

Heating a greenhouse

- 1 A greenhouse contains an electric heater.



- (a) The heater makes good use of the heating effect of an electric current.

Give an example of a device where the heating effect of an electric current is a **disadvantage**.

(1)

- (b) This label is attached to the heater.

230 V	500 W
50 Hz	

Use this information to calculate the expected current in the heater.

(3)

current = A

(c) Complete the sentence by putting a cross (☒) in the box next to your answer.

The potential difference across the heater can be measured either in volts or in

(1)

- A** amps per ohm
- B** amps per joule
- C** coulombs per ohm
- D** joules per coulomb

(d) When a charge flows in a resistor, the resistor becomes hot.

Explain why the resistor becomes hot.

(2)

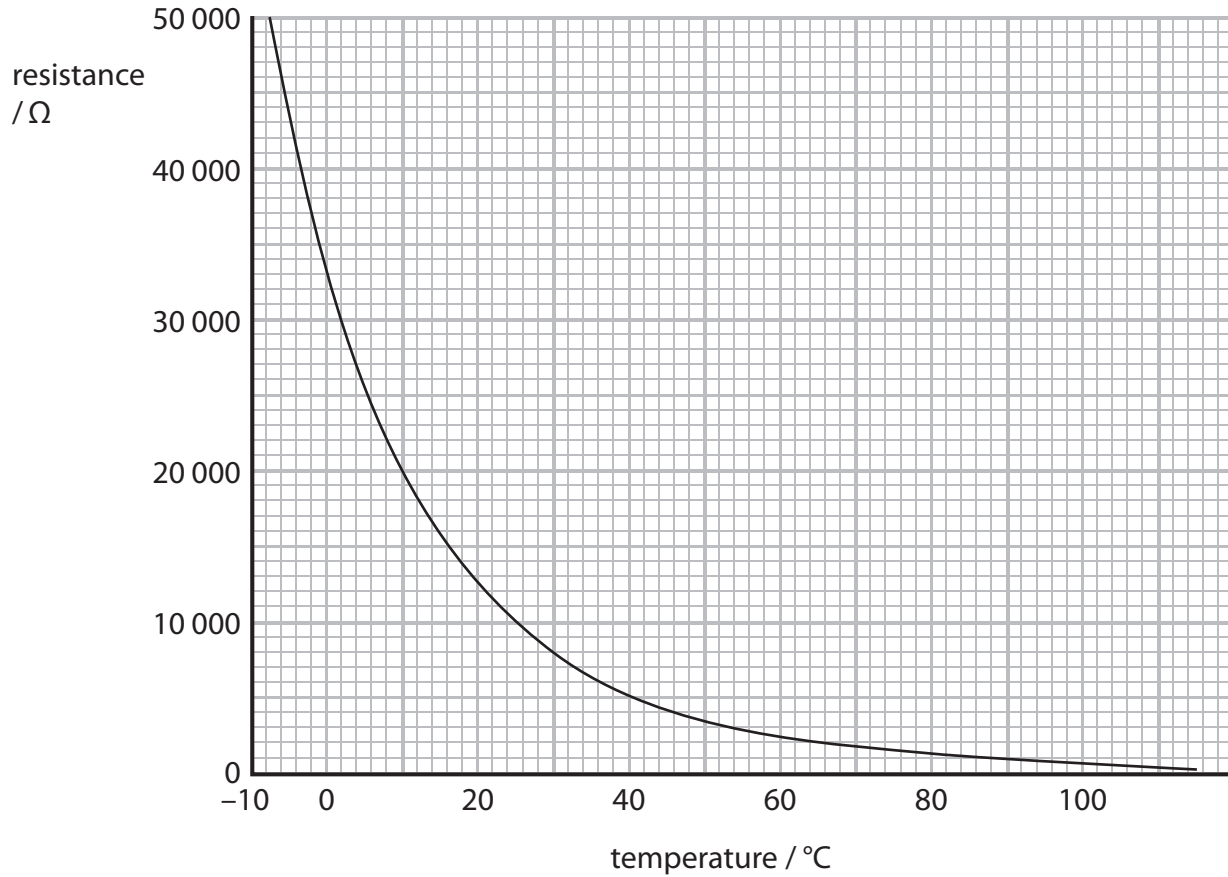
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- (e) A thermistor is used to control the heater.
The graph shows how the resistance of the thermistor changes with temperature.



When the temperature is 10 °C, the current in the thermistor is 0.60 mA.

Calculate the potential difference across the thermistor at 10 °C.

(3)

potential difference = V

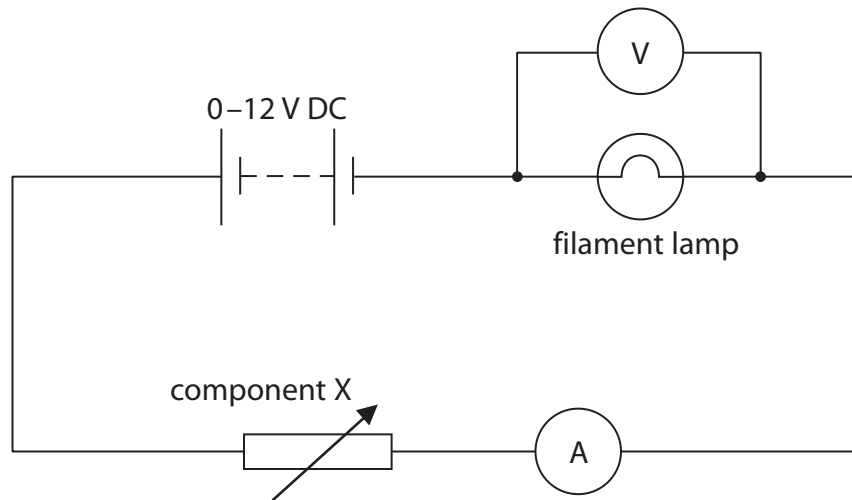
(Total for Question 3 = 10 marks)

Filament lamps

2 A student sets up an experiment to measure the potential difference (voltage) across a filament lamp.

She changes the current through the lamp.

The diagram shows the circuit she used.



(a) Complete the sentences by putting a cross (☒) in the box next to your answer.

(i) The component X in the circuit diagram is a

(1)

- A diode
- B fixed resistor
- C thermistor
- D variable resistor

(ii) The meter that measures potential difference is

(1)

- A in parallel with the power supply
- B in parallel with the lamp
- C in series with the lamp
- D in series with the component X

(iii) Describe how the student should increase the current in the lamp.

(2)

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(b) The student recorded these readings.

current / A	potential difference / V
0.00	0.0
0.20	2.0
0.31	4.0
0.37	6.0
0.42	8.0
0.44	10.0

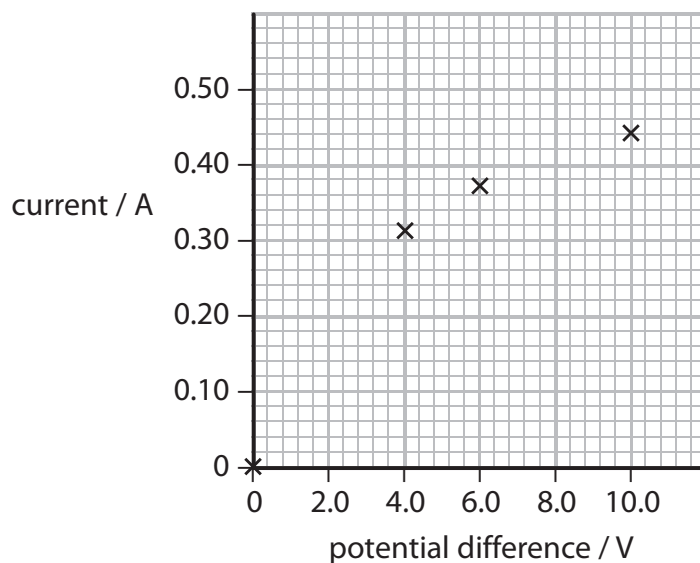
Four points are plotted on the graph.

(i) Plot the points for 2.0 V and 8.0 V.

(1)

(ii) Draw the line of best fit.

(1)



(c) Calculate the resistance of the lamp when the current is 0.44 A and the potential difference is 10.0 V.

(2)

$$R = \frac{V}{I}$$

resistance = Ω

(d) Describe the energy transfer that takes place in the lamp.

(2)

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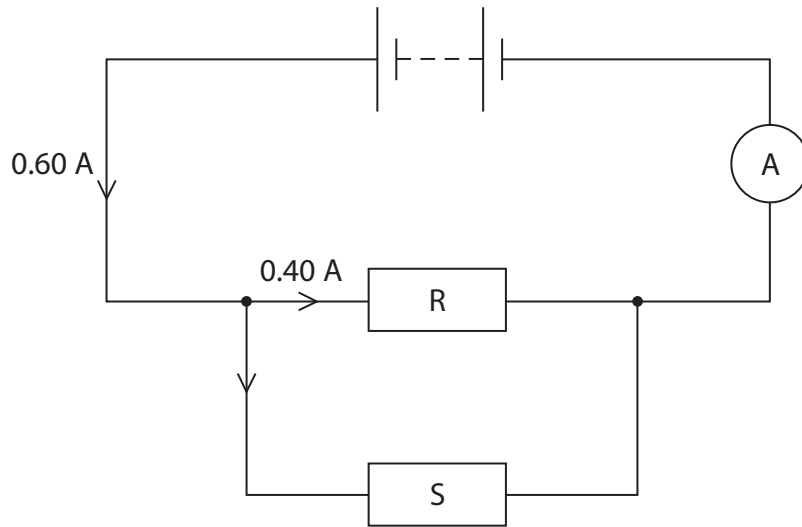
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(Total for Question 3 = 10 marks)

Electric circuits

- 3 (a) The diagram shows an electric circuit with two resistors, R and S.



- (i) R has a resistance of 11 ohms.

Calculate the potential difference across R.

(2)

potential difference = V

(ii) Use information from the diagram to calculate the current in S.

(1)

current = A

(iii) Complete the sentence by putting a cross (☒) in the box next to your answer.

A student wants to measure the battery voltage with a voltmeter.

The voltmeter should be placed

(1)

- A** in series with the battery
- B** in parallel with the battery
- C** in parallel with the ammeter
- D** in series with either resistor R or S

(b) Explain why the temperature of a resistor increases when a current passes through it.

(2)

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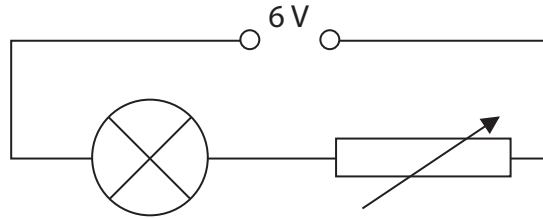
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Electric circuits

- 4 (a) Some students investigate electric circuits.
They set up this circuit.



What can the students do to increase the brightness of the lamp?

Put a cross (☒) in the box next to your answer.

(1)

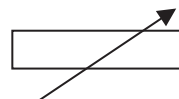
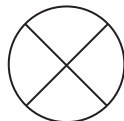
- A** add another lamp in series
- B** add another lamp in parallel
- C** increase the resistance of the variable resistor
- D** decrease the resistance of the variable resistor

- (b) The students want to measure both the current in the lamp and the potential difference (voltage) across the lamp.

- (i) Complete the circuit below with an ammeter and a voltmeter correctly connected.

The power supply, variable resistor and lamp symbols are already drawn for you.

(3)



- (ii) The current in a lamp is 0.5 A.
Its resistance is 8Ω .

Calculate the potential difference (voltage) across the lamp.

(2)

potential difference = V

- (c) Some electrical energy is transferred to light energy in the lamp.

Explain why only some of the electrical energy is transferred to light energy in the lamp.

(2)

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- (d) The students use a different lamp in the circuit.
The current in this lamp is 0.4 A.
The potential difference (voltage) across the lamp is 5 V.

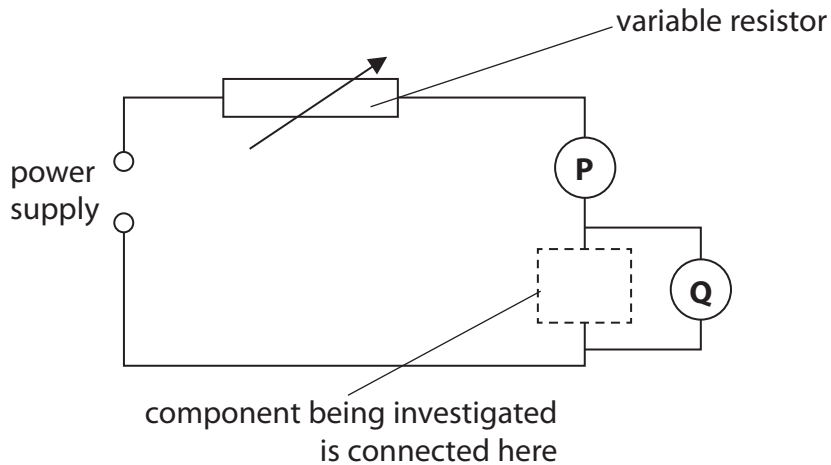
Calculate the power being supplied to the lamp.

(2)

power supplied to the lamp = W

(Total for Question 3 = 10 marks)

- 5 (a) Some students investigate the electrical resistance of different components using this circuit.



- (i) Which row of the table is correct for both meters **P** and **Q**?

Put a cross (☒) in the box next to your answer.

(1)

	meter P is	meter Q is
<input checked="" type="checkbox"/> A	an ammeter	an ammeter
<input checked="" type="checkbox"/> B	an ammeter	a voltmeter
<input checked="" type="checkbox"/> C	a voltmeter	a voltmeter
<input checked="" type="checkbox"/> D	a voltmeter	an ammeter

- (ii) One of the components being investigated is a 12 ohm resistor.
When it is in the circuit, the ammeter reading is 0.50 A.

Calculate the voltmeter reading.

(2)

voltmeter reading = V

(iii) The students reduce the resistance of the variable resistor.
State what happens to the readings on each of the meters **P** and **Q**.

(2)

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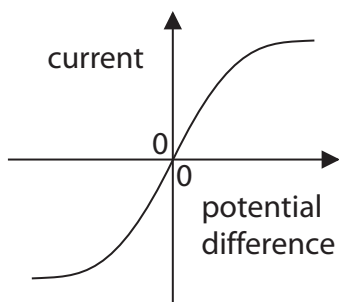
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(iv) The students then reduce the voltage of the power supply.
State what happens to the current in the circuit.

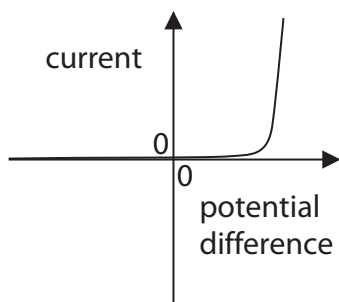
(1)

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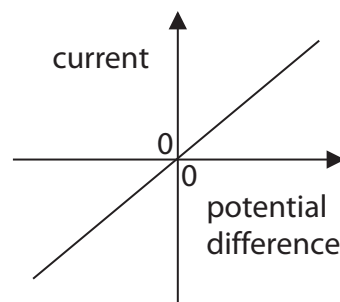
(b) The graphs **L**, **M** and **N** each show how the current in a component varies with the potential difference (voltage) across that component.



L



M



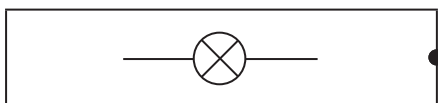
N

Match each graph with the symbol of the component to which it applies.
Draw lines to connect each symbol with its correct graph.

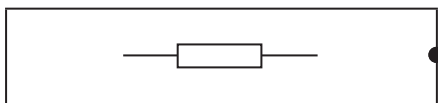
(2)

component symbol

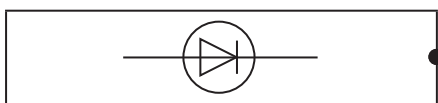
graph



graph **L**



graph **M**



graph **N**

(Total for Question 1 = 8 marks)