

Circuit rules, power and mains safety

Physics grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · Test answers (mark scheme)

Model answers show the working that earns method marks. Award the mark for a correct unit with each final answer where the question asks for one, and allow follow-through if an earlier wrong value is used correctly later.

Level: Physics grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** GCSE P2, HS-PS3-3

Question 1 Series and parallel (2 marks)

Any two: current is the same everywhere in series but splits in parallel; voltage is shared in series but the same across each branch in parallel; total resistance is larger in series and smaller in parallel; in series one failure stops everything.

Marking: 1 mark for each correct difference.

Question 2 Series calculation (3 marks)

- a. $R = 20 + 40 = \mathbf{60\ \Omega}$.
- b. $I = 9.0 \div 60 = \mathbf{0.15\ A}$.
- c. $V = 0.15 \times 40 = \mathbf{6.0\ V}$.

Marking: 1 mark per part.

Question 3 Parallel calculation (3 marks)

- a. $I = V \div R$: $12 \div 24 = \mathbf{0.50\ A}$ and $12 \div 8.0 = \mathbf{1.5\ A}$.
- b. $I_{\text{total}} = 0.50 + 1.5 = \mathbf{2.0\ A}$.

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

Question 4 Hair dryer fuse (2 marks)

- a. $I = 1800 \div 230 = \mathbf{7.8\ A}$.
- b. The **13 A** fuse, since it is the smallest standard fuse above 7.8 A.

Marking: 1 mark each part.

Question 5 Cost of an oven (3 marks)

- a. $E = 1.5 \times 2.5 = \mathbf{3.75 \text{ kWh}}$.
b. $\text{Cost} = 3.75 \times 28 = 105 \text{ p} = \mathbf{£1.05}$.

Marking: (a) 1 mark; (b) 1 mark for multiplying by 28 p, 1 mark for the correct final value with unit.

Question 6 Role of the earth wire (3 marks)

The earth wire gives the current a low-resistance path from the case to the ground. A large current flows through the live wire and the earth wire. This large current makes the fuse melt, which breaks the circuit and stops the case staying live.

Marking: 1 mark for the low-resistance path, 1 mark for the large current, 1 mark for the fuse melting and disconnecting.

Question 7 Power in a resistor (2 marks)

$$P = I^2 R = 3.0^2 \times 8.0 = 9.0 \times 8.0 = \mathbf{72 \text{ W}}.$$

Marking: 1 mark for the correct formula and substitution, 1 mark for the answer with unit.

Question 8 Lamps in a house (2 marks)

In parallel each lamp is connected directly across the supply and keeps the full voltage and its own current. In series the supply voltage is shared among all lamps, so each gets a smaller share and a smaller current, so they dim.

Marking: 1 mark for parallel reasoning, 1 mark for series reasoning.