

**materials**

Plan and run our heating and cooling inquiry

Lesson at a glance

Open with one bare ice cube beside one loosely wool-wrapped cube and ask which melts first, then hand each group the choice of an ice-wrapping or warm-water-cup path. Groups write a testable question and prediction on the FairTestPlanner, sort change / measure / keep-the-same on the IWB fair-test interactive for both paths, then lock their own three planner lines. After a shared class timer they rank Trial 1 only onto the DataTable and close with talk on what one trial can and cannot prove.

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 ice cubes (bottle-cap size) and keep them in a cooler bag until the trial step. Gather wool, foil, paper, bubble wrap; identical plastic, metal and paper cups; trays; one class timer. Have hand-warm water ready for you to pour — never hot, never pupil-poured.



**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, never by pupils. Wipe spills as you go; no tasting of handled ice; dry floors before pack-away.

Teaching moves

- **Getting Started:** Show only the bare cube and the wool-wrapped cube on a tray — do not lay out the full kit. Take three or four quick ideas, accept every suggestion, and plant that each group will own its own heating or cooling question.
- **Our question and prediction:** Reveal on the IWB in three beats only: pick ice or warm-water path; then the material choices and one model question shape; then write the question and voice a short because. Circulate for one clear testable question on the FairTestPlanner — a spoken because is enough if writing time is tight. Listen for 'wool will melt the ice faster' and reframe that a wrap slows heat moving in or out.
- **Plan our fair test:** Drive the fair-test planner interactive in challenge mode without projecting target answers. Run the full ice sort with the class calling placements, then the warm-water sort. Protect time for every group to finish its own three FairTestPlanner lines; if a board pass runs long, shorten the second path but do not skip group writing. Challenge vague plans into a named measure and one change only.
- **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 short window, then start one shared class timer. During the wait, fold groups into whole-class notice questions — no parallel desk task. At the bell, ranks go straight onto the DataTable Trial 1 column; check only one thing changed and the same pupil judged every warm-water cup.
- **Record our readings:** This is a tidy-up, not a second write. Confirm every material or cup has a Trial 1 rank already on the DataTable. Model one board row if needed (wool | half melted), then cross out claim wording like 'so wool is best' and say claims wait until after repeats. Store journals with plan and DataTable together for Part 2.
- **What does trial one suggest?:** Draw out two or three groups with different questions. Revoice 'ours was best' into 'on trial one, the wool wrap was least melted in our group'. Ask which sameness was hardest and why one trial is not enough.

What it should show

Wool or bubble wrap usually slows melting more than paper; bare ice melts fastest. Metal cups often lose warmth faster than thicker plastic. Room temperature shifts absolute speed, but within-group rank order still teaches fair testing. If nothing differs, cubes may be too large or wraps too alike — try a bare control or smaller bottle-cap ice next trial.



Misconceptions & interventions

- **Wool keeps us warm, so it will melt the ice faster.** — Hold up the wool wrap and reframe: a wrap slows heat moving in or out; it does not make heat. Push the because toward thickness, trapped air, or how quickly heat can pass.
- **Pupils change two things at once — different cups and different amounts of water, or different wraps and different cube sizes.** — Point back at the three FairTestPlanner boxes and ask which single line is the change. Have them name every sameness out loud before the timer starts.
- **Pupils write claims such as 'so wool is best' in the Trial 1 column instead of a rank or reading.** — Show a crossed-out claim beside a clean reading like 'wool | half melted'. Say readings go on the DataTable now; winners wait until after repeats.



Differentiation

Emerging	Developing	Proficient
• Let a pupil dictate Trial 1 ranks to a partner while the partner writes the DataTable row. • Offer the model question shapes and three planner sentence starters so the group only fills the material names.	• Ask one extra circulating prompt: which sameness on your plan will be hardest to keep when you repeat? • Invite a tiny sketch of the set-up beside the DataTable row.	• After recording, whisper one thing that might have made today's trial unfair and how the repeat will fix it. • Stretch the because toward a material property (trapped air, thickness, how fast heat passes) rather than 'it keeps things hot or cold'.



Cross-curricular hook

Tie to Maths Data — ranks on the DataTable become the evidence set pupils will chart and compare across repeats.

