

materials

Reversible and irreversible changes

Lesson at a glance

Open with fresh bread beside toast and ask whether the toast can become soft bread again. Model melting chocolate on a warm lid then cooling it on a chilled plate, then run a two-station rotation: salt dissolve-and-dry with a pre-dried “salt came back” sample, and baking soda with vinegar. Pupils record same-material vs new-material evidence on the Investigation Journal page, explore the states-of-matter interactive for the chocolate melt, then sort all four changes as a class and link irreversible changes to cooks and makers.

Learning objectives

- Distinguish changes that can be undone from changes that make something new
- Sort hands-on station results as reversible or irreversible with evidence
- Explain how cooks and makers use changes that cannot be undone

Before the bell: prep

Night before: chill one plate for the demonstration chocolate; dry and label three “salt came back” dishes, one per salt tray; print one Investigation Journal page per pupil and three copies of the station cards. Before the bell: toast one slice for the hook and keep a second for the demo; set six trays, three salt and three fizz; check chocolate/gluten allergies. Hand-warm water only, poured by you.

**Materials**

Item	Qty	Per	Source	Low-cost substitute
plain chocolate pieces (allergy-checked, small squares)	3	class	supermarket	plain cooking chocolate broken from a large bar
chilled plate or saucer for re-hardening the demonstration chocolate	1	class	classroom	any saucer left in a fridge or cool box before the lesson
clean spoon or spatula for moving the demonstration chocolate (not palms)	1	class	classroom	clean lollipop sticks or coffee stirrers
cup of warm hand-safe water with a lid for gently warming the demonstration chocolate (teacher-prepared)	1	class	classroom	a mug of hand-warm water with a saucer laid over it
table salt	1	class	supermarket	any fine cooking salt
labelled pre-dried salt samples ("salt came back")	3	class	classroom	salt sprinkled on dark card labelled as the dried result if overnight drying fails, plus honest talk that real drying leaves the same salt
clear plastic cups or beakers	9	class	classroom	clean yoghurt pots
water in small jugs	3	class	classroom	tap water in bottles
dark paper or dark plates for drying salt drops	3	class	classroom	black card scraps or a dark lunch tray
baking soda (bicarbonate of soda)	1	class	supermarket	fresh bicarbonate of soda from a home baking cupboard
white vinegar	1	class	supermarket	any clear cooking vinegar
teaspoons and tablespoons	9	class	classroom	any clean measuring spoons
plastic trays for the pupil stations (three salt, three fizz)	6	class	classroom	lids from storage boxes or baking trays
sliced bread for toast demo	2	class	supermarket	any plain sliced bread; gluten-free if needed for display only
toaster or toaster oven (teacher only)	1	class	school kit	teacher brings pre-made toast and fresh bread to compare if no toaster is available

Item	Qty	Per	Source	Low-cost substitute
paper towels	1	class	classroom	clean cloths for wiping only
Investigation Journal page	1	pupil	provided printable	the three questions and a two-column sort (reversible, irreversible) written in the copy

Safety watch-point

Toaster and warm water are teacher-only at the front; hand-warm water, never carried by pupils. No tasting; vinegar cups on trays away from eyes; stand clear when toast pops; check chocolate/gluten allergies; wash hands after pack-away.

Teaching moves

- **Getting Started:** Hold up fresh bread and toast. Take three or four hands-up guesses with one reason each, leave them standing, and do not hand out kit yet. Flag any food allergies before materials open.
- **Changes we can undo, and changes we cannot:** Project only the short board text. Model the full cycle once: soften a small square of chocolate on the warm-water lid you control, move it to a chilled plate, and voice prediction–observe–decide that the same material came back.
- **What do you think will happen?:** Think-pair-share only: no kit on desks. Capture two or three group predictions under Can undo / Makes something new. Introduce evidence as what you see, hear or feel; offer the stems I think ... is reversible/irreversible because ...
- **Station investigations:** Run toast and chocolate at the front with pupils seated back; toaster stays with you. Send six groups of about four on a two-visit rotation (salt then fizz, or reverse). Circulate asking what is the same material, what is new, and what is the evidence; wipe fizz spills at once.
- **Record what we observed:** Journals open straight after stations. Pupils answer the three evidence questions only; leave the sort table blank for step 7. Push words like softened, hardened, crystals, fizz, brown and crisp. If live salt drops are wet, point them to the labelled pre-dried sample.
- **Why we could undo the chocolate melt:** Drive the particle interactive on the IWB: warm past melt, cool back to solid, and name that the dots are the same material moving differently. Keep the slider near melting; if dragged high, stop and say chocolate would scorch, not boil cleanly.
- **Sort the changes:** Board headings Reversible and Irreversible. Target: chocolate and salt reversible; fizz and toast irreversible. If salt is mis-sorted, return to the pre-dried sample and the idea that slow still counts. Ask groups to defend one sort from their journal evidence.
- **Cooks, makers and what we learned:** Plenary before pack-away. Revoice two strong evidence sentences, link soda bread and toasting to deliberate irreversible changes, then take three pairs: one reversible, one irreversible, one cook use. Only then tip fizz mixes, bin food waste, wipe trays and wash hands.



What it should show

Chocolate softens then firms again on the chilled plate (reversible). Salt “disappears” in water; the pre-dried sample shows crystals returned (reversible; live drops may still be wet). Baking soda with vinegar fizzes and leaves a mixture that is not the original powder and liquid (irreversible). Toast is brown, dry and crisp and cannot become soft bread (irreversible). Odd salt sorts usually mean the live drop was still wet. Use the labelled sample.



Misconceptions & interventions

- **Pupils say a change is irreversible just because it looks messy or takes a long time, like salt drying.** Show the labelled “salt came back” dish beside the wet live drop and revoice: reversible means the same material can return, not that it happens instantly.
- **“The vinegar disappeared so it is gone forever” or “heat destroys the chocolate.”** Ask what new substance they can point to (gas, toast crust) versus the same substance in a new form. On the interactive, cool the melt back and say the bits are still chocolate: only how they hold together changed.
- **Breaking a chocolate bar is treated the same as toasting or fizzing.** Park it briefly: pieces can sit together again and no new substance formed; keep today’s sort on melt/dissolve versus new-material changes so the main idea stays clear.



Differentiation

Emerging	Developing	Proficient
• Offer the spoken stems I think ... is reversible/irreversible because ... and “same material” / “new material” cards during the class sort. • Pair-share the Investigation Journal so one partner scribes evidence words while the other names what they saw.	• Prompt for one evidence phrase per change (softened, crystals, fizz, brown and crisp) before they leave the tray. • If the live salt drop is wet, require an explicit compare with the labelled “salt came back” sample in the journal.	• Ask what evidence they will look for before stations, and have them defend one disputed sort from journal notes. • Add one everyday kitchen example (melting butter versus frying an egg) in the cooks-and-makers talk.



Cross-curricular hook

Link to Irish kitchens: soda bread’s baking-soda rise and toasting are irreversible changes cooks choose on purpose.

