Mechanical devices

Unit 2 · Energy, materials, systems and devices · matches the "Mechanical devices" lesson slides (about 60 minutes)

Teacher notes for someone teaching this lesson without a Design and Technology background, including a cover or supply teacher standing in for the usual class teacher.

IF YOU ONLY DO ONE THING (RUSHED COVER LESSON)

If you only do one thing: make sure every pupil can say what "Linear motion" means in their own words before the lesson ends. Movement in a straight line. Ask two or three pupils to explain it back to you - do not just ask "does that make sense?".

Key facts in plain language

These are the facts this lesson depends on. They are written in plain English, not subject jargon, so you can say them in your own words while you teach.

Linear motion:
Movement in a straight line.

Rotary motion:
Movement in a circle.

Reciprocating motion:
Movement backwards and forwards in a straight line.

Oscillating motion:
Swinging backwards and forwards in an arc, like a pendulum.

Lever:
A rigid bar that turns about a pivot (fulcrum) to give mechanical advantage.

Gear ratio:
Teeth on the driven gear divided by teeth on the driver gear.

Common misconceptions

Drawn from the wrong answers pupils pick in this lesson's own question bank, paired with the explanation that is already written for the right answer.

Pupils may think: "Rotary" is correct.
Why it is wrong: the correct answer is "Oscillating". It swings back and forth in an arc.

Pupils may think: "10" is correct.
Why it is wrong: the correct answer is "4". Gear ratio = driven teeth ÷ driver teeth = 40 ÷ 10 = 4, so the driver turns 4 times for every one turn of the driven gear (4:1).

Pupils may think: "Changes linear motion into rotary motion" is correct.
Why it is wrong: the correct answer is "Changes rotary motion into reciprocating motion". The turning cam pushes the follower up and down. A cam cannot be driven backwards by the follower.

Pupils may think: "With the load between it and the effort" is correct.
Why it is wrong: the correct answer is "Between the effort and the load". A seesaw or scissors: the fulcrum sits between effort and load.

Pupils may think: "The lever creates extra energy" is correct.
Why it is wrong: the correct answer is "A small effort can move a larger load". MA = load / effort; a long effort arm lets a small effort move a big load.

Talking points to follow the slide deck

The slide deck for this lesson follows the usual DT Classroom shape: a retrieval starter, then each key term below in turn, worked examples, exam-style practice, then an exit ticket. Use these lines as you reach each part - they are the same facts as above, just phrased as something you can say out loud.

When the deck reaches "Linear motion": say — Movement in a straight line. Ask: "can someone give me an example?"

When the deck reaches "Rotary motion": say — Movement in a circle. Ask: "can someone give me an example?"

When the deck reaches "Reciprocating motion": say — Movement backwards and forwards in a straight line. Ask: "can someone give me an example?"

When the deck reaches "Oscillating motion": say — Swinging backwards and forwards in an arc, like a pendulum. Ask: "can someone give me an example?"

When the deck reaches "Lever": say — A rigid bar that turns about a pivot (fulcrum) to give mechanical advantage. Ask: "can someone give me an example?"

When the deck reaches "Gear ratio": say — Teeth on the driven gear divided by teeth on the driver gear. Ask: "can someone give me an example?"

Worked answers to this lesson's questions

The same question bank used for this lesson's knowledge organiser self-check and worksheet exam practice. Use this page as the answer key, or cover the right-hand explanation and hand out the questions as a silent task (see the cover lesson box below).

1. A pendulum shows which type of motion?

a) Oscillating, b) Rotary, c) Reciprocating, d) Linear

Answer: a) Oscillating. It swings back and forth in an arc.

2. A 10-tooth driver gear turns a 40-tooth driven gear. How many turns does the driver make for one turn of the driven gear?

a) 4, b) 10, c) 0.25, d) 40

Answer: a) 4. Gear ratio = driven teeth ÷ driver teeth = 40 ÷ 10 = 4, so the driver turns 4 times for every one turn of the driven gear (4:1).

3. What does a cam and follower do?

a) Changes linear motion into rotary motion, b) Changes reciprocating motion into rotary motion, c) Increases the speed of a rotating shaft, d) Changes rotary motion into reciprocating motion

Answer: d) Changes rotary motion into reciprocating motion. The turning cam pushes the follower up and down. A cam cannot be driven backwards by the follower.

4. In a class 1 lever, where is the pivot?

a) With the load between it and the effort, b) With the effort between it and the load, c) Exactly halfway along the bar every time, d) Between the effort and the load

Answer: d) Between the effort and the load. A seesaw or scissors: the fulcrum sits between effort and load.

5. What does mechanical advantage mean for a lever?

a) A small effort can move a larger load, b) The lever creates extra energy, c) The effort needed is larger than the load, d) The load moves further than the effort

Answer: a) A small effort can move a larger load. MA = load / effort; a long effort arm lets a small effort move a big load.

READY-TO-RUN COVER LESSON

Project the existing lesson slides as normal; read the key facts and talking points above before the lesson starts.

Low-prep silent task (needs no workshop tools or machinery): write or display the numbered questions above without the "Answer:" line, and have pupils answer them in silence on paper. Mark from the answers above at the end, or next lesson.

If the lesson plan calls for tools, machinery, heat or anything hands-on, do not run that part as a non-specialist cover teacher - set the silent task above instead and leave the practical for the subject teacher. See the general workshop safety guide in the Teachers hub.