocolate; browning and firmer toast. Re-voice once that ice is reversible from what freezers do, even though you did not freeze it today.
- **Sort the changes:** Open the sorting-tree interactive. Class decides; you move cards. Demand a reason each time — cool-back, freezer knowledge, or new material. If anyone sorts by hot or cold, revoice: heat can cause both kinds of change.
- **What did we learn?:** Lead the kitchen discuss prompt, then revisit board predictions — matched and mismatched both count. Draw the big idea in pupil language: reversible gets the original back; irreversible makes a new material. Start toaster cool-down early; empty trays; pupils wash hands.

What it should show

Ice usually melts faster than chocolate into clear water; chocolate becomes a brown liquid and often firms or loses its runny shine on the cool saucer within a minute or two. Toast browns and firms and stays toast. If chocolate is still mostly solid at about ten minutes, note it as slower melting, lift softened bits onto the saucer, and remind the class materials melt at different rates. A group calling ice irreversible likely blurred the freezer-reasoning standard with the cool-back check.

Lesson 10

Misconceptions & interventions

- **Pupils say the melted ice is gone or disappeared.** — Point at the clear liquid in the dish: only the state changed — still water. Name it reversible because freezing can make ice again.
- **We didn't get the solid ice back today, so melting ice must be irreversible.** — Say aloud that the two checks use different evidence: ice rests on what freezers do to water; chocolate rests on the cool-back they watched. Keep those standards distinct on the journal reasons.
- **Pupils sort cards by whether something was heated or cooled, not by whether it can be undone.** — On the sorting-tree, revoice the guide questions: Can you get the original material back? Has a new material been made? Heat can drive both kinds of change.

Differentiation

Emerging	Developing	Proficient
• Watch ice first, then chocolate one material at a time; use sentence openers I can see... and I think this means...; accept single words such as runny or clear.	• Keep both dishes under watch together and write a clear reason for each reversible or irreversible decision using cool-back or freezer knowledge.	• Ask why the two melt at different speeds and whether a larger chocolate piece would change what they saw; add one everyday kitchen example of each change type ready for sorting.

Cross-curricular hook

Link to English oral language: explain reversible to a 3rd-class pupil in one clear sentence using today's evidence.