

Power, energy and electricity bills

Grade 8 science (Year 9 · Class 8) · Test answers (mark scheme)

The model answers below show the full working. Marks are given for the formula, the correct substitution and the final answer with a unit. A correct answer without a unit loses one mark.

Level: Grade 8 science (Year 9 · Class 8) · **Curriculum:** MS-PS3

Question 1 Meaning of power (2 marks)

- a. The rate at which energy is transferred (energy per second).
- b. Watt, W (1 joule per second).

Marking: 1 mark for each part.

Question 2 Cool box (2 marks)

- a. $P = V \times I$.
- b. $P = 12 \times 3.5 = \mathbf{42\ W}$.

Marking: 1 mark for the formula, 1 mark for 42 W with unit.

Question 3 Hair dryer (3 marks)

- a. $10\ \text{min} = 1/6\ \text{h}$. $E = 1.8 \times 1/6 = \mathbf{0.30\ kWh}$.
- b. $E = 1800\ \text{W} \times 600\ \text{s} = \mathbf{1\ 080\ 000\ J}$ (check: $0.30 \times 3\ 600\ 000$).

Marking: Part a: 1 mark for the time in hours, 1 mark for 0.30 kWh. Part b: 1 mark.

Question 4 Monthly bill (3 marks)

- a. $3018 - 2906 = \mathbf{112\ kWh}$.
- b. $\text{Cost} = 112 \times 0.22 = \mathbf{24.64\ dollars}$.

Marking: Part a: 1 mark. Part b: 1 mark for the method, 1 mark for the answer.

Question 5 Blender fuse (3 marks)

- a. $I = P \div V = 1380 \div 230 = \mathbf{6.0\ A}$.
- b. $\mathbf{13\ A}$, the smallest one above the working current of 6.0 A.

Marking: Part a: 1 mark for the rearrangement, 1 mark for 6.0 A. Part b: 1 mark.

Question 6 Why kilowatt-hours? (3 marks)

- a. The heater has a higher power, so it transfers more joules every second and uses more energy in the same hour, which costs more.
- b. The kilowatt-hour is a much bigger unit than the joule, so bills show small convenient numbers instead of millions.

Marking: Part a: 1 mark for power as energy per second, 1 mark for linking more energy to more cost. Part b: 1 mark.

Question 7 Television or oven (3 marks)

- a. Television: $0.120 \times 4 = \mathbf{0.48 \text{ kWh}}$. Oven: $2.4 \times 25/60 = \mathbf{1.0 \text{ kWh}}$.
- b. The **oven** uses more, by $1.0 - 0.48 = 0.52 \text{ kWh}$.

Marking: Part a: 1 mark each. Part b: 1 mark.

Question 8 Correct the statement (1 mark)

Energy depends on time. The heater uses **2 kWh only if it runs for exactly 1 hour**; in general $E = P \times t$.

Marking: 1 mark for stating that the time is needed.