

## Lesson 14 • materials

# Dissolving: what dissolves in water?

## Lesson at a glance

Open by stirring sugar into a clear cup of warm water and asking where it goes. Pupils sort six fair-test cards on the IWB planner (change the material; measure time; keep water amount, temperature, stir and spoonful the same), then write predictions in the Investigation Journal. Groups time sugar, salt, sand and flour in warm water with shared start/stop rules, record live, and close by naming soluble versus insoluble from the evidence.

## Learning objectives

- Plan which variable to change, measure and keep the same in a dissolving test
- Classify materials as dissolving or not dissolving in water and compare times where they do

## Before the bell – prep

Day before: four clear cups, sugar, salt, sand and flour in small pots, level teaspoons and stirring spoons per group of 4–5. Have a warm jug ready (kettle mixed with cold — comfortably warm, not scalding). Mark a 100 ml fill line on cups. Open fair-test-planner and fair-test-timer on the IWB.



**Materials**

| Item                                                                                | Qty | Per   | Source      | Low-cost substitute                                                 |
|-------------------------------------------------------------------------------------|-----|-------|-------------|---------------------------------------------------------------------|
| clear plastic cups                                                                  | 4   | group | supermarket | clean glass jars or yoghurt pots                                    |
| warm water in a jug                                                                 | 1   | group | classroom   | room-temperature water (times will be longer)                       |
| sugar in a small labelled pot (about 4 level teaspoons)                             | 1   | group | supermarket | caster sugar from staff room supplies                               |
| table salt in a small labelled pot (about 4 level teaspoons)                        | 1   | group | supermarket | cooking salt                                                        |
| clean play sand or builder's sand in a small labelled pot (about 4 level teaspoons) | 1   | group | school kit  | fine dry soil or grit from outdoors, dried                          |
| plain flour in a small labelled pot (about 4 level teaspoons)                       | 1   | group | supermarket | cornflour                                                           |
| teaspoon for measuring                                                              | 1   | group | classroom   | 5 ml medicine spoon                                                 |
| stirring spoon                                                                      | 1   | group | classroom   | clean lolly stick                                                   |
| stopwatch or timer                                                                  | 1   | group | school kit  | classroom clock with second hand, or the fair-test-timer on the IWB |
| cloths for spills                                                                   | 2   | class | classroom   | paper towels                                                        |
| Investigation Journal page                                                          | 1   | pupil | classroom   | ruled paper with a simple results table drawn by the pupil          |

**Safety watch-point**

Water must be comfortably warm only (kettle mixed with cold) — never scalding. No tasting any mixture. Wipe spills at once; tip sandy/floury solids to the bin before emptying cups so sinks do not clog.



### Teaching moves

- **Getting Started:** At the front, stir half a teaspoon of sugar into a clear cup of warm water so the class watches it disappear. Ask 'If the sugar is gone from sight, is it still there?' Accept ideas without settling them. Do not show sand or flour yet.
- **Plan a fair dissolving test:** Open the fair-test-planner interactive and drag the six cards as pupils call Change, Measure or Keep the same. Target: change the material; measure time to dissolve; keep water amount, temperature, stir and amount of material the same. If temperature lands under Change, ask how they would know it was the material that mattered. Let each group agree its own 'dissolved' stop rule and stick to it.
- **Test the four materials:** Model one full sugar trial on the fair-test-timer while cups stay untouched: start when solid goes in and stirring begins; stop on the dissolve rule or at two minutes. Then groups run salt, sand and flour one at a time with clear roles. Circulate for same volume poured just before each trial, one level teaspoon, same stir style — stop anyone who pre-fills all four cups.
- **Check your journal page:** Quick five-minute check only: every material needs dissolves yes/no and a time in seconds or a blank. Help rough-note groups transfer once onto the Investigation Journal. Early finishers may average two times or note one unfair-test risk.
- **What does the evidence show?:** Pool which materials dissolved and which times were fastest. Insist on the words soluble and insoluble. Close the hook: the sugar is still in the water, mixed evenly — not destroyed and not melted. Compare groups' dissolve rules on flour. Display-only talk; nothing typed.



### What it should show

Expect sugar to dissolve (often fastest, roughly 20–60 s in warm water); salt to dissolve more slowly; sand to stay visible (insoluble); flour to cloud the water and count as does not dissolve if bits remain. Odd long times usually mean cooler water from pre-filled cups or uneven stirring — re-pour from the warm jug just before the trial.



### Misconceptions & interventions

- **Pupils say the sugar melted when it disappeared in the water.** — Revoice: melting is a solid turning to liquid from heat alone; here the solid mixed into water so the pieces are no longer separate — that is dissolving. Point back at the clear cup of sugar-water from the hook.
- **Pupils think if you cannot see the sugar it is gone or destroyed.** — Close the hook loop: the sugar is still in the water, mixed so evenly we cannot see separate pieces. Remind we do not taste in class, but that is why sweet tea still tastes sweet.
- **Pupils change water temperature or pre-fill all cups, treating several things as free to vary.** — Ask: if one cup is hotter or sat longer, how do we know it was the material that made the difference? Re-pour the same volume from the shared warm jug immediately before each trial.



**Differentiation**

| Emerging                                                                                                                                                                                                                                                                    | Developing                                                                                                                                                                                                     | Proficient                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• Limit the group to two materials tested carefully with teacher-table support on roles and the journal columns.</li><li>• Pair a less confident recorder with a peer who calls dissolves yes/no while they write the time.</li></ul> | <ul style="list-style-type: none"><li>• Repeat one material and compare the two times under the same dissolve rule.</li><li>• Note one thing that would have made the test unfair if it had changed.</li></ul> | <ul style="list-style-type: none"><li>• Critique whether different group dissolve rules changed how flour was classified and propose one clearer shared rule.</li><li>• Explain why sugar and salt can look alike as white grains yet both count as soluble while sand does not.</li></ul> |

**Cross-curricular hook**

Tie to Maths measures — pupils record dissolve times in seconds and compare which soluble material was fastest.