



Materials

Solids, liquids and gases



Lesson at a glance

Open with a wooden block, a cup of water and a sealed bag of air and ask which keeps shape, pours, or fills its container. Groups rotate four shared stations of tricky materials (sand, a sponge squeezed under water, washing-up liquid poured slowly, a squashed air bag) asking the same three questions at each. Capture a class table, then run the states-of-matter interactive on water particles before groups sort six harder items (salt, milk, play-dough, an ice cube, a sponge, a football) and find the two with two states at once. Pupils record the three states with the three tests and an example each, explain whether sand is a liquid, and draw the particles in ice, water and water vapour on the Investigation Journal page.



Learning objectives

- Describe how solids, liquids and gases behave differently
- Sort everyday examples into solid, liquid or gas
- Explain in simple terms that particles are packed and move differently in each state



Before the bell: prep

Night before: dry sand trays with pouring cups, sealed clear air bags, two or three dry sponges and a basin per sponge station, washing-up liquid from the staffroom kitchen with two clear cups per station, and one block, cup of water and air bag for the opening. Sort kits per group: salt, play-dough, a sponge and a football from the PE store, with milk from the staffroom fridge on the day; Solid/Liquid/Gas mats. For 24 to 28 pupils run two identical sets of the four stations, with the sand, sponge and washing-up liquid stations together in one spill zone. Fetch ice from the staffroom freezer at the start of the sort.



**Materials**

Item	Qty	Per	Source	Low-cost substitute
a wooden block, a clear cup of water and a sealed bag of air (the opening)	1	class	classroom	a smooth stone or cork for the block
dry sand in a shallow tray	1	class	school kit	dry rice or uncooked lentils in a tray
small cup for pouring sand	1	class	classroom	a clean yoghurt pot
dry sponges (sponge station)	3	class	classroom sink or staffroom kitchen (clean ones)	a clean, dry cloth folded into a thick pad
basin or washing-up bowl half full of water (sponge station)	1	class	classroom sink or staffroom kitchen	a deep tray or a large clear plastic tub
washing-up liquid, about a finger's depth in a clear cup, with a second clear cup (washing-up liquid station)	1	class	staffroom kitchen	liquid hand soap or cooking oil
clear sealable bags puffed with air and sealed (station)	3	class	supermarket	a sealed empty clear drinks bottle with the lid on (air inside)
salt, a spoonful in a small sealed bag or pot (sort kit)	1	group	staffroom kitchen	sugar, or a sticky note labelled Salt
milk, a little in a small clear bottle or lidded cup (sort kit)	1	group	staffroom fridge	a sticky note labelled Milk
play-dough, a small lump (sort kit)	1	group	classroom	plasticine, or a sticky note labelled Play-dough
ice cube (sort kit)	1	group	staffroom freezer	a sticky note or picture card labelled Ice cube
sponge (sort kit)	1	group	classroom sink or staffroom kitchen	a sticky note labelled Sponge
football (sort kit)	1	group	PE store	any pumped-up ball, or a sticky note labelled Football
	1	group	classroom	



Item	Qty	Per	Source	Low-cost substitute
sorting trays or mats labelled Solid, Liquid, Gas				three sheets of paper with the state names written large
Investigation Journal page	1	pupil	classroom	a ruled A4 page with three rows labelled solid, liquid and gas

Safety watch-point

Stand in the pouring zone (sand, sponge basin, washing-up liquid) the whole station block. Calm pours only; wipe spills straight away, as washing-up liquid on the floor is slippery; keep soapy hands away from eyes; reseal air bags without popping.

**Teaching moves**

- **Getting Started:** Hold up the block, water cup and sealed air bag in turn. Take two or three quick answers on shape, pour and fill — do not name solid, liquid or gas yet. Note any 'air is nothing' or 'sand is a liquid' comments without correcting.
- **Three ways materials behave:** Project only the short key point naming solid, liquid and gas. Model one full wonder–predict–observe cycle aloud on the block only, then send groups to run the same three questions at every station.
- **Station exploration:** Stand in the pouring zone for the full fifteen minutes. Signal a brisk move every three minutes. At sand ask whether each grain keeps its shape; at the sponge ask what the bubbles are; at the washing-up liquid ask whether slow still means liquid; at the air bag ask whether the squashed air still fills the bag.
- **Hold, pour or fill?:** Build a four-row class table on the board (sand, sponge, washing-up liquid, air bag). Leave the sand row open for a phrase like 'pile pours / each grain solid' — do not force a bare yes/no. If the class votes sand a liquid, pinch a few grains and ask whether one grain keeps its shape.
- **What the particles are doing:** Open the states-of-matter interactive in guided mode on water. Walk solid (packed, wobbling) → liquid (sliding, low) → gas (racing, fills space) yourself before anyone touches the slider. Key line: still water in all three; heating changes how particles move, not what they are.
- **Sort everyday things by state:** Give each group its own six-item sort kit and Solid/Liquid/Gas mat. Circulate for justifications on salt, milk and play-dough. Finish with a 30-second show of hands on the challenge: the sponge and the football each hold air, a gas, inside a solid.
- **Record on your journal page:** Model one solid row on the IWB, then pupils complete the three rows on paper: holds its own shape / pours / fills its whole container / one example from today. Then they explain with one test why sand is not a liquid, and draw the particles in ice, water and water vapour. Steer gas examples back to the air bag or the air inside the football.
- **Make sense together:** Keep the three particle summary lines visible. Ask one pupil who changed their mind about sand or air to name the evidence that shifted them — celebrate the change of mind as good science.

What it should show

Sand: the pile pours but each grain is a solid, not a fourth state. Sponge: a solid that holds its shape; the bubbles squeezed out under water are air, a gas, from its holes. Washing-up liquid: pours slowly and takes the cup's shape, so it is a liquid. Air bag: squashed into a new shape, the air still fills the whole bag. Sort: salt solid (each grain), milk liquid, play-dough solid, ice solid water; the sponge and the football each have air, a gas, inside a solid. A white kettle cloud is tiny liquid droplets, not gas.





Misconceptions & interventions

- **Sand pours, so it must be a liquid.** Pinch a few grains and ask whether one grain keeps its own shape. Write 'pile pours / each grain solid' on the board so the longer answer is visible.
- **Air is nothing — the bag is empty.** Have them gently squeeze the sealed bag and notice it still feels full. Name air as a real material that fills its whole container.
- **The white cloud above a kettle is a gas.** Redirect: true water vapour is invisible; the white cloud is tiny liquid droplets. Keep gas examples to the air bag, balloon contents and room air.

Differentiation

Emerging	Developing	Proficient
• Answer the three station questions aloud only while you stand at their pouring turn — no written capture until the modelled journal row. • Offer sentence starters on the journal: 'A solid... A liquid... A gas...' and 'One example is...'.	• At the washing-up liquid, pour into a differently shaped clear cup and say what stayed the same about the liquid. • Justify one sort placement aloud to you before the class show of hands on the challenge.	• Explain why sand is many tiny solids rather than a liquid, using the three tests. • Link ice, liquid water and invisible vapour as the same material with particles moving differently.

Cross-curricular hook

Link to Maths sorting and classifying — three labelled groups with a rule justified by the hold / pour / fill tests.