

Lesson 22 • energy-forces

Sound: vibrations, pitch and volume

Lesson at a glance

Open by listing classroom sounds, then share one clean elastic-band pluck on a desk box. Pupils predict on the Investigation Journal how less ruler overhang and a harder pluck will change the sound. Groups free-explore rubber-band guitars and ruler twangs under a freeze signal, then run two fair tests: Test A changes only overhang for pitch; Test B changes only pluck strength for volume. Record observations on paper and close with a display-only talk linking findings to guitar and tin whistle.

Learning objectives

- Explain that sound is caused by vibration
- Change pitch and volume deliberately on a simple homemade instrument and describe what was changed

Before the bell – prep

Night before: stretch 2–3 elastic bands of mixed thickness across one small cardboard or tissue box per group of 3–4, plus one 30 cm plastic ruler. Print Investigation Journal pages. Clear a table-edge overhang per group. Agree a freeze signal (hand up or soft chime) before trays open.

Materials

Item	Qty	Per	Source	Low-cost substitute
small cardboard box or empty tissue box	1	group	classroom	a sturdy takeaway container or plastic lunchbox with elastic bands stretched across
elastic bands (mixed thickness if possible)	3	group	supermarket	hair ties that stretch, or rubber bands from post and packing
30 cm plastic ruler	1	group	classroom	a sturdy strip of thick card of similar length
Investigation Journal page	1	pupil	classroom	plain paper with headed sections for predict, observe, conclude

Safety watch-point

Elastic bands stay on the boxes — no shooting. Rulers stay low over the table edge. Use the freeze signal so the room can hear clean trials.



Teaching moves

- **Getting Started:** Take three or four quick sound answers only — no materials yet. End with one clean pluck on the pre-stretched desk box so the whole class hears the same note, then leave the box visible for the next step.
- **What is a sound?:** Project the short board text only. Model the full inquiry cycle once with the ruler: 20 cm overhang then 10 cm, same flick strength, think aloud prediction–test–observe without writing the conclusion on the board. Keep pitch (high/low) and volume (loud/quiet) as two separate words every time you speak.
- **Question and predict:** With trays still closed, show one band pluck and one gentle ruler flick and name the variable ‘how much hangs over the edge’. Leave both stems on the board; pupils write I-think-because predictions on the Investigation Journal before any group plucking.
- **Explore the instruments:** Open trays and run 45–60 second trial bursts then freeze-and-listen so each group hears one clean sound. Circulate asking what is wobbling and whether they changed only one thing. Close with freeze, hands off, trays ready for the two tests.
- **Investigate pitch and volume:** Stop explore with the freeze signal. Test A: everyone uses the ruler, two overhangs they choose, same flick — about 4–5 minutes plus a one-line jot. Freeze and swap. Test B: same band tightness, two pluck strengths only — another 4–5 minutes plus jot. If a group changes two things, pause and redo one clean trial.
- **Observe and record:** Pupils expand the light jots into full Investigation Journal rows: predicted, changed, noticed, plus one vibration note. Coach concrete lines such as ‘less hanging over sounded higher’ and keep faster blur with pitch, wider swing with louder pluck.
- **What did the evidence show?:** Display-only science talk: take two or three groups per question. Revoice toward shorter/tighter → higher pitch, harder touch → louder, wobble stops when sound stops. Link to fretting a guitar string and covering tin-whistle holes. Fold pack-away into the end of the step.

What it should show

Less ruler overhang or a tighter band gives a higher pitch; more overhang or a looser band gives lower. Harder pluck or flick is louder without raising pitch. The band or free ruler end blurs or can be felt while the sound lasts. A group whose ‘short’ overhang sounds lower usually changed flick strength or measured unevenly — re-run with the same gentle flick.

Misconceptions & interventions

- **Pupils treat louder as the same as higher** — ‘I plucked harder so the note went up.’ — Replay Test B on one band: same tightness, gentle then hard pluck. Ask whether the note climbed or only got bigger, and keep the words high/low and loud/quiet on the board as two columns.
- **Pupils think sound can happen without anything moving, or that the wobble keeps going after the sound stops.** — Have them watch the band or ruler free end during a pluck: point to the blur while they hear it, then freeze hands and notice both stop together.
- **Pupils change overhang and flick strength together and still claim the test shows what length does.** — Pause the group and ask what would make the comparison unfair. Redo one clean pair of trials changing only the overhang.

Differentiation

Emerging	Developing	Proficient
• Accept a shared spoken prediction captured by the teacher or a partner, still covering both stems on the page. • A labelled sketch of the ruler overhang or band on the box counts as the observation row; offer board starters: I predicted... I changed... I noticed...	• After both jots are done, allow one optional extra trial on the same instrument if time remains. • Prompt a because clause: why did the shorter free part sound higher?	• Ask them to critique a trial that changed two things and say which variable to lock next time. • Stretch: explain how fretting a guitar or covering tin-whistle holes uses the same shorter-vibrating-bit idea as the ruler.

Cross-curricular hook

Link to Music: fretting a guitar string or covering tin-whistle holes shortens the vibrating length and raises pitch.