

## Solutions

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**2.1** (a) kinetic. (b) gravitational potential. (c) elastic potential.

**2.2** The kinetic store of the car empties; the thermal store of the brakes (and tyres, surroundings) fills – energy is dissipated by friction between the brake pads and wheels.

**2.3** Energy enters by work done when a current flows (electrical work). The thermal store of the motor and surroundings fills as the fan runs – the kinetic store of the blades also fills as they spin up, then stays steady.

**3.1** While falling: the gravitational potential store of the ball empties and its kinetic store fills. On impact: the kinetic store empties. The thermal store of the ball, the table and the surrounding air fills – the energy is dissipated, not destroyed.

**3.2** (a) Pumped uphill: gravitational potential store fills. Running down: gravitational potential store of the water empties; the kinetic store fills as it passes the turbine – the question asks for the store that empties, which is gravitational potential. (b) A system is an object or group of objects chosen for study; here the lake, dam and water (the energy changes of the lake–water system are tracked, while the grid outside it is the surrounding).

**3.3** (a) Input arrow 5 cm for 90 kJ; useful arrow  $90 - 27 = 63$  kJ wide  $\Rightarrow 63/90 \times 5 = 3.5$  cm; wasted arrow 27 kJ wide  $\Rightarrow 27/90 \times 5 = 1.5$  cm; arrows labelled in kJ with the useful one marked, and the two output widths adding to the input width. (b) The useful arrow is wider ( $45/90 \times 5 = 2.5$  cm) and the wasted arrow narrower; the two still add to 5 cm because the input is unchanged.