

Potential Divider Circuits

Question Paper

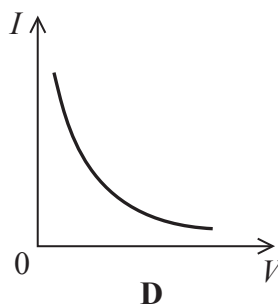
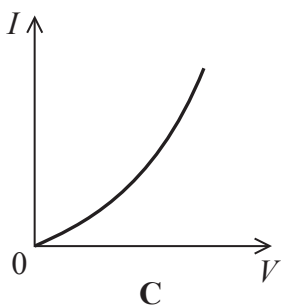
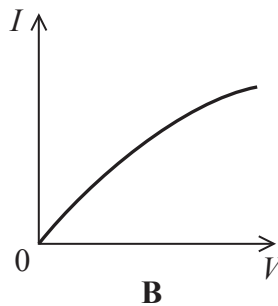
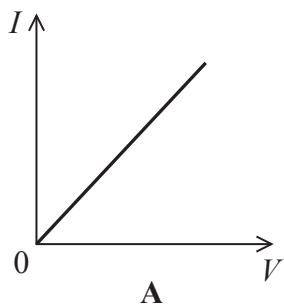
Level	International A Level
Subject	Physics
Exam Board	Edexcel
Topic	DC Electricity
Sub Topic	Potential Divider Circuits
Booklet	Question Paper

Time Allowed: 38 minutes
Score: /31
Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	77.5%	70%	62.5%	57.5%	45%	<45%

1 Which graph correctly shows how the current I varies with the potential difference V for a negative temperature coefficient thermistor?

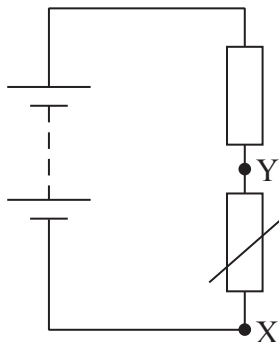


- A
- B
- C
- D

(Total for Question 1 = 1 mark)

Question 2 refer to the diagram below.

The diagram shows a circuit containing a fixed resistor and a negative temperature coefficient thermistor.

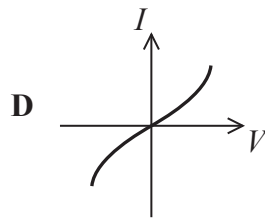
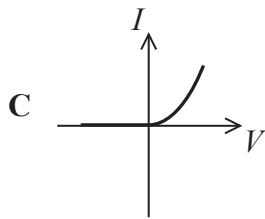
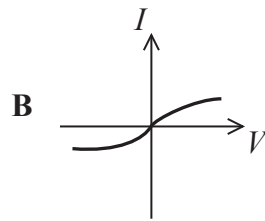
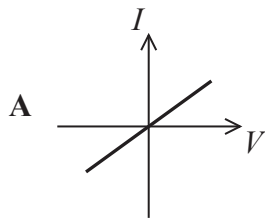


- 2 The temperature in the circuit increases.
Which row in the table correctly shows what happens to the current in the thermistor and the potential difference across the thermistor?

	Current	Potential difference
<input type="checkbox"/> A	decreases	decreases
<input type="checkbox"/> B	decreases	increases
<input type="checkbox"/> C	increases	decreases
<input type="checkbox"/> D	increases	increases

(Total for Question 2 = 1 mark)

- 3 Which of the following current-potential difference (I - V) graphs shows the correct behaviour for a negative temperature coefficient thermistor?



A

B

C

D

(Total for Question 3 = 1 mark)

- 4 A student is investigating how the resistance of a thermistor varies with temperature. The student heats distilled water in a beaker and puts the thermistor in the hot water. She connects a multimeter directly across the thermistor and uses it to measure resistance. She uses a thermometer to measure the temperature of the water.



The student records corresponding values of temperature and resistance as the water cools.

Temperature of water / °C	Resistance of thermistor / Ω
80.0	118
70.0	145
60.0	180
50.0	235
40.0	317
30.0	457
20.0	603

- (a) (i) The student suggests that the resistance of the leads to the multimeter will cause an error in the results. She measures the total resistance of the leads to be 1.8Ω . Discuss her suggestion.

(2)

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(ii) State two advantages of using a data logger with suitable probes to measure the resistance and temperature.

(2)

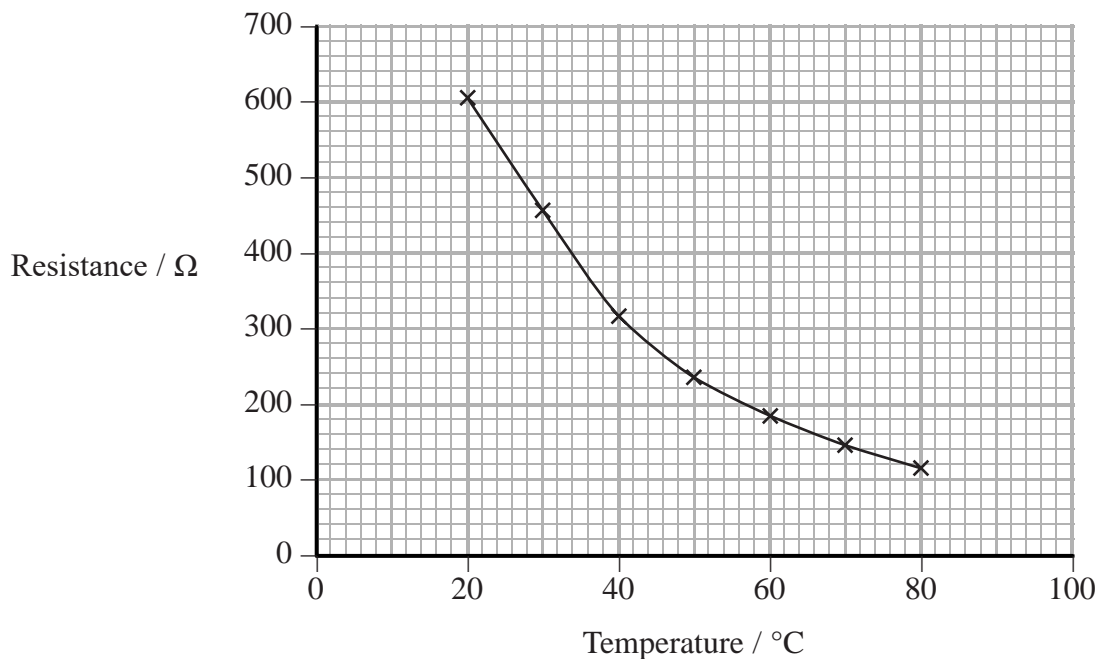
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(b) The student plots the results on a graph.



(i) Explain, in terms of charge carriers, why these results are obtained.

(3)

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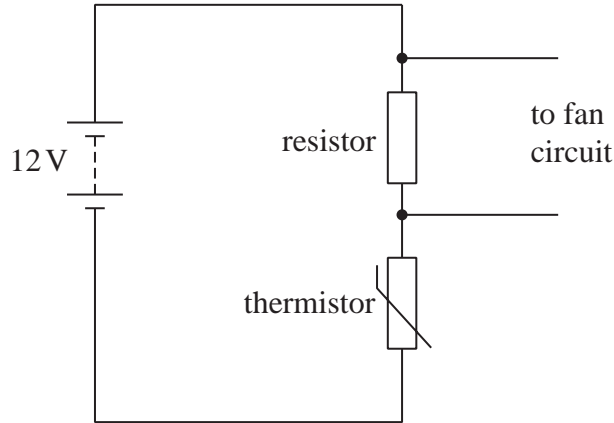
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- (ii) The student designs the circuit shown, that uses this thermistor to switch on a fan when the temperature is above 24 °C. The fan switches on when the potential difference across the fan circuit is at least 4.5 V.



Calculate the resistance of the resistor.

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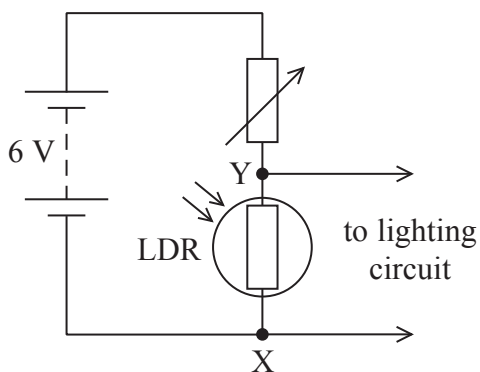
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Resistance of the resistor =

(Total for Question 4 = 11 marks)

- 5 A student designed a circuit to switch on a light when it gets dark. The circuit contained a light dependent resistor (LDR) in series with a variable resistor to control the light level at which the lighting circuit is switched on.



The resistance of the LDR decreases as the radiation flux of the incident light increases.

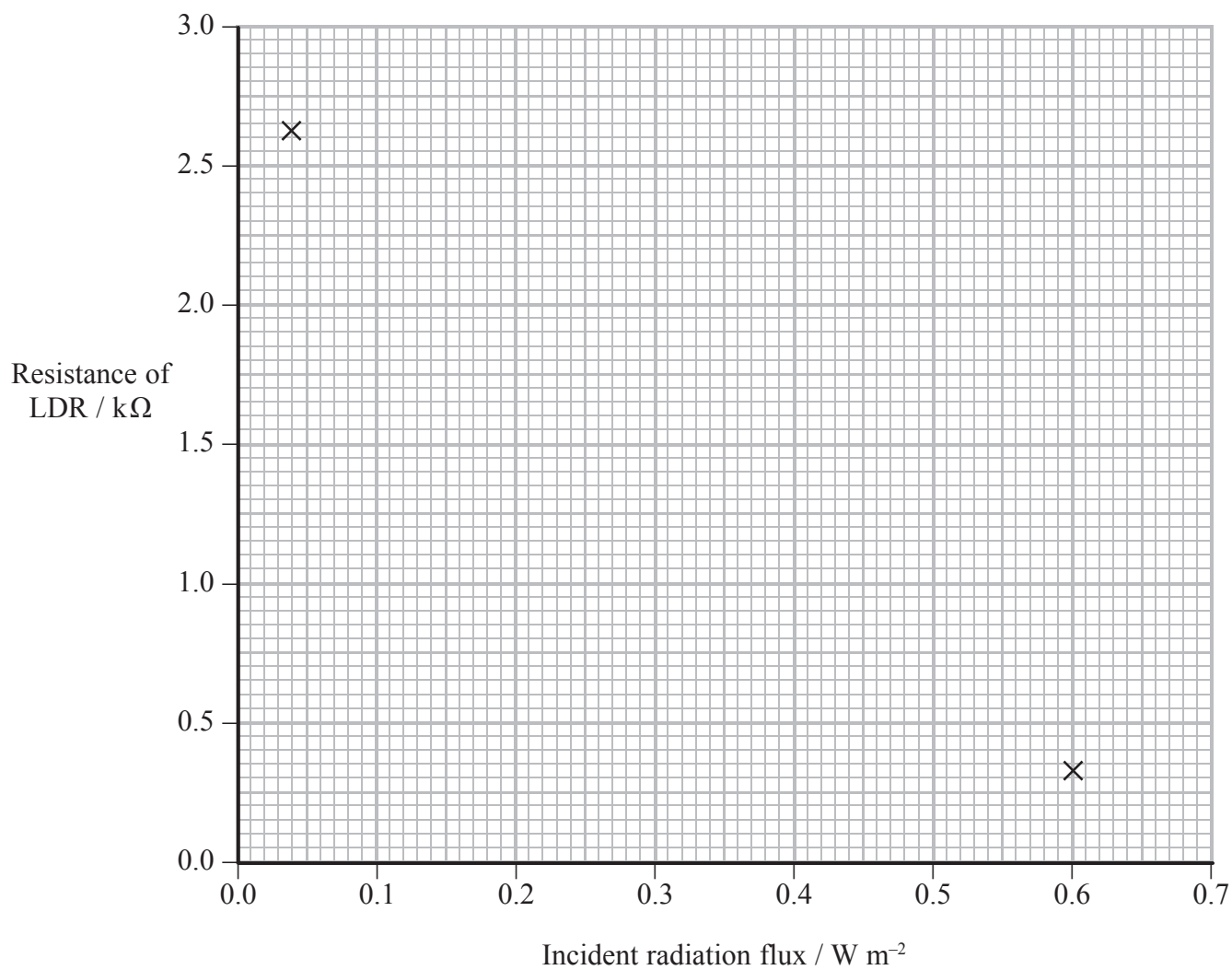
The student placed a lamp at different distances from the LDR. For each distance the radiation flux incident on the LDR was measured using a light meter and the resistance of the LDR was measured.

The results are shown in the table.

Incident radiation flux / W m^{-2}	Resistance of LDR / $\text{k}\Omega$
0.04	2.62
0.09	1.37
0.11	1.08
0.17	0.63
0.35	0.44
0.60	0.32

(a) Use the results in the table to complete the graph.

(3)



(b) The lighting circuit will switch on when the potential difference across XY is 0.60 V.

Determine the required resistance R of the variable resistor so that the lighting circuit will switch on when the incident radiation flux is 0.25 W m^{-2} .

(3)

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Resistance =

(c) Apart from eliminating human error, suggest how using a resistance sensor and a radiation flux sensor connected to a data logger could have improved the quality of the graph.

(2)

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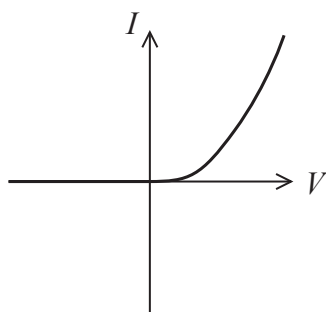
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(Total for Question 5 = 8 marks)

7 The graph shows how current varies with applied potential difference for a diode.



Explain the shape of the graph.

(3)

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(Total for Question 7 = 3 marks)