materials

Plan and run our heating and cooling inquiry

Lesson at a glance

Open with one bare ice cube and one wool-wrapped cube and ask which melts first, then hand each group the choice: keep ice frozen or keep water warm. Groups write a testable question and prediction, then sort change / measure / keep-the-same cards on the fair-test-planner interactive before filling their Investigation Journal planning page. They run one timed trial (about 8 minutes), rank melt or warmth straight into the Trial 1 column, and close with a display-only talk on what the first reading only hints at.

Learning objectives

- Frame an open, testable heating or cooling question within the class theme
- Plan a fair test by deciding what to change, what to measure and what to keep the same
- Run a first trial carefully and record readings separately from interpretations

Before the bell — prep

Freeze matched small cubes (bottle-cap size) and keep them in a cooler bag until the trial. Set out wool, foil, paper and bubble wrap for ice groups; identical-size plastic, metal and paper cups for warm-water groups. Have hand-warm water ready for teacher pouring only; agree one class timer.

Lesson 12

Materials

Item	Qty	Per	Source	Low-cost substitute
same-size ice cubes from one tray	4	group	school kit	freeze water overnight in identical bottle caps or ice-cube trays
cooler bag or insulated box for ice	1	class	classroom	collect ice from the staff-room freezer immediately before groups set up; or a polystyrene box with a lid
jug of warm (hand-safe) water	1	class	classroom	groups stay on the ice path only
assorted wrapping scraps (wool or fabric, foil, paper, bubble wrap)	1	group	classroom	scraps brought from home (clean fabric, foil, newspaper)
identical cups of different materials (for example plastic, metal, paper)	3	group	classroom	same cup type with different outer wraps
stopwatch or timer	1	group	school kit	shared class timer on the IWB or a phone stopwatch held by the teacher
shallow tray	1	group	classroom	plastic lunch box lid or baking tray
Investigation Journal pages	1	pupil	provided printable	ruled page with labelled boxes for plan and a simple results table
cloths for spills	4	class	classroom	paper towels

Safety watch-point

Hand-warm water is teacher-poured only — never hot. Keep floors dry as you wipe spills; no tasting of handled ice; no rushing across wet floors at pack-away.

Teaching moves

- **Getting Started:** Show only the bare cube and the wool-wrapped cube on a tray. Take three or four quick ideas; do not name variables or lay out the full kit yet. Stress that each group will own its own heating or cooling question.
- **Our question and prediction:** Reveal materials in three stages: ice path or warm-water path first; then wrappings versus cups with one model question shape; then write the question and a spoken because. Keep stations out of sight so groups plan instead of handling kit. Listen for wool-melts-ice-faster talk and reframe wraps as slowing heat, not making it.
- **Plan our fair test:** Drive the fair-test-planner interactive in challenge mode: ice path first with the class calling placements, then warm-water path. Keep target answers to yourself. Send groups to write only their three planner lines on the Investigation Journal. Challenge vague plans into a named measure and a named wait; for warm-water groups, check cups match in size and shape.
- **Run our first trial:** Bring ice out only now. Ice groups set wrappings first; you pour hand-warm water for every warm-water group in one spell, then start one shared class timer. During the wait, fold groups into short notice-and-sameness questions. At the bell, ranks go straight into Trial 1 — no full melt, same finger-judge on every cup.
- **Record our readings:** This is a tidy-up, not a second write. Confirm every material or cup has a Trial 1 rank. Model one board row if needed, then show a crossed-out claim box so pupils see readings stay separate from winner talk until after repeats.
- **What does trial one suggest?:** Draw two or three groups with different questions. Revoice ours-was-best into on-trial-one the wool wrap was least melted. Ask which sameness was hardest and why one trial is not enough. Preview the project next step: same test again, chart both trials, then decide.

What it should show

Wool or bubble wrap usually slows melting more than paper; bare ice melts fastest. Metal cups often cool faster than thicker plastic. Room temperature shifts absolute speed, but within-group ranks still teach fair testing. If nothing differs, wrappings may be too alike or cubes too large — add a bare control or use smaller ice next trial.

Misconceptions & interventions

- **Wool keeps us warm, so it will melt the ice faster.** — Hold up the wrap and reframe: it slows heat moving in or out; it does not make heat. Push the because toward trapped air or thickness, then check the Trial 1 ranks against that idea.
- **We can change the cup and the amount of water — both will still show which is best.** — Point back to the three planner lines: if two things change, you cannot tell which caused the result. Have them strike the second change and rewrite one keep-the-same.
- **Trial one already proves our wrapping or cup is the winner.** — Show a crossed-out claim beside the reading. Revoice half melted after 8 minutes as a reading only; the winner waits until repeats show a pattern.

Lesson 12

Differentiation

Emerging	Developing	Proficient
• Let a pupil dictate Trial 1 ranks to a partner while another points to the matching wrapping or cup. • Offer the worked model sentence stems (I will change… I will measure… I will keep…) for the three planner lines.	• Ask which sameness on their plan was hardest to hold and have them star it on the planning page for the repeat. • Prompt a because linked to thickness, trapped air, or how quickly heat passes — not it makes things hot or cold.	• Have them whisper one thing that might have made today's trial unfair and note it beside Trial 1 for the improve talk next time. • Stretch: sketch a bare control beside a well-wrapped cube as a possible next-trial addition using only kit already out.

Cross-curricular hook

Tie ranks and later repeats to the Maths Data strand — ordered categories today, then a simple comparison chart across two trials.