

Ohm's law and component characteristics

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

The model answers include mark allocations. Accept equivalent wording, and give error carried forward when a wrong earlier answer is used correctly in a later part.

Level: Physics grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** GCSE P2, IGCSE 4.3

Question 1 Definitions (2 marks)

a. $R = V \div I$

b. One joule of energy is transferred for each coulomb of charge that passes ($1 \text{ V} = 1 \text{ J/C}$).

Marking: 1 mark each.

Question 2 Using $V = I R$ (3 marks)

a. $R = V \div I = 7.5 \div 0.050 = \mathbf{150 \Omega}$

b. $V = I R = 0.080 \times 150 = \mathbf{12 \text{ V}}$

Marking: 1 mark for the equation or substitution; 1 mark for the answer; 1 mark for part (b).

Question 3 Measuring resistance (3 marks)

a. The ammeter is placed in series with R in the loop; the voltmeter is placed in parallel across R only.

b. $R = V \div I$

Marking: 1 mark for the ammeter in series; 1 mark for the voltmeter across R; 1 mark for the equation.

Question 4 Filament lamp (3 marks)

The decreasing gradient means that the current rises less for each extra volt, so the **resistance increases**. The filament becomes hotter as the current increases, so its ions vibrate more and collide with the electrons more often.

Marking: 1 mark for resistance increases; 1 mark for hotter filament; 1 mark for more collisions with electrons.

Question 5 Sensors (3 marks)

- a. The resistance **decreases**.
- b. Put the thermistor in a circuit with the fan. When the temperature rises, the thermistor resistance falls, so the current increases and switches on the fan.

Marking: (a) 1 mark. (b) 1 mark for resistance falling as temperature rises; 1 mark for the current rising and switching on the fan.

Question 6 Energy transferred (2 marks)

$$W = Q \times V = 25 \times 12 = \mathbf{300\ J}$$

Marking: 1 mark for the equation or substitution; 1 mark for the answer with unit.

Question 7 Diode (2 marks)

It lets current pass in **one direction only**. Use: converting alternating current to direct current, or protecting a circuit against a reversed battery.

Marking: 1 mark for the one-way statement; 1 mark for a use.

Question 8 Longer wire (2 marks)

$R = \mathbf{12\ \Omega}$. Charge has twice as far to travel through the metal, so there are twice as many collisions and the resistance doubles.

Marking: 1 mark for $12\ \Omega$; 1 mark for the explanation.