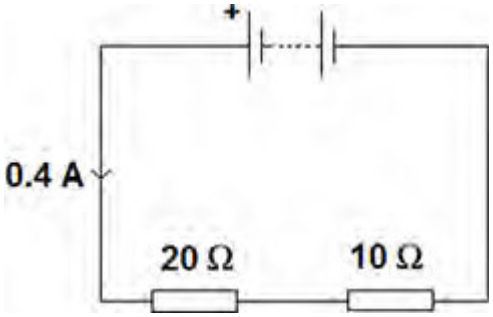
Q1. An electrical circuit is shown in the figure below.



(a) The current in the circuit is direct current.

What is meant by direct current?

Tick **one** box.

Current that continuously changes direction. ☐

Current that travels directly to the component. ☐

Current that is always in the same direction. ☐

(1)

(b) The equation which links current, potential difference and resistance is:

potential difference = current × resistance

Calculate the potential difference across the battery in the circuit in the figure above.

.....

.....

Potential difference = ... V

(3)

(c) The equation which links current, potential difference and power is:

power = current × potential difference

Calculate the power output of the battery in the figure above.

Give your answer to one significant figure.

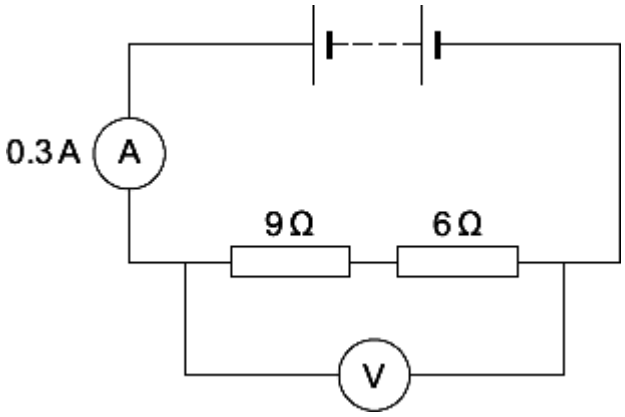
.....

Power = ... W

(2)

(Total 6 marks)

Q2. (a) The diagram shows a simple circuit.



(i) Calculate the total resistance of the two resistors in the circuit.

.....

Total resistance = ... Ω

(1)

(ii) Calculate the reading on the voltmeter.

Show clearly how you work out your answer.

.....

.....

Voltmeter reading = ... V

(2)

(iii) Draw a ring around the correct answer in the box to complete the sentence.

Replacing one of the resistors with a resistor of higher value will

decrease
not change
increase

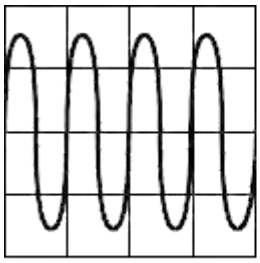
the reading on the ammeter.

(1)

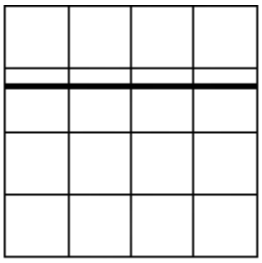
(b) The voltmeter in the circuit is replaced with an oscilloscope.

Which one of the diagrams, **X**, **Y** or **Z**, shows the trace that would be seen on the oscilloscope?

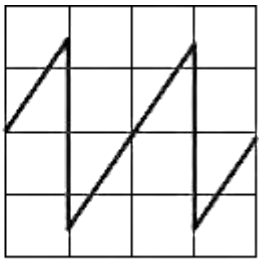
Write your answer, **X**, **Y** or **Z**, in the box.



X



Y



Z

Diagram

Give a reason for your answer.

.....

.....

.....

(2)
(Total 6 marks)

Q3.(a) The diagram shows the information plate on an electric kettle. The kettle is plugged into the a.c. mains electricity supply.

230 V	**2760 W**
50 Hz	

Use the information from the plate to answer the following questions.

(i) What is the frequency of the a.c. mains electricity supply?

.....

(1)

(ii) What is the power of the electric kettle?

.....

(1)

(b) To boil the water in the kettle, 2400 coulombs of charge pass through the heating element in 200 seconds.

Calculate the current flowing through the heating element and give the unit.

Choose the unit from the list below.

amps **volts** **watts**

.....

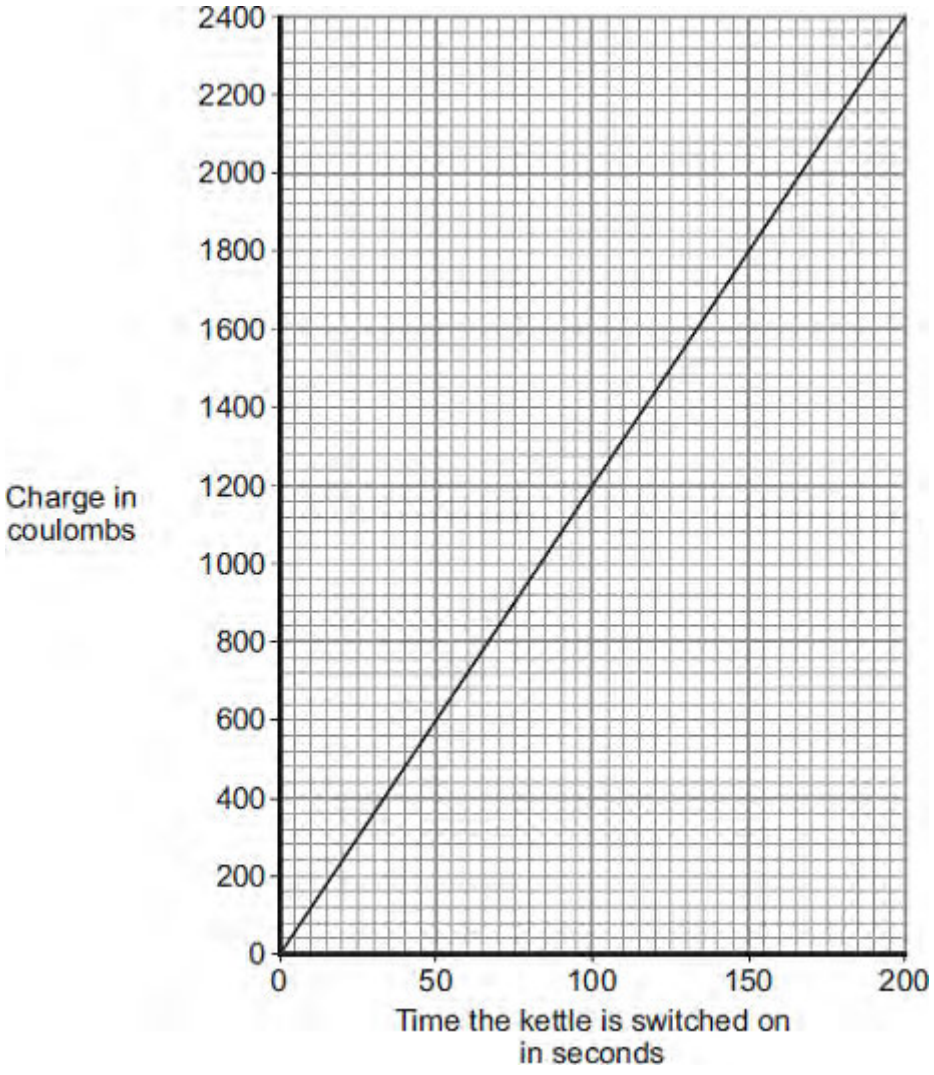
.....

.....

Current = ...

(3)

(c) The amount of charge passing through the heating element of an electric kettle depends on the time the kettle is switched on.



What pattern links the amount of charge passing through the heating element and the time the kettle is switched on?

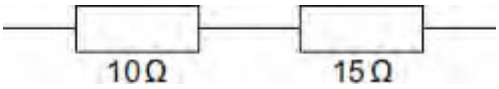
.....

.....

(2)
(Total 7 marks)

Q4.(a) Electrical circuits often contain resistors.

The diagram shows **two** resistors joined in series.



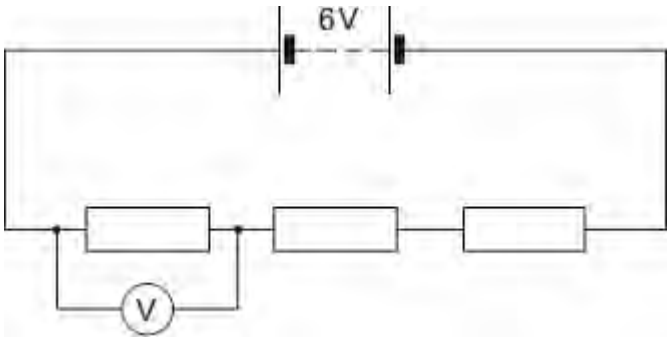
Calculate the total resistance of the **two** resistors.

.....

Total resistance = ... Ω

(1)

(b) A circuit was set up as shown in the diagram. The three resistors are identical.



(i) Calculate the reading on the voltmeter.

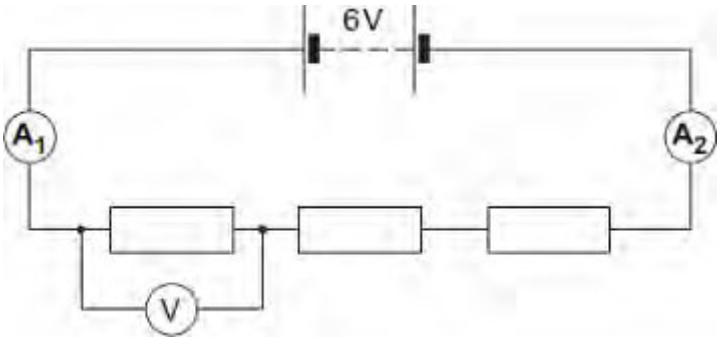
.....

.....

Reading on voltmeter = ... V

(2)

(ii) The same circuit has now been set up with two ammeters.



Draw a ring around the correct answer in the box to complete the sentence.

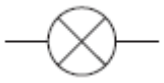
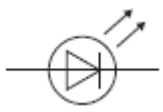
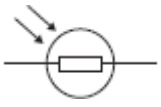
The reading on ammeter $\mathbf{A_2}$ will be

smaller than
equal to
greater than

the reading on ammeter $\mathbf{A_1}$.

(1)
(Total 4 marks)

Q5.(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)

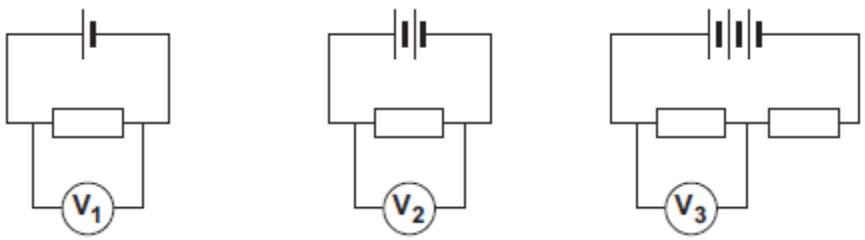
(b) **Figure 1** shows three circuits.

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.

half	**twice**	**the same as**

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

(1)

(ii) Calculate the reading on voltmeter $\mathbf{V_2}$.

.....

Voltmeter reading $\mathbf{V_2}$ = ... V

(1)

(iii) Which voltmeter, $\mathbf{V_1}$, $\mathbf{V_2}$ or $\mathbf{V_3}$, will give the lowest reading?

Draw a ring around the correct answer.

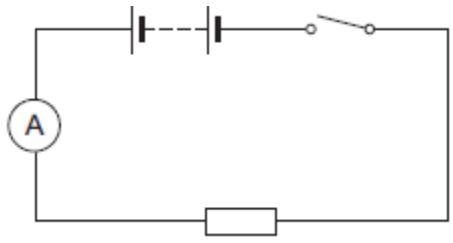
$\mathbf{V_1}$ $\mathbf{V_2}$ $\mathbf{V_3}$

(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



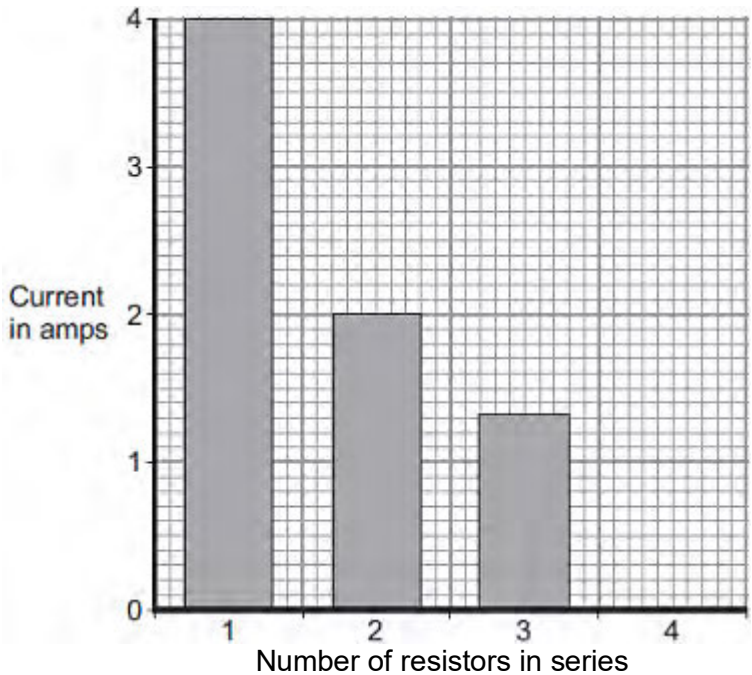
The student started with one resistor and then added more identical resistors to the circuit.

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?

.....

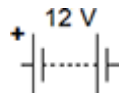
.....

(1)

(Total 10 marks)

Q6.A student wants to investigate how the current through a filament lamp affects its resistance.

(a) Use the circuit symbols in the boxes to draw a circuit diagram that she could use.

12 V battery	variable resistor	filament lamp	voltmeter	ammeter
				

(2)

(b) Describe how the student could use her circuit to investigate how the current through a filament lamp affects its resistance.

.....

.....

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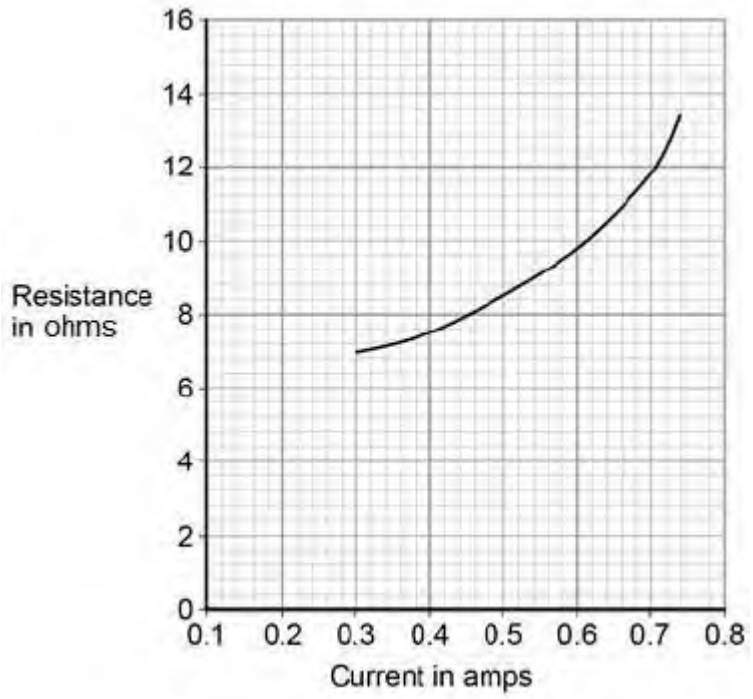
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.....

(4)

(c) The student's results are shown in **Figure 1**.

Figure 1



Describe how the resistance of the filament lamp changes as the current through it increases.

.....

.....

(1)

(d) Use **Figure 1** to estimate the resistance of the filament lamp when a current of 0.10 A passes through the lamp.

Resistance = ... Ω

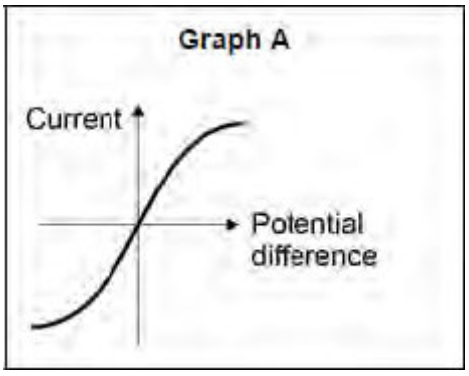
(1)

(e) The current - potential difference graphs of three components are shown in **Figure 2**.

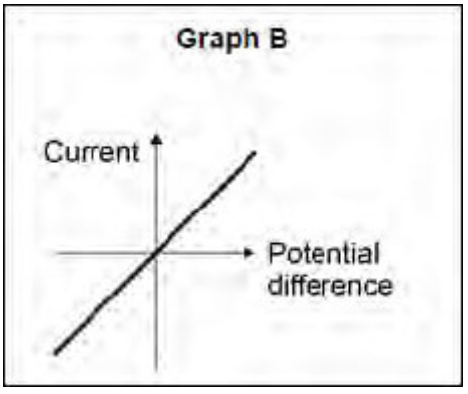
Use answers from the box to identify each component.

diode	**filament lamp**	**light dependent resistor**
resistor at constant temperature		**thermistor**

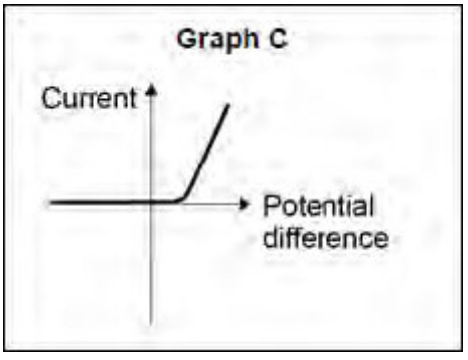
Figure 2



.....



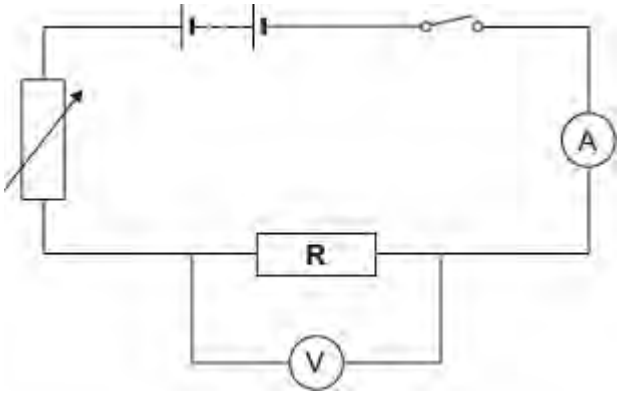
.....



.....

(3)
(Total 11 marks)

Q7.(a) A resistor is a component that is used in an electric circuit.



(i) Describe how a student would use the circuit to take the readings necessary to determine the resistance of resistor **R**.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6)

(ii) Explain why the student should open the switch after each reading.

.....

.....

.....

.....

(2)

(iii) In an experiment using this circuit, an ammeter reading was 0.75 A.
The calculated value of the resistance of resistor **R** was 16 Ω.

What is the voltmeter reading?

.....

.....

Voltmeter reading = ... V

(2)

(iv) The student told his teacher that the resistance of resistor **R** was 16 Ω.

The teacher explained that the resistors used could only have one of the following values of resistance.

10 Ω **12 Ω** **15 Ω** **18 Ω** **22 Ω**

Suggest which of these resistors the student had used in his experiment.

Give a reason for your answer.

.....

.....

.....

.....

(2)

(b) The diagram shows a fuse.



Describe the action of the fuse in a circuit.

.....

.....

.....

.....

.....

.....

.....

.....

(3)
(Total 15 marks)