Mark schemes

Q1.

(a) 50 hertz

1

(b) 230 volts

1

(c)

resistance = $\frac{0.45}{0.75}$

1

resistance = 0.60 (Ω)

1

(d)

1

(e) pd across battery - pd across thermistor

1

(f) 1.5 V

1

(thermistor has the) same resistance as resistor
or
both (components) have a resistance of 200 (Ω)

MP2 dependent on scoring MP1

allow pd shared equally (between components of equal resistance)

allow pd will be half (of the total pd)

1

(g) resistance at 15 °C = 200 (Ω)

1

change in resistance = 400 (Ω)

allow a correct change in resistance from a misread resistance within the range 180 to 220 Ω

1

[10]

Q2.

(a)

$$\text{current} = \frac{2.0}{0.40}$$

1

current = 5.0 (A)

1

[2]

Q3.

(a)

$$\mathbf{X} = \frac{0.26 + 0.21 + 0.25}{3}$$

1

X = 0.24 (A)

allow $\mathbf{X} = \frac{0.26 + 0.25}{2} = 0.255$

for 2 marks

1

(b) current = 0.17 (A)

1

power = 3.0 × 0.17

allow a correct substitution using a value of I in the range 0.16 to 0.18 A

1

power = 0.51 (W)

allow an answer consistent using a value of I in the range 0.16 to 0.18 A

*answers of 0.456, 5.1 or 51 score **2** marks*

1

(c) decreases

1

(d) filament lamp

1

[7]

Q4.

(a) **Level 3**: The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.

5–6

Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.

3–4

Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.

1–2

No relevant content

0

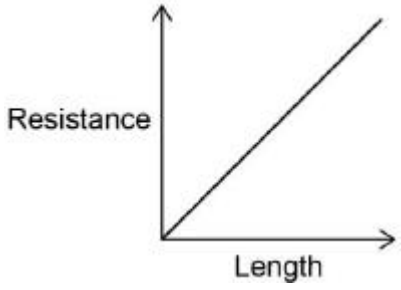
Indicative content

- measure the length of the wire (between the crocodile clips) using the ruler
- length varied by moving crocodile clips
- current measured with ammeter
- potential difference measured with voltmeter
- calculate resistance for each length
- use $V = IR$ to calculate resistance
- record current and pd for different lengths

- repeat readings of current and pd for each length and mean values calculated
- remove any anomalous readings
- ensure values of current are low to minimise heating of wire
- ensure circuit is disconnected between readings

Level 2:
Varying the length of the wire. Measurements / equipment needed for pd and current.

(b)



1

(c) potential difference is (very) low

1

(so) no risk of electric shock
or

(so) no risk of electrocution

allow less risk of electric shock

allow so wire won't melt

allow so wire won't get hot

1

[9]

Q5.

(a) switch

1

(b) current

1

potential difference

allow p.d.

allow voltage

1

in this order only

(c)

Quantity	Decrease	Stay the same	Increase
Current in the circuit	✓		
Potential difference across the lamp	✓		
Total resistance of the circuit			✓

any extra tick in a row negates the mark for that row

3

(d) $\text{current} = \frac{15}{60}$

1

current = 0.25 (A)

1

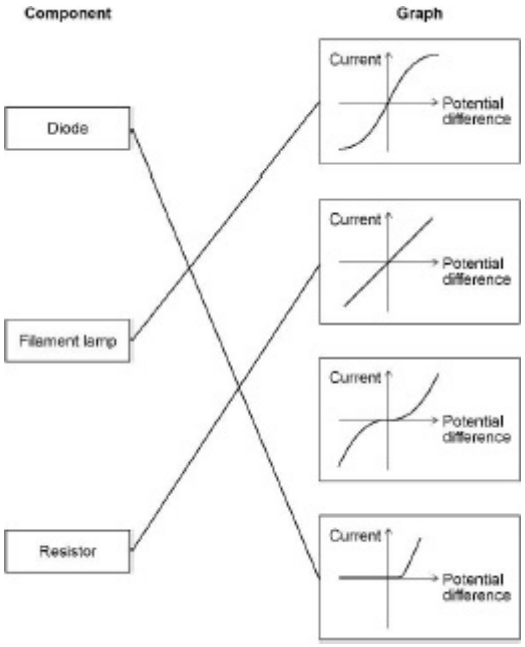
(e) $R = \frac{6.0}{0.12}$

1

R = 50 (Ω)

1

(f)



2 marks for all 3 correct

1 mark for 1 or 2 correct

additional line from a box on the left negates the mark for that box

2

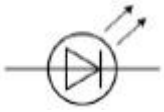
(g) a zero error

1

[13]

Q6.

(a)



1

[1]

Q7.

(a) charge flow = current × time
or
$Q = It$

1

(b) $t = 300$ (s)

1

$Q = 130\,000 \times 300$

allow a correct substitution using an incorrectly / not converted value of t

1

$Q = 39\,000\,000$
or
$Q = 3.9 \times 10^7$

allow a correct calculation using an incorrectly / not converted value of t

1

coulombs / C

1

[5]