

Storing and transforming energy

Lesson at a glance

Open with a wind-up toy or demo cotton-reel car held still then released, asking where the energy was hiding. After a one-wind vs more-winds class demo and hands-up prediction, groups build a pre-threaded elastic-band car, then take turns on a shared 1–2 m floor run testing low vs high winds. Seated groups help judge the fair test. The flow-builder interactive orders the energy chain; pupils draw and label store → movement → sound/heat on the DrawingRecord page before a everyday-life talk.

Learning objectives

- Build a device that stores energy and releases it to do a job
- Trace and label a full energy-transformation chain from store to output
- Test how changing the amount of stored energy changes the output

Before the bell – prep

Pre-build and check one working demo car. Pre-thread an elastic through each group's cotton reel; tray-ready a short stick, long pencil, card circle and tape per group. Clear a 1–2 m smooth floor run. Print one DrawingRecord page per pupil.

**Materials**

Item	Qty	Per	Source	Low-cost substitute
wind-up or pull-back toy (class demo)	1	class	classroom	pre-built demo elastic-band cotton-reel car from the build kit
pre-built demo elastic-band cotton-reel car	1	class	classroom	twist an elastic band between two fingers to spin a pencil if a full demo car fails
cotton reels or empty thread spools (elastic pre-threaded)	1	group	classroom	cardboard tube short section with holes punched for the axle
elastic bands (mixed sizes)	4	group	supermarket	cut rings from a clean party balloon
pencils (short stick and long axle)	2	group	classroom	wooden dowel pieces or sturdy straws for axles
card offcuts for washers	4	group	classroom	stiff cereal-box card from home recycling
sticky tape	1	group	classroom	masking tape or a small blob of reusable adhesive putty
masking tape or paper scraps for start and stop marks	1	group	classroom	chalk mark on floor or a shoe as a start line
Investigation Journal page	1	pupil	provided printable	blank A4 with a title box for the chain drawing

Safety watch-point

Aim cars and flying elastic ends away from faces; do not overstretch bands until they snap; clear feet from the run; stop if a band looks frayed.

Teaching moves

- **Energy that waits:** Run the live demo only once—wind first, mark the stop, then take every hand on further/same/less before the high-wind run. Voice the short I-wonder → I-predict → I-test → I-observed → I-think model once. Hold the phrase energy transformation for step 6.
- **Build a stored-energy device:** Keep kits closed until this step. Flash the labelled tray parts on the IWB, then set a tight build clock. Walk for slipping bands and add a tape tab or thicker card circle. Success look-for: the car only moves after the band is wound, and groups can point to where the energy waited.
- **Test more stored energy:** Call two groups at a time to the shared run; everyone else stays seated and answers fair-test checks (same device, same start, same release). Each turn: predict aloud, low winds, mark stop, high winds, mark stop, clear. Re-voice that only the number of winds may change.
- **Notice what changed:** Keep this oral only. Push past 'it went more' toward precise notices: left faster, reel hummed, tipped or spun on the spot. Treat a flip after many winds as useful data about release, not a failed build.
- **Trace the energy chain:** Name energy transformation here. Drive the flow-builder interactive in chain layout; class predicts order before any drag: stored in wound elastic → movement of the car → some as sound and heat. Stress the useful output is distance travelled and why the car eventually stops.
- **Record the chain:** Pupils draw and label on the DrawingRecord page only. Board starter: 'When we stored more energy, the car...' Look for a clear store start, movement next, sound/heat after, plus one evidence-based distance sentence from their trials.
- **Make sense of our results:** Most groups should report further travel with more winds; explore slip, flip or uneven floor honestly. Link to pull-back toys, clock springs, batteries and Irish mill sluices. Spoken reflect only: what would you change next time? Collect bands and small parts before dismissal.

What it should show

More winds usually send the car further along the run — more stored elastic energy, larger movement output. A group with little or no gain often had a slipped band, a push instead of a still release, or an uneven floor; re-run from rest with the band gripping. A spin or flip after many winds still counts; mark the furthest point along the run.



Misconceptions & interventions

- **Pupils say the energy is 'used up and gone' when the car stops.** — Revoice with the chain cards: energy changes form; a little becomes sound and heat through friction and the unwinding band, so the car slows, but it has not vanished.
- **Pupils think a harder push or a different let-go is what makes the car go further.** — Freeze the next trial and restate the fair-test rule: same device, same start line, release from rest — only the number of winds may change. Re-run both trials the same way.
- **Pupils put movement first in the chain, as if the car 'makes' the energy when it rolls.** — Point back to the wound band held still: 'Where was the energy while nothing seemed to be happening?' Rebuild the order from store → movement → sound and heat.

Differentiation

Emerging	Developing	Proficient
• Pair at the teacher table with the pre-threaded reel and a partly fixed card circle already gripping; supply the board sentence starter for the DrawingRecord page. • Let them run a teacher-counted low vs high wind while a partner marks the two stops.	• Ask them to name one fair-test thing their group kept the same, and one precise notice beyond 'further'. • On the journal page, mark beside the movement step how the distance changed with more winds.	• Critique a spoiled run: was it slip, push or floor — and say how to re-test fairly. • On the drawing, mark where sound or heat might appear along the run, not only at the stop.

Cross-curricular hook

Link to Maths measures — mark distance in floor tiles or book-lengths and compare low- vs high-wind runs.