Mark schemes

1

(a) 25(Ω)

1

(b) (i) 2(V)

*allow **1** mark for showing a correct method, ie 6 / 3*

2

(ii) equal to

1

[4]

2

(a) switch

allow answer circled in box

1

(b) 24

1

(c) equal to 0.25 A

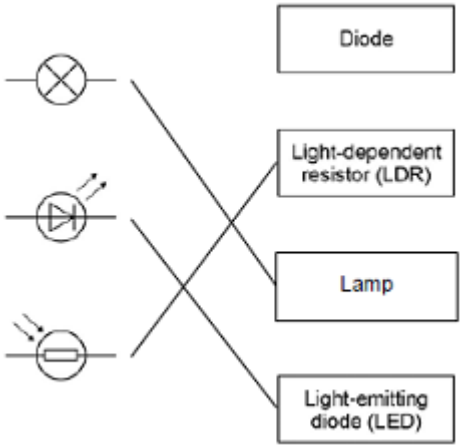
1

(d) 4

1

[4]

3 (a)



*allow **1** mark for each correct line if more than one line is drawn from any symbol then all of those lines are wrong*

3

(b) (i) half

1

(ii) 3(V)

1

(iii) V_1

1

(c) (i) potential difference / voltage of the power supply

accept the power supply

accept the voltage / volts

accept number of cells / batteries

accept (same) cells / batteries

do not accept same ammeter / switch / wires

1

(ii) bar drawn – height 1.(00)A

ignore width of bar

*allow **1** mark for bar shorter than 3rd bar*

2

(iii) as the number of resistors increases the current decreases

1

[10]

4 (a) (i) 15

1

(ii) 4.5 or their (a)(i) x 0.3 correctly calculated

*allow **1** mark for correct substitution, ie 0.3 x 15/their (a)(i), provided no subsequent step*

2

(ii) decrease

1

(b) **Y**

accept any correct indication

*reason only scores if **Y** is chosen*
accept voltage for p.d.

1

(only one that) shows a direct current / p.d.
or
a battery / cell gives a direct current

*accept both **X** and **Z** are a.c.*

or
a battery/cell gives a constant current/p.d.

accept it's a constant current/p.d.
it is not changing is insufficient

1

[6]

5 (a) current that is always in the same direction

1

(b) total resistance = 30 (Ω)

1

V = 0.4 × 30

1

12 (V)

1

*allow 12 (V) with no working shown for **3** marks*
*an answer of 8 (V) or 4 (V) gains **2** marks only*

(c) P = 0.4 × 12 = 4.8

1

5 (W)

1

*allow 5 (W) with no working shown for **2** marks*
*allow 4.8 (W) with no working shown for **1** mark*

[6]

6 (a) V = 0.10 × 45

1

4.5 (V)

1

(b) R = 12 / 0.10

1

total resistance = 120 (Ω)

1

R = 120 – 105 = 15 (Ω)

(c) (total) resistance decreases

1

(so) current increases

1

[7]

7 (a) $97\,500 = 65.0 \times t$

1

$$t = \frac{97500}{65.0}$$

1

t = 1500 (s)

*an answer of 1500 (s) scores **3** marks*

*an answer of 1.5 scores **2** marks*

1

(b) $19.6 = I^2 \times 1.60$

1

$$I^2 = \frac{19.6}{1.60}$$

1

I = 3.5 (A)

allow 1 mark for a correct value for I correctly multiplied by 4

1

current through battery = 14 (A)

*an answer of 14 (A) scores **4** marks*

1

[7]

8 (a) 35

*an answer with more than 2 sig figs that rounds to 35 gains **2** marks*

*allow **2** marks for correct method, ie* $\frac{230}{6.5}$

*allow **1** mark for I = 6.5 (A) **or** R =* $\frac{230}{26}$

*an answer 8.8 gains **2** marks*

*an answer with more than 2 sig figs that rounds to 8.8 gains **1** mark*

3

(b) (maximum) current exceeds maximum safe current for a 2.5 mm^2 wire

accept power exceeds maximum safe power for a 2.5 mm^2 wire

or

(maximum) current exceeds 20 (A)

(maximum) current = 26 (A) is insufficient

1

a 2.5 mm^2 wire would overheat / melt

accept socket for wire

*do **not** accept plug for wire*

1

(c) a.c. is constantly changing direction

accept a.c. flows in two directions

accept a.c. changes direction

a.c. travels in different directions is insufficient

1

d.c. flows in one direction only

1

[7]

9 (a) filament bulb

1

(b) (i) 6 V

1

(ii) 3 Ω or their $\frac{\text{(i)}}{2}$ correctly calculated

allow 1 mark for correct substitution ie

6 = 2 × R

or their (i) = 2 × R

2

(iii) 1 A

1

(iv) 6 Ω or their (i) / their (iii) correctly calculated

1

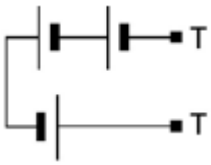
(v)

Decrease	Stay the same	Increase
	✓	
✓		
✓		

1
1
1

[9]

10 (a) 3rd box from the left ticked



1

(b) correct symbol drawn in series with other components

symbol must have upper case A

1

(c) (i) 9 + 3 = 12V

reason only scores if this mark scored

1

pd of battery is shared between the variable resistor and fixed resistor

accept $V_1 + V_2$ = pd of the battery

accept p.d. is shared in a series circuit

accept voltage for p.d.

1

(ii) 600

reason only scores if this mark scored

1

p.d. of supply shared equally when resistors have the same value

or

ratio of the p.d. is the same as the ratio of the resistance

1

(iii) 0.015

or

their (c)(i) ÷ (their (c)(ii) + 200) correctly calculated

*allow **2** marks for correct substitution ie 12 = I × 800*

or

their (c)(i) = I × (their (c)(ii) + 200)

*allow **1** mark for total resistance = 800 (Ω) or their (c)(ii) + 200*

or

*allow **1** mark for a substitution of 12 = I × 200*

or

their (c)(i) = I × 200

or

alternative method using the graph

V = 3 V (1)

3 = I × 200 (1)

3

[9]

11 (a) current at 0.5 V = 0.91 (A)

1

$P = 0.91 \times 0.5$

1

$P = 0.455$ (W)

*an answer of 0.455 (W) scores **3** marks*

1

(b) straight line with positive gradient

*allow for **1** mark a straight line that passes through (0.1, 0)*

1

positive y-axis intercept

ignore any values on y-axis

1

(c) $0.15 = \frac{0.52}{\text{total P}}$

1

total P = 3.47 (W)

1

$\text{area} = \frac{3.47}{450}$

1

area = 7.7×10^{-3} (m^2)

*an answer of 7.7×10^{-3} (m^2) scores **4** marks*

allow use of student's calculated incorrect total power for last 2 marking points

1

(d) connect the solar cells in parallel

1

(so that) the current has multiple paths it can take

or

the total resistance is less than the resistance of one solar cell

1

[11]