

The lungs: how we breathe

Lesson at a glance

Pupils put hands on chest and tummy, notice what moves, then watch a finished bottle model: pull the base sheet and the lung balloon fills; push it up and it empties. Pairs seal the diaphragm sheet on a half-built kit, observe the fill-empty cycle on the class signal, then predict and count breaths for 30 seconds at rest and after one minute of star jumps. They record both counts and a because-sentence on the Investigation Journal page and close with a display-only talk on why breathing speeds up when muscles work harder.

Learning objectives

- Build a simple model that shows how the diaphragm helps the lungs fill and empty
- Count breaths at rest and after moving and compare the two
- Explain in their own words that breathing speeds up when muscles work harder and need more from the air

Before the bell – prep

Adult-only the night before: cut bottle bases, fix one lung balloon airtight in each lid, and leave kits half-built. Keep one finished demo bottle ready. Gather cut-open balloons or rubber sheets, tape, and spare pre-built lids. Classroom clock or stopwatch for the timed counts.

Materials

Item	Qty	Per	Source	Low-cost substitute
clear plastic bottle with base removed and lid airway prepared by an adult	1	pair	supermarket	a large clear plastic cup with the base carefully cut out by an adult and a balloon sealed over the rim as the lung if a bottle lid is awkward
balloon for the lung	1	pair	supermarket	a small party balloon from a multipack
balloon or thin rubber sheet for the diaphragm	1	pair	supermarket	a piece of stretchy washing-up glove taped over the base
short drinking straw	1	pair	classroom	skip the straw and fix the lung balloon directly in a hole in the lid
masking tape	1	group	classroom	sticky tape
stopwatch or classroom clock with a second hand	1	class	classroom	teacher counts seconds aloud
Investigation Journal page	1	pupil	classroom	a ruled page with headings for prediction, breaths at rest, breaths after moving, and one conclusion sentence

Safety watch-point

Adult-only bottle cutting and lid prep. No shared balloons or mouthpieces. Clear floor for star jumps; stop anyone dizzy or light-headed and make them a counter. No breath-holding contests.

Teaching moves

- **Getting Started:** Keep bottles away. Hands on chest and tummy only. Ask two or three pupils what moved. Link lightly: the heart speeds up when we move — might breathing change too?
- **How our lungs work:** Hold the finished demo bottle first. Say the cycle aloud before naming parts: I pull the base — the lung fills; I push up — it empties. Then name lungs and diaphragm briefly. Head off the suck idea: outside air is pushed in when the chest space gets bigger.
- **Build a lung in a bottle:** Pairs check the pre-fixed lung, stretch and tape the base sheet only, then hands up for your seal check. Do not let them free-test the pull. At about ten minutes, send any weak-seal pair to the demo bottle so the observation is not lost.
- **Watch the model breathe:** Class signal: pull gently down, then push up. Revoice pull-down = fill, push-up = empty. Say the body difference aloud: we push the sheet up, but your own diaphragm just relaxes back up by itself.
- **Count breaths at rest and after moving:** Agree one breath = one in and one out together; practise two slow breaths. Prediction stem first, then you call start/stop for both 30-second counts and the one-minute move. Show only the current instruction on the board. Pupils who should not jump become timekeepers or partner-counters.
- **Record and make sense:** Leave the causal board line up: muscles work harder and need more from the air, so breathing speeds up. Pupils finish the journal sentence in their own words. Take shares on whether the prediction was close and how the bottle helped; no fitness ranking of outliers.

What it should show

Pulling the base sheet should inflate the lung balloon; pushing it up should empty it. A failed fill is almost always a weak base or lid seal — retape or switch to the demo bottle. Rest counts often land around 8–12 breaths in 30 seconds and rise after star jumps. A flat or lower second count usually means counting only in-breaths, talking during the count, or not moving for the full minute — re-agree the one-breath rule and re-run the second count if needed.

Misconceptions & interventions

- **Lungs suck air in by themselves.** — Trace the demo: pull the base so the space gets bigger, then the balloon fills. Say air is pushed in from outside when the diaphragm makes more space — the lungs do not pull on their own.
- **One breath means only the breathe-in.** — Practise two or three slow class breaths before the timed counts and keep the board rule visible: one breath = one in and one out together.
- **On the model we push the sheet up, so something must shove my diaphragm up the same way.** — Hold the bottle and say it once clearly: we push the sheet to show the move; in quiet real breathing the diaphragm mostly relaxes and domes back up by itself.



Lesson 4

Differentiation

- {'emerging': ['Keep the half-built default: seal the base sheet only, or join the demo bottle for the watch step.', "Act as timekeeper or count a partner's breaths instead of star jumps; use a partly filled journal row if writing is heavy."]}
- {'developing': ['Add a tighter second base seal and compare how well the balloon fills.', 'Extend the because-clause: link the higher count to muscles needing more from the air.']}
- {'proficient': ['Critique fairness of the count: different times, in-only counting, or talking while counting.', 'Explain how the bottle model maps to real lungs and where the model differs (we push the sheet; the real diaphragm relaxes).']}

Cross-curricular hook

Tie to Maths Data — compare the two 30-second counts and talk about the difference between rest and after moving.

