Lesson 10

materials

States of matter and changing state

Lesson at a glance

Open by holding up one ice cube and asking what heating and cooling might do to it. Pupils predict on the Investigation Journal page about the front tray—ice, warm water, kettle and cold fridge lid—then watch the teacher-only demo of melting, boiling and condensation. They record what they saw before the states-of-matter interactive links each stage to particle movement. Close with a shared sort of everyday solids, liquids and gases and a short talk on Irish dairy and distilling heating–cooling.

Learning objectives

- Identify solid, liquid and gas as the usual states of everyday materials
- Describe how heating and cooling move water between ice, liquid and steam, including condensation
- Link changing state to what particles are doing and to Irish industries such as dairy and distilling

Before the bell — prep

Night before: freeze ice cubes and chill a clean metal lid or mirror in the fridge. Morning: set one front demo tray with ice, jug of hand-safe warm water, clear cup, teacher-only kettle and cold lid; clear floor space so pupils stay back. Sorting set: wooden block or pencil, metal spoon, sealed water bottle, inflated balloon.

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Item	Qty	Per	Source	Low-cost substitute
ice cubes from the same tray	6	class	school kit	freeze water in identical bottle caps the day before
electric kettle (teacher only)	1	class	classroom	teacher-only saucepan of recently boiled water brought from staff room (pupils still stay well back from steam)
jug of warm hand-safe water	1	class	classroom	tap water that feels clearly warmer than the ice, judged by the teacher's hand
clear plastic or glass cup	1	class	classroom	any clear jar or bottle base
cold metal lid or small mirror	1	class	classroom	a clean metal baking tray or spoon chilled the same way
everyday state-sort items (wooden block or pencil, metal spoon, small sealed water bottle, inflated balloon or sealed bag of air)	1	class	classroom	use whatever safe classroom objects you already have and name three zones for solid, liquid and gas
paper zone mats labelled solid, liquid and gas	3	class	classroom	three areas of desk or board marked with sticky notes
Investigation Journal page	1	pupil	provided printable	ruled paper with a predict line and four rows headed ice, liquid water, steam, cold lid

Safety watch-point

Kettle and steam are teacher-demo only. Pupils stay well back; never let children pour boiling water or hold the kettle. Warm jug water must be hand-safe.

Teaching moves

- **Getting Started:** Hold one ice cube high so all can see. Ask only 'What do you already notice about ice that is different from the water in the sink?' Take quick hands-up guesses—do not teach the three states or run the demo yet.
- **Solid, liquid and gas:** Project only the three short state definitions. Hold changing state and condensation until after the demo. Keep the full key-concepts table for your own circling-back, not a front-load lecture.
- **What do you predict?:** Point to ice, jug, kettle and cold lid in turn so every item is nameable. Hand out the Investigation Journal; pupils write one short prediction only. Collect two or three spoken predictions on the board in their own words—do not reveal condensation.
- **Watching water change state:** Run the four stages briskly: show ice (hard, keeps shape), pour warm water into a clear cup, boil the kettle yourself with pupils well back, hold the cold lid in the steam path until beads form. Say each stage in one or two sentences and pause for naming. Never call the white plume gas—name invisible vapour as the gas and white mist as tiny liquid drops. If the lid stays dry, breathe gently on a cold mirror as backup and move on.
- **Record what we saw:** Pupils complete the observe section on the same Journal page before any particle talk. Prompt rows for ice, cup water, kettle steam and lid drops against What did you see? / Solid, liquid or gas? / Heating or cooling? Revoice steam carefully as you circulate.
- **What the particles were doing:** Drive the states-of-matter interactive in guided mode on the IWB only—short visual link, not a second lesson. Advance cold solid → melt at 0°C → room liquid → near 100°C vapour → cool back to liquid, pausing to link each screen to the real demo. Ask two key questions: what makes ice keep its shape, and did the particles themselves change or only how they move?
- **Everyday materials by state:** Default: shared class sort on the IWB or front desk—block/pencil, spoon, sealed water bottle, inflated balloon—into solid / liquid / gas. Demand the justification keeps its shape, flows or spreads out. Cold-call so every child defends at least one. If powder appears, revoice: each grain is solid.
- **Making sense of states:** Revoice toward three ideas: still water each time; heating speeds particles, cooling slows them; condensation is gas to liquid on a cold surface. Link briefly to dairy heating–cooling and distillery vapour cooled in pipes like the lid. Pairs match each industry example to heating, cooling or both.
- **What we learnt:** Exit check with fingers: 1 solid, 2 liquid, 3 gas—invisible kettle vapour (expect 3), drops on the lid (expect 2). Teacher alone handles the cooling kettle; wipe spills; return ice trays.

What it should show

Ice stays solid then softens/melts to liquid; cup water flows and takes shape; some water leaves the kettle as mostly invisible vapour; clear liquid beads form on the cold lid (condensation). White plume is tiny liquid drops, not the gas. Weak lid beads usually mean the lid was not cold enough—use a fridge-chilled mirror or a breath-on-mirror backup.

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Misconceptions & interventions

- **"The ice disappeared" or "it turned into air."** — Point to the meltwater in the cup and the beads on the lid and ask 'Where is the water now?' Keep repeating: still water—only the state changed.
- **Pupils point at the white kettle plume and call it gas.** — Say: some water left as a gas we mostly cannot see; the white mist is already tiny liquid drops in cooler air. The cold lid then shows more liquid forming as that gas cools.
- **"The particles get bigger when we heat them" or "steam particles are air particles."** — On the states-of-matter interactive, freeze on solid then liquid and ask what changed—the particles themselves or only how they move and space. Same water particles throughout.

Differentiation

Emerging	Developing	Proficient
• Allow drawing of the four demo stages with a board word bank (solid / liquid / gas) instead of full sentences on the Journal page. • Pair at the teacher table during the shared sort; offer the three justification phrases keeps its shape / flows / spreads out as a spoken stem.	• After observing, tick or note their earlier prediction beside each Journal row and add one sentence: 'It was still water because…' • During the sort, cold-call a second item and ask them to challenge a neighbour's placement with evidence.	• Ask them to explain why the white plume is not the gas, using the lid beads as evidence of condensation. • Stretch the industry talk: match dairy and distilling to heating, cooling or both and name which state change each step shows.

Cross-curricular hook

Link to Irish dairy (yoghurt/cheese heating then cooling) and distilling; Maths measures °C at the 0°C melt and 100°C boil points on the interactive.