

Following energy through devices and chains

Grade 7 science (Year 8 · Class 7) · Test answers (mark scheme)

Model answers with the marks available. Award method marks for correct substitution even if the final arithmetic has a slip, and look for the key ideas in the explanations rather than exact wording.

Level: Grade 7 science (Year 8 · Class 7) · **Curriculum:** MS-PS3-5

Question 1 Conservation of energy (2 marks)

Energy cannot be created or destroyed; it can only be transferred from one store to another.
Example: the electrical energy of a lamp is partly transferred as wasted thermal energy.

Marking: 1 mark for the law; 1 mark for a valid example.

Question 2 Radio chain (3 marks)

- a. **Chemical → electrical → sound.**
- b. **Thermal energy** in the wires and circuit.

Marking: (a) 1 mark for each correct link; (b) 1 mark.

Question 3 Water pump Sankey (3 marks)

- a. **360 J.**
- b. **240 J.**
- c. $360 \div 600 \times 100 = \mathbf{60\%}$.

Marking: 1 mark for each part.

Question 4 Gas ring (3 marks)

- a. Efficiency = (useful energy output ÷ total energy input) × 100 %.
- b. $1800 \div 3000 \times 100 = \mathbf{60\%}$.

Marking: (a) 1 mark; (b) 1 mark for substitution, 1 for the answer.

Question 5 Hard to reuse (2 marks)

The thermal energy spreads out into the surrounding air, warming a very large amount of air by a tiny amount. It is too spread out to be gathered, so it cannot do useful work.

Marking: 1 mark for energy spreading to the surroundings; 1 mark for too spread out or too little warming to use.

Question 6 Compare two devices (3 marks)

- a. A: $40 \div 50 \times 100 = \mathbf{80\%}$. B: $36 \div 40 \times 100 = \mathbf{90\%}$.
b. A wastes 10 J and B wastes 4 J, so **device B** wastes less.

Marking: (a) 1 mark each; (b) 1 mark.

Question 7 Impossible claim (2 marks)

This would create 50 J of energy from nothing, which breaks the law of conservation of energy. The output of a machine is always less than or equal to the input, so its efficiency cannot exceed 100 %.

Marking: 1 mark for energy cannot be created; 1 mark for efficiency cannot be more than 100 %.

Question 8 Insulating a kettle (2 marks)

The efficiency **increases**. The insulation reduces the thermal energy transferred to the air, so a larger share of the electrical energy ends up in the water.

Marking: 1 mark for increase; 1 mark for less thermal energy escaping to the surroundings.