

Energy & Potential Difference in Circuits

Question Paper

Level	GCSE
Subject	Physics
Exam Board	Edexcel IGCSE
Module	Double Award (Paper 1P)
Topic	Electricity
Sub-Topic	Energy & Potential Difference in Circuits
Booklet	Question Paper

Time Allowed: 101 minutes

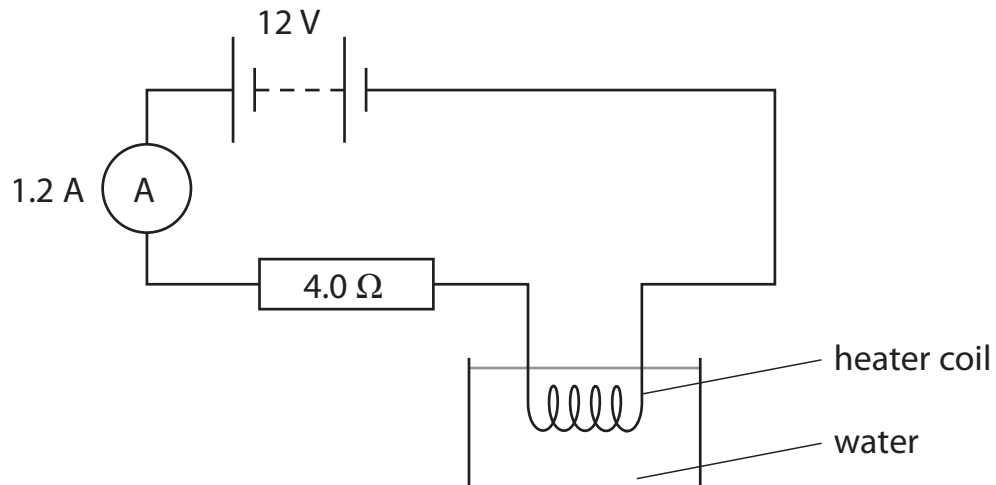
Score: /84

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	75%	70%	60%	55%	50%	<50%

1. The diagram shows a heater coil and a resistor connected to a 12 V battery and an ammeter. The ammeter reading is 1.2 A.



(a) (i) State the equation linking voltage, current and resistance. (1)

(ii) Calculate the voltage across the 4.0Ω resistor. (2)

Voltage = V

(iii) Show that the voltage across the heater coil is about 7 V. (2)

(iv) Calculate the energy transferred to the heater coil in 5.0 minutes. (3)

Energy transferred = J

(v) At first, the temperature of the water increases.

After a while, the temperature reaches a steady value below the boiling point of water.

Explain why the temperature reaches a steady value.

(2)

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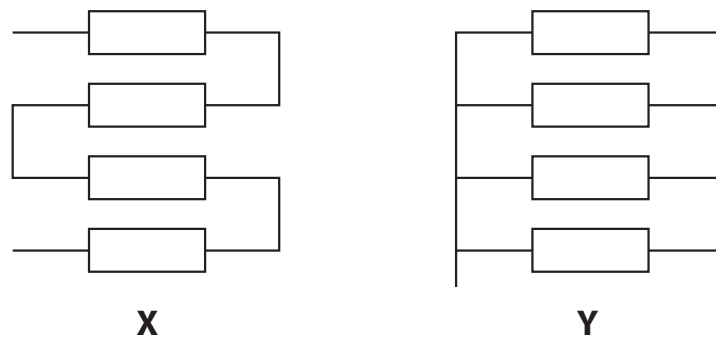
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(b) Resistors can be used as heating elements in the rear windows of cars.

The diagram shows two possible designs.



(i) Complete the table by placing a tick (✓) in the correct boxes.

(1)

Design	Series	Parallel
X		
Y		

(ii) Describe the advantages and disadvantages of design X when used as a heater in a car window.

(3)

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(Total for Question 1 = 14 marks)

2. A light dependent resistor (LDR) can be used as a sensor to detect light intensity.

Describe how the resistance of an LDR varies as the light intensity changes.

You may sketch a graph to help your answer.

(3)

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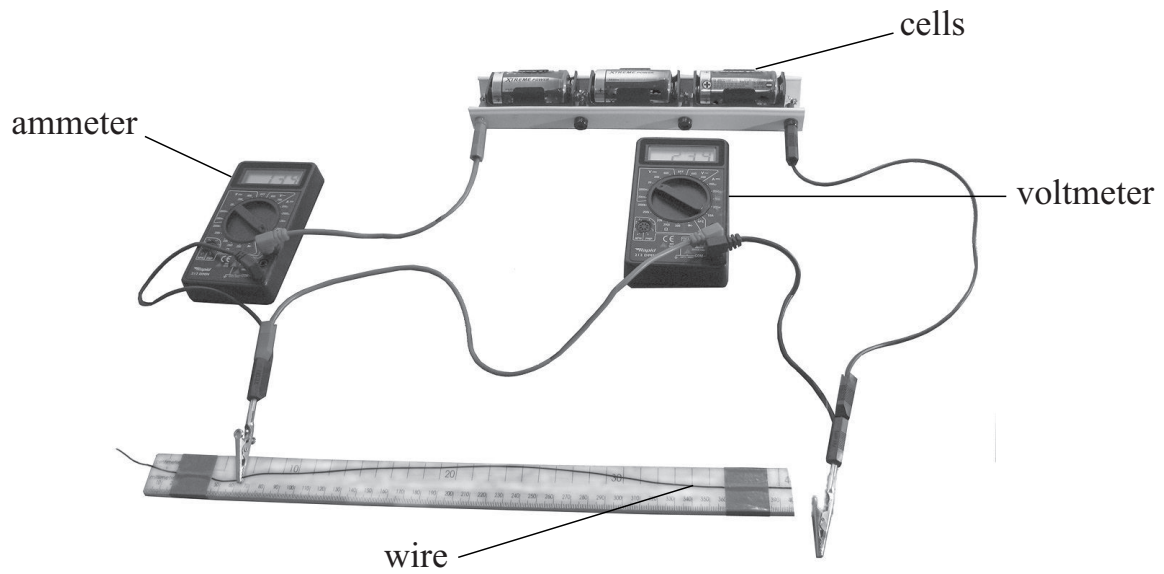
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(Total for Question 2 = 3 marks)

3. A student investigates how the resistance of a wire depends on its length.

The photograph shows the circuit that the student uses.



(a) Draw a circuit diagram to show how the components in the photograph are connected.

(3)

(c) The table shows the student's measurements.

Length of wire in cm	Voltage in V	Current in A	Resistance of wire in Ω
20	4.5	3.6	1.3
40	4.5	1.8	2.5
60	4.5	1.2	3.8
80	4.5	0.9	5.0
100	4.5	0.7	

(i) State the equation linking voltage, current and resistance.

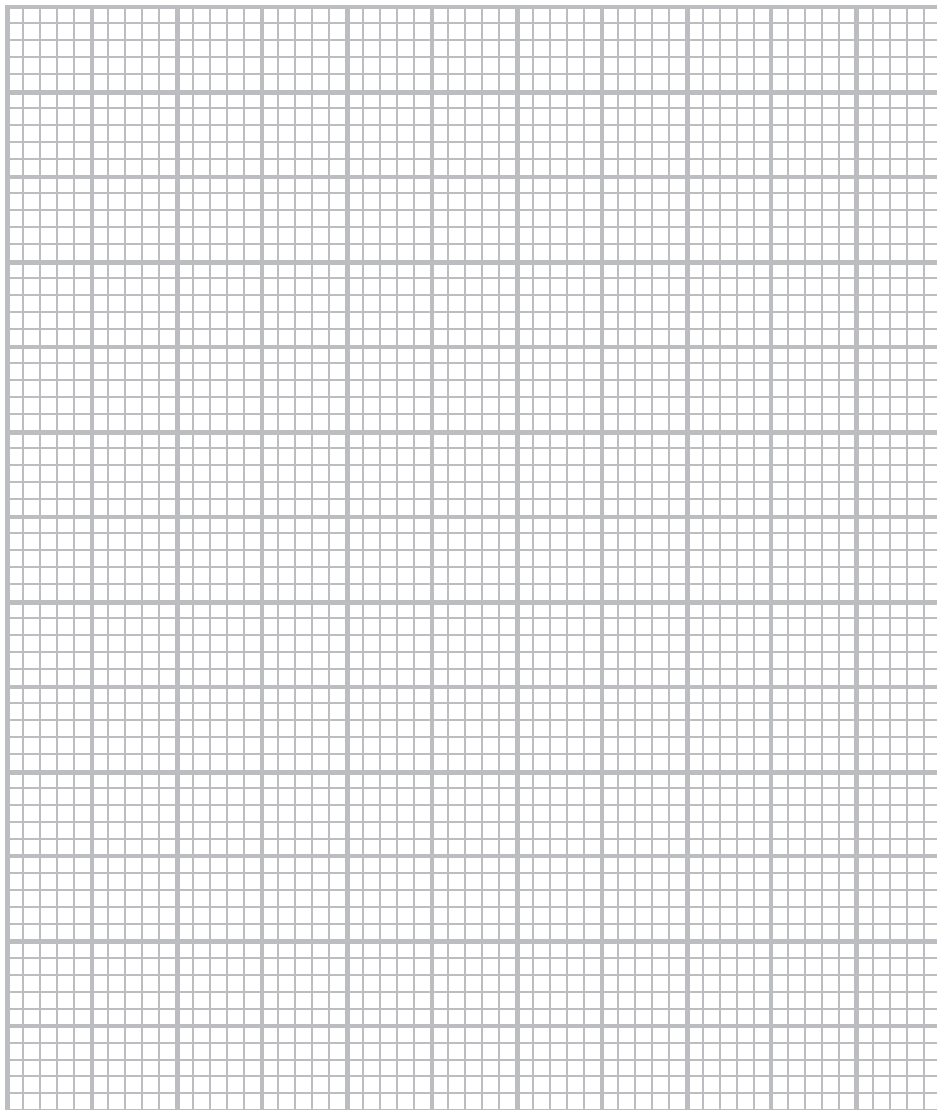
(1)

(ii) Complete the table by calculating the missing value of resistance.

(1)

(d) (i) Use the results from the table opposite to plot a graph of resistance (y -axis) against length of wire (x -axis) and draw the line of best fit.

(5)



(ii) Write a conclusion for the investigation.

(1)

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(iii) Explain how the graph supports this conclusion.

(2)

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(Total for Question 3 = 19 marks)

4. A student investigates how the resistance of a thermistor varies with temperature.

(a) Draw the circuit symbol for a thermistor.

(1)

(b) The student uses voltmeter and ammeter readings to find the resistance at each temperature.

One set of readings is shown below.

temperature in °C	voltmeter reading in V	ammeter reading in mA
80	13.2	2.60

(i) State the equation linking voltage, current and resistance.

(1)

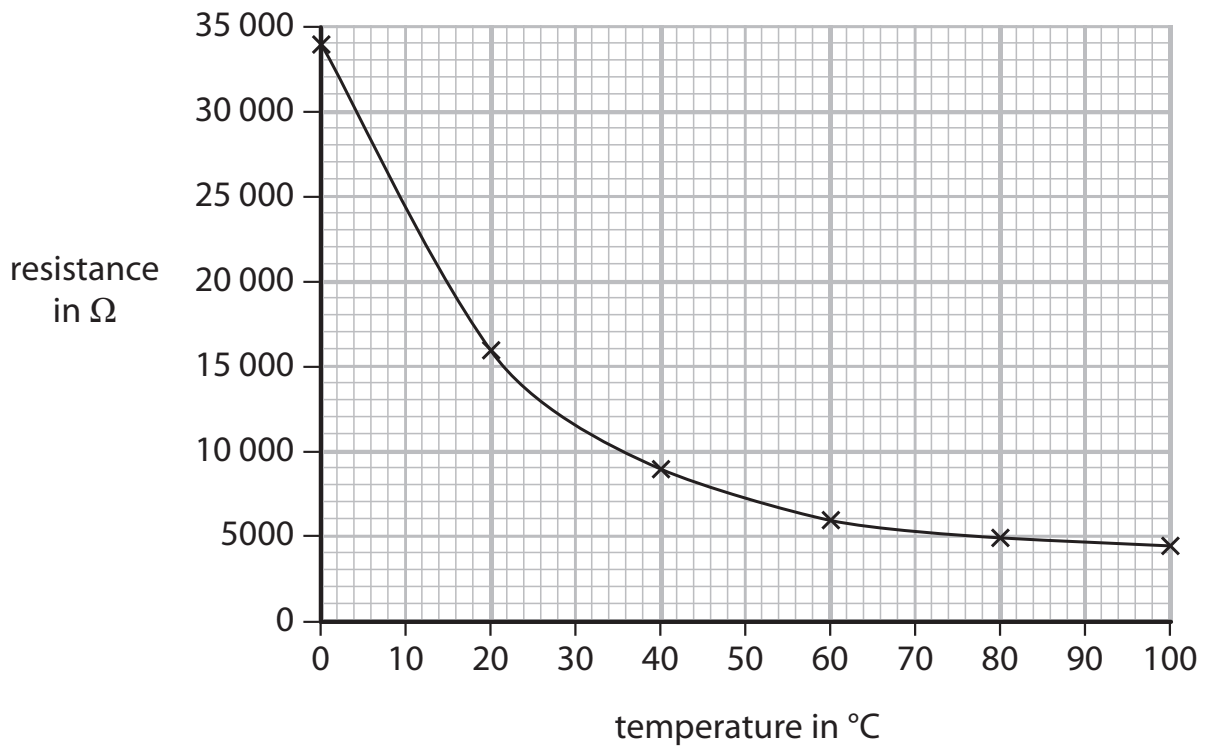
(ii) Show that the resistance of the thermistor at 80 °C is about 5000 Ω .

(3)

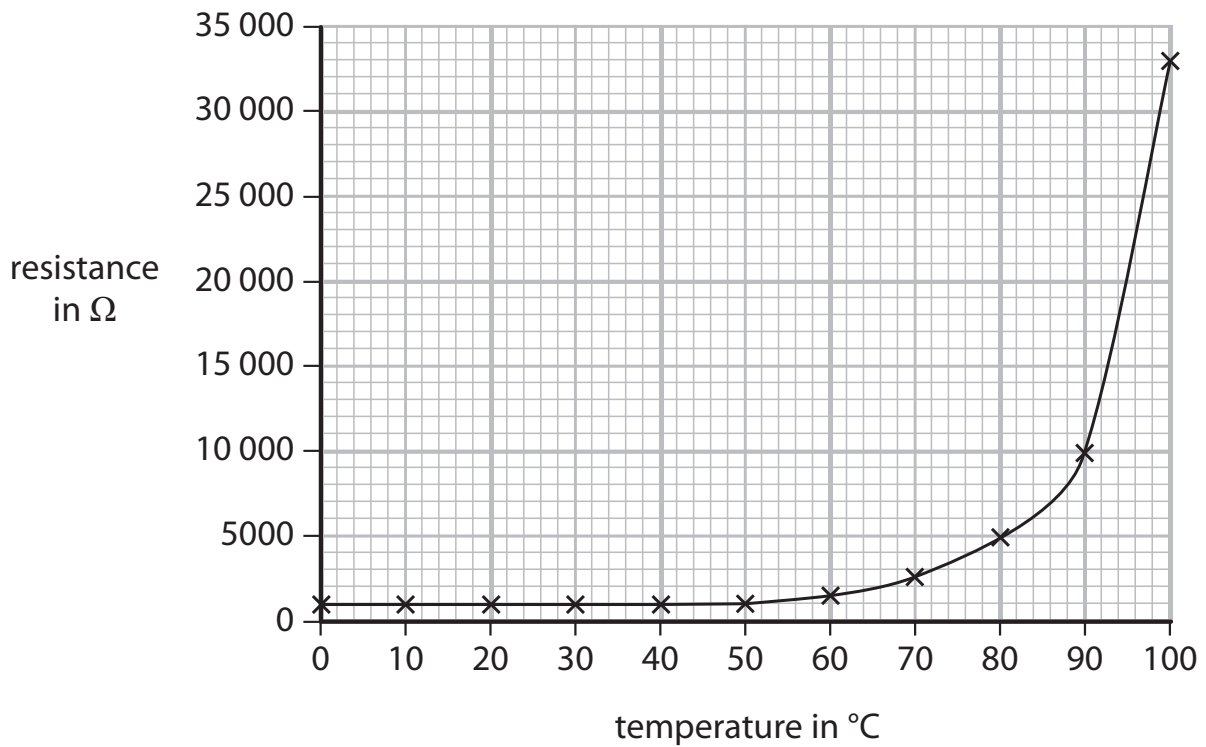
(c) Another student takes measurements for two more components, A and B.

The graphs show the results.

Component A



Component B

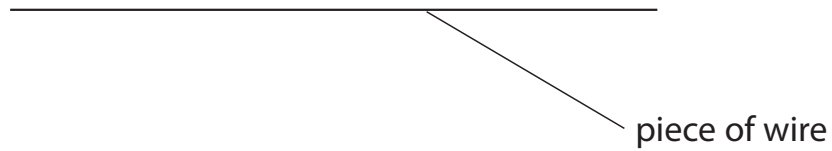


5. A student investigates how the resistance of a piece of wire changes with voltage across the wire.

The student connects an ammeter, a voltmeter, a battery, a variable resistor and the wire in an electrical circuit.

- (a) (i) Complete the diagram to show how the student should connect the circuit.

(3)



- (ii) Describe what she should do to obtain a set of results for her investigation.

(3)

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(b) The student keeps the temperature of the wire constant during the investigation.

(i) Suggest **why** she does this.

(1)

(ii) Suggest **how** she does this.

(1)

(c) When the student looks at her results, she notices that the voltage across the wire is directly proportional to the current in it.

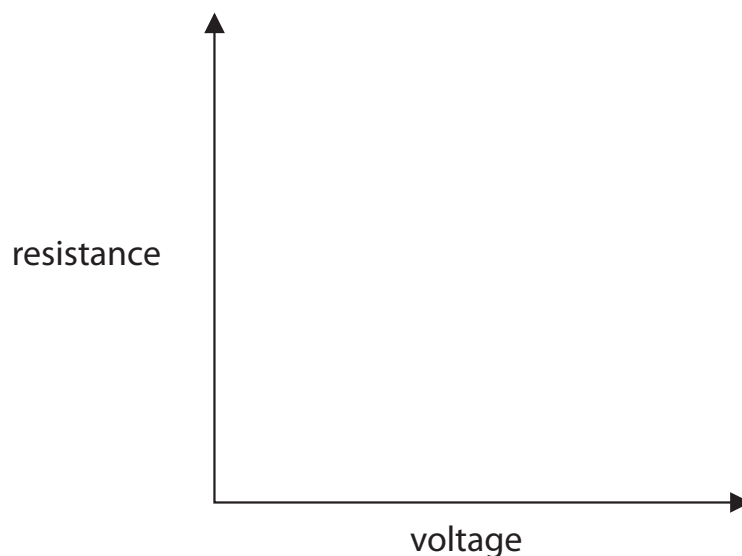
(i) State the relationship linking voltage, current and resistance.

(1)

(ii) The student calculates the resistance and then plots a graph of resistance against voltage.

On the axes, sketch the shape of her graph.

(1)



(Total for Question 5 = 10 marks)

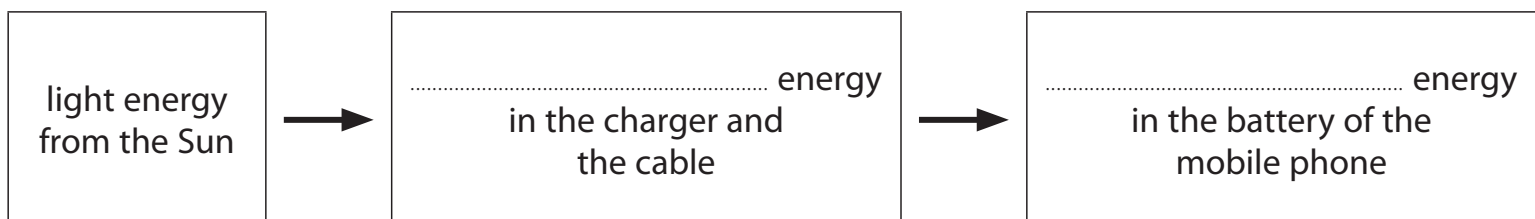
6. The photograph shows a solar-powered battery charger connected to a mobile phone.



When the battery charger is used, it transfers light energy from the Sun to the battery of the mobile phone.

(a) Complete the energy transfer diagram.

(2)



(b) It takes 3.5 hours to recharge the battery fully.

The average current supplied by the charger is 400 mA.

(i) State the equation linking charge, current and time.

(1)

(ii) Calculate the amount of charge needed to recharge the battery fully, and give the unit.

(3)

charge = unit

(c) If the charger is moved into the shade, the output power decreases.

The voltage across the charger stays the same.

Explain how moving the charger into the shade affects the time needed to recharge the battery fully.

(2)

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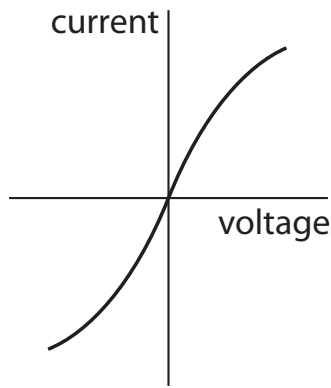
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(Total for Question = 8 marks)

7. The graph shows how current and voltage vary for a filament lamp.



(a) Draw a circuit diagram to show how you should connect the equipment needed to make the measurements needed to plot the graph.

(4)

(b) The resistance of the filament lamp changes as the voltage is increased.

(i) How can you tell this from the graph?

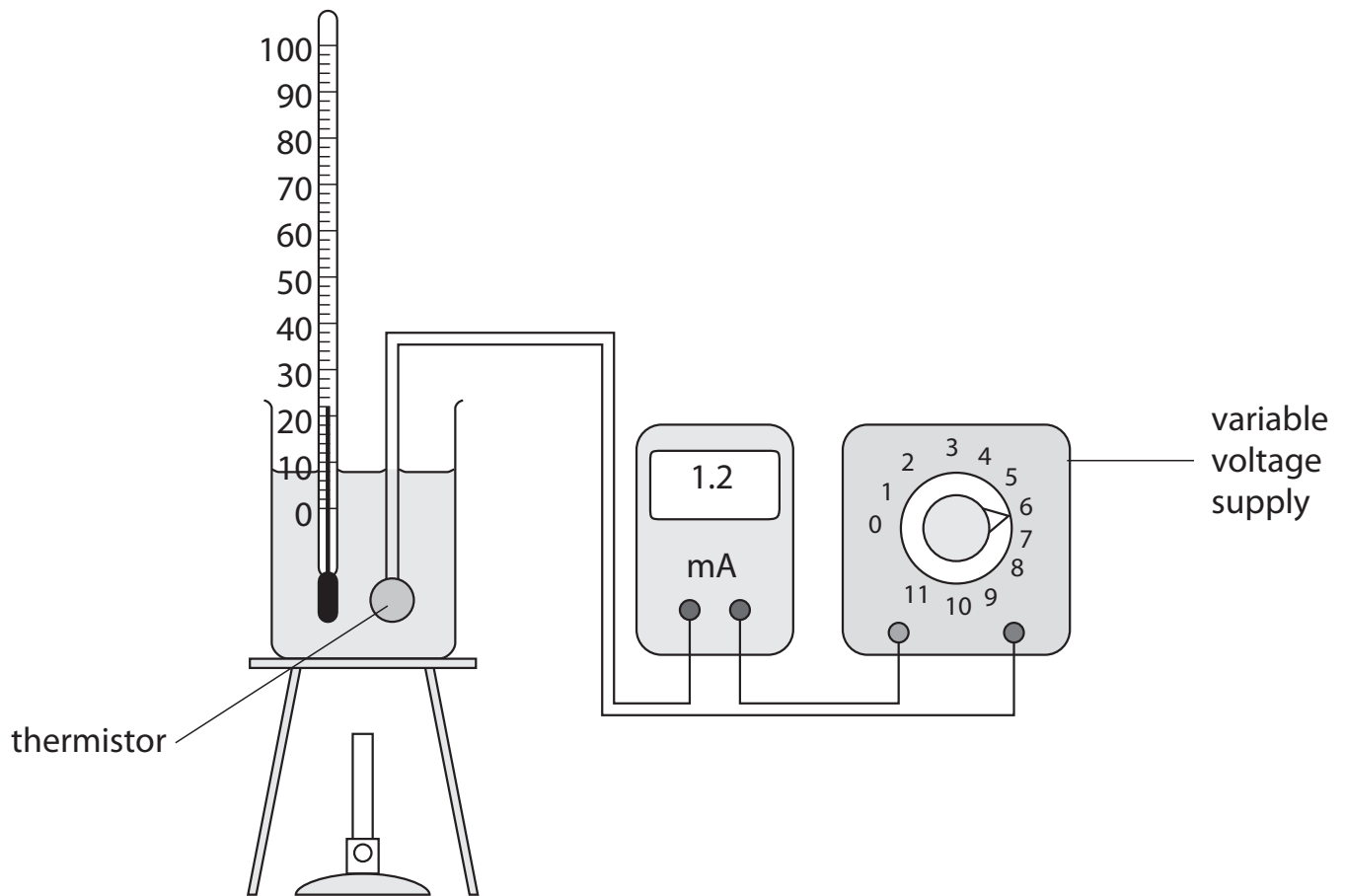
(1)

(ii) Explain these changes in resistance.

(3)

Total for question = 8 marks

8 (a) A student uses this apparatus to investigate how the resistance of a thermistor changes with temperature.



(i) Draw a circuit diagram for this investigation.

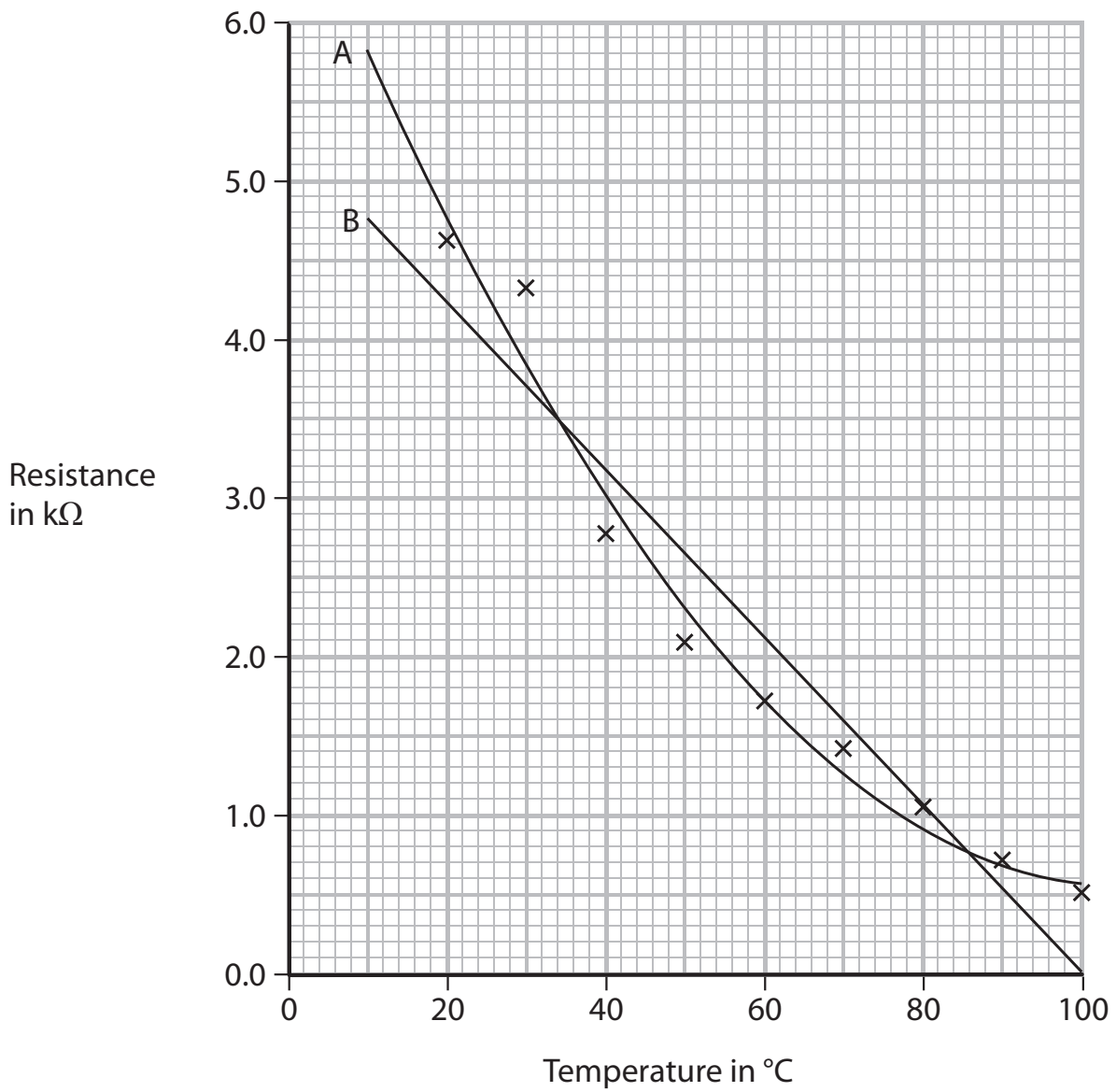
(2)

(ii) The student wants to measure the voltage across the thermistor.

On your diagram, add a symbol to show how she should connect the voltmeter to the circuit.

(1)

(b) The graph shows the student's results.



Two students discuss the line of best fit for this graph.

One student thinks it is the curved line A.

The other student thinks that it is the straight line B.

(i) Suggest which line is better, giving a reason for your choice.

(1)

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(ii) Suggest why measuring the resistance of the thermistor at 10 °C could help to decide which line is better.

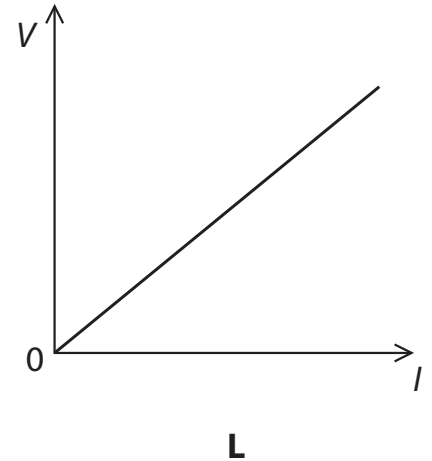
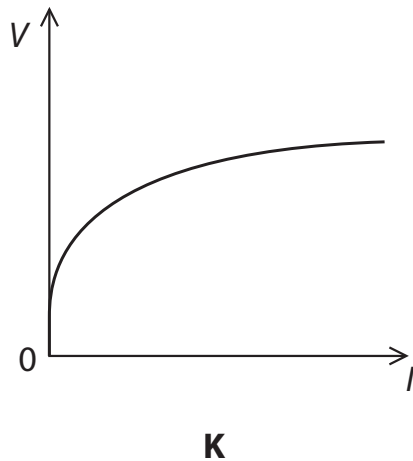
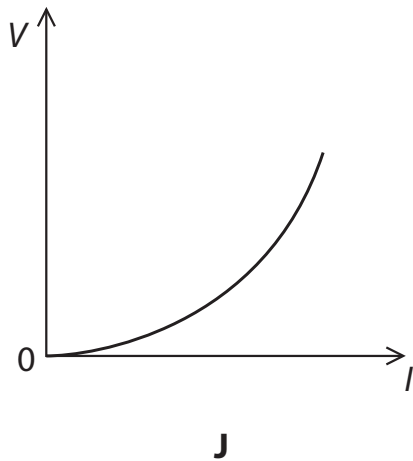
(1)

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(c) These graphs show the voltage (V) changes with the current (I) for three components.



The components are a metal wire at constant temperature, a diode and a filament lamp.

Which letter represents the correct graph for each component?

(2)

metal wire at constant temperature

diode

filament lamp

Total for Question = 12 marks