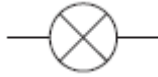


1

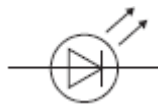
(a) Draw **one** line from each circuit symbol to its correct name.

**Circuit symbol**

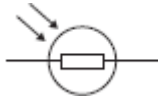
**Name**



Diode



Light-dependent resistor (LDR)



Lamp

Light-emitting diode (LED)

(3)

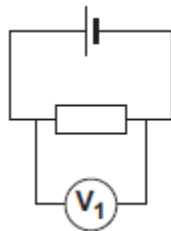
(b) **Figure 1** shows three circuits.

The resistors in the circuits are identical.

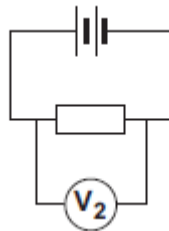
Each of the cells has a potential difference of 1.5 volts.

**Figure 1**

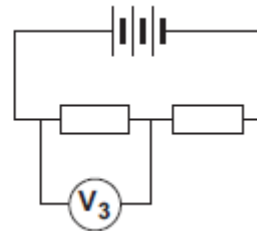
**Circuit 1**



**Circuit 2**



**Circuit 3**



- (i) Use the correct answer from the box to complete the sentence.

<b>half</b>	<b>twice</b>	<b>the same as</b>
-------------	--------------	--------------------

The resistance of **circuit 1** is \_\_\_\_\_ the resistance of **circuit 3**.

(1)

- (ii) Calculate the reading on voltmeter **V<sub>2</sub>**.

\_\_\_\_\_

Voltmeter reading **V<sub>2</sub>** = \_\_\_\_\_ V

(1)

- (iii) Which voltmeter, **V<sub>1</sub>**, **V<sub>2</sub>** or **V<sub>3</sub>**, will give the lowest reading?

Draw a ring around the correct answer.

**V<sub>1</sub>**

**V<sub>2</sub>**

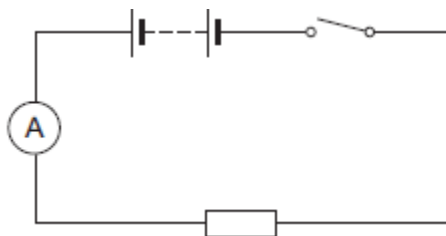
**V<sub>3</sub>**

(1)

- (c) A student wanted to find out how the number of resistors affects the current in a series circuit.

**Figure 2** shows the circuit used by the student.

**Figure 2**



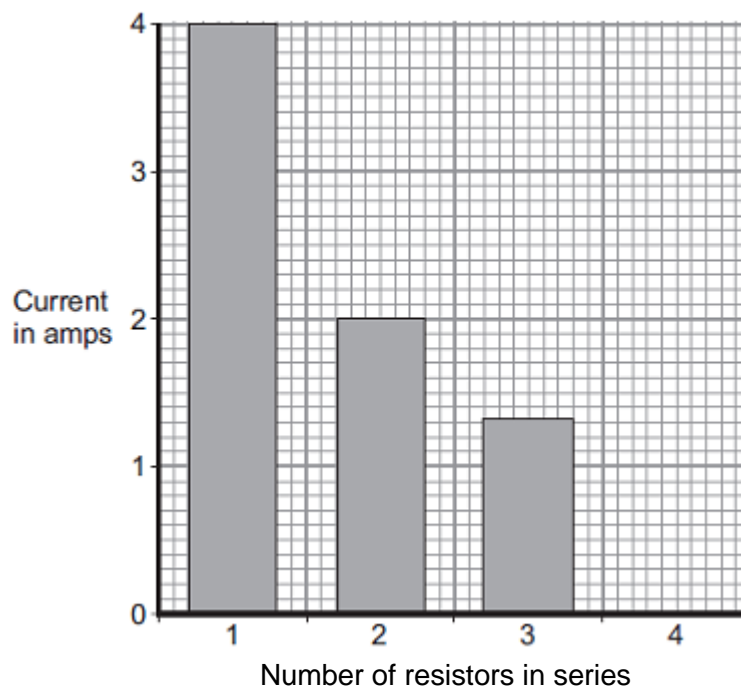
The student started with one resistor and then added more identical resistors to the circuit.

Each time a resistor was added, the student closed the switch and took the ammeter reading.

The student used a total of 4 resistors.

**Figure 3** shows three of the results obtained by the student.

**Figure 3**



- (i) To get valid results, the student kept one variable the same throughout the experiment.

Which variable did the student keep the same?

---

(1)

- (ii) The bar chart in **Figure 3** is not complete. The result using 4 resistors is not shown.  
Complete the bar chart to show the current in the circuit when 4 resistors were used.

(2)

- (iii) What conclusion should the student make from the bar chart?

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(1)

(Total 10 marks)

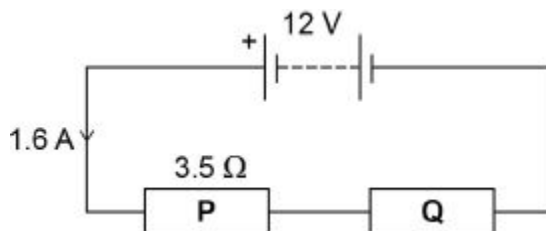
2

- (a) Draw a diagram to show how 1.5 V cells should be connected together to give a potential difference of 4.5 V.

Use the correct circuit symbol for a cell.

(2)

A student built the circuit shown in the diagram below.



(b) Calculate the total resistance of the circuit in the diagram above.

Use the equation:

$$\text{resistance} = \frac{\text{potential difference}}{\text{current}}$$

---

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---

Total resistance = \_\_\_\_\_  $\Omega$

(2)

(c) The resistance of **P** is 3.5  $\Omega$ .

Calculate the resistance of **Q**.

---

---

---

---

Resistance of **Q** = \_\_\_\_\_  $\Omega$

(1)

(d) The student connects the two resistors in the diagram above in parallel.

What happens to the total resistance of the circuit?

Tick **one** box.

It decreases

It increases

It does not change

(1)

Give a reason for your answer.

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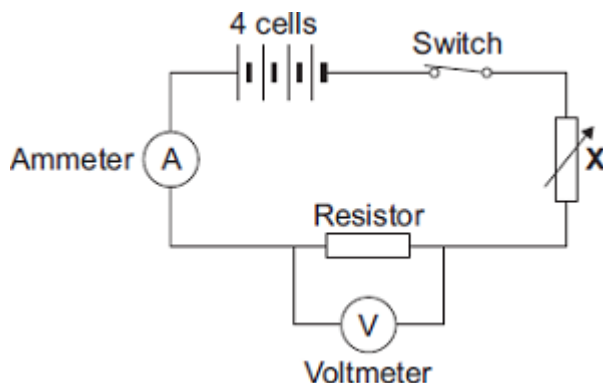
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(1)

(Total 7 marks)

3

(a) The diagram shows the circuit that a student used to investigate how the current through a resistor depends on the potential difference across the resistor.



(i) Each cell provides a potential difference of 1.5 volts.

What is the total potential difference provided by the four cells in the circuit?

---

Total potential difference = \_\_\_\_\_ volts

(1)

- (ii) The student uses the component labelled **X** to change the potential difference across the resistor.

What is component **X**?

Draw a ring around your answer.

**light-dependent resistor**

**thermistor**

**variable resistor**

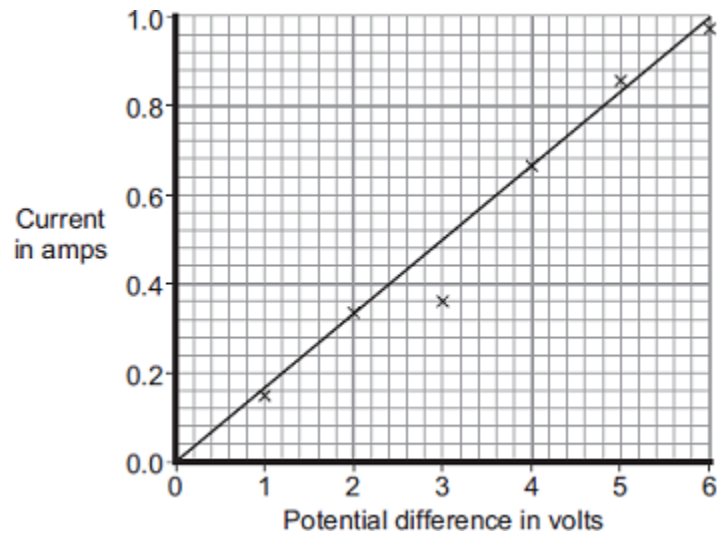
(1)

- (iii) Name a component connected in parallel with the resistor.

\_\_\_\_\_

(1)

- (b) The results obtained by the student have been plotted on a graph.



- (i) One of the results is anomalous.

Draw a ring around the anomalous result.

(1)

(ii) Which **one** of the following is the most likely cause of the anomalous result?

Put a tick (✓) in the box next to your answer.

The student misread the ammeter.

The resistance of the resistor changed.

The voltmeter had a zero error.

(1)

(iii) What was the interval between the potential difference values obtained by the student?

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(1)

(c) Describe the relationship between the potential difference across the resistor and the current through the resistor.

---

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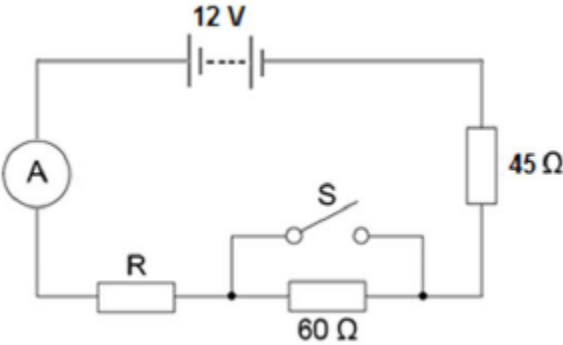
(1)

(Total 7 marks)



4

A student set up the electrical circuit shown in the figure below.



(a) The ammeter displays a reading of 0.10 A.

Calculate the potential difference across the 45 Ω resistor.

---

---

Potential difference = \_\_\_\_\_ V

(2)

(b) Calculate the resistance of the resistor labelled R.

---

---

---

Resistance = \_\_\_\_\_ Ω

(3)

(c) State what happens to the total resistance of the circuit and the current through the circuit when switch S is closed.

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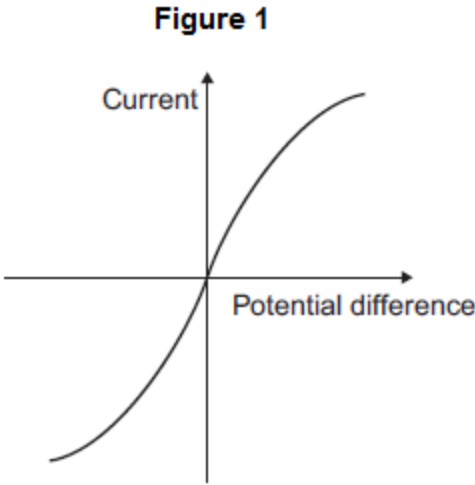
(2)

(Total 7 marks)

5

The current in a circuit depends on the potential difference provided by the cells and the total resistance of the circuit.

(a) **Figure 1** shows the graph of current against potential difference for a component.



What is the name of the component?

Draw a ring around the correct answer.

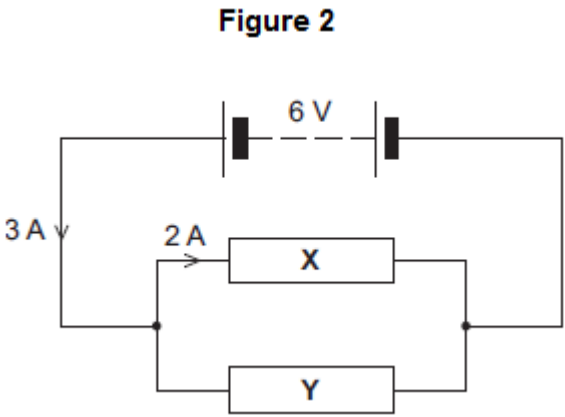
- diode**                      **filament bulb**                      **thermistor**

(1)

(b) **Figure 2** shows a circuit containing a 6 V battery.

Two resistors, **X** and **Y**, are connected in parallel.

The current in some parts of the circuit is shown.



(i) What is the potential difference across **X**?

Potential difference across **X** = \_\_\_\_\_ V

(1)

(ii) Calculate the resistance of **X**.

---

---

Resistance of **X** = \_\_\_\_\_  $\Omega$

(2)

(iii) What is the current in **Y**?

Current in **Y** = \_\_\_\_\_ A

(1)

(iv) Calculate the resistance of **Y**.

---

Resistance of **Y** = \_\_\_\_\_  $\Omega$

(1)

(v) When the temperature of resistor **X** increases, its resistance increases.

What would happen to the:

- potential difference across **X**
- current in **X**
- total current in the circuit?

Tick (✓) **three** boxes.

	Decrease	Stay the same	Increase
Potential difference across <b>X</b>			
Current in <b>X</b>			
Total current in the circuit			

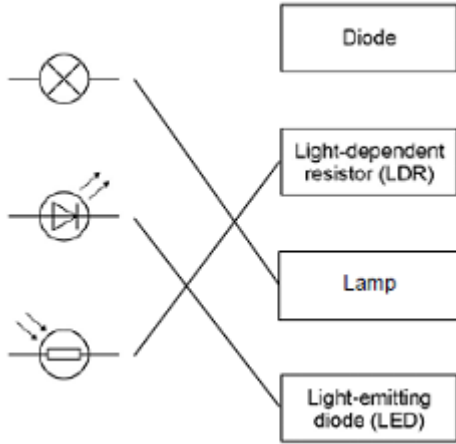
(3)

(Total 9 marks)

Mark schemes

**1**

(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 3<sup>rd</sup> bar*

2

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

1

**[10]**

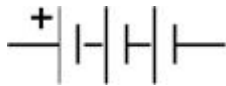
2

(a) correct circuit symbol

1

3 cells joined in series in correct orientation

e.g.



*ignore absence of + symbol*

1

(b)  $R = \frac{12}{1.6}$

1

$R = 7.5 (\Omega)$

1

*an answer of 7.5 ( $\Omega$ ) scores 2 marks*

(c) 4.0 ( $\Omega$ )

*allow their answer to part (b) – 3.5 correctly calculated*

1

(d) it decreases

1

the current would be higher (for the same p.d.)

*reason only scores if correct box is chosen*

**or**

more than one path for charge to flow

*allow current for charge*

**or**

total resistance is always less than the smallest individual resistance

1

[7]

3

(a) (i) 6

1

(ii) variable resistor

1

(iii) voltmeter

1

(b) (i) point at 3 V ringed

1

(ii) The student misread the ammeter.

1

(iii) 1 (volt)

*accept every volt*

1

(c) as one increases so does the other

**or**

directly proportional

**or**

positive correlation

*accept a numerical description, eg when one doubles the other also doubles*

1

[7]

4

(a)  $V = 0.10 \times 45$

1

4.5 (V)

1

(b)  $R = 12 / 0.10$

1

total resistance = 120 ( $\Omega$ )

1

$R = 120 - 105 = 15$  ( $\Omega$ )

1

(c) (total) resistance decreases

1

(so) current increases

1

[7]

5

(a) filament bulb

1

(b) (i) 6 V

1

(ii) 3  $\Omega$  or their  $\frac{(i)}{2}$  correctly calculated  
*allow 1 mark for correct substitution ie*  
 $6 = 2 \times R$   
*or their (i) = 2  $\times$  R*

2

(iii) 1 A

1

(iv) 6  $\Omega$  or their (i) / their (iii) correctly calculated

1

(v)

Decrease	Stay the same	Increase
	✓	
✓		
✓		

1  
1  
1

[9]