# 2.1 Current, Potential Difference & Resistance

## Question Paper

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|---|---|
| Course | AQA GCSE Physics |
| Section | 2. Electricity |
| Topic | 2.1 Current, Potential Difference & Resistance |
| Difficulty | Medium |

**Time allowed:** 70

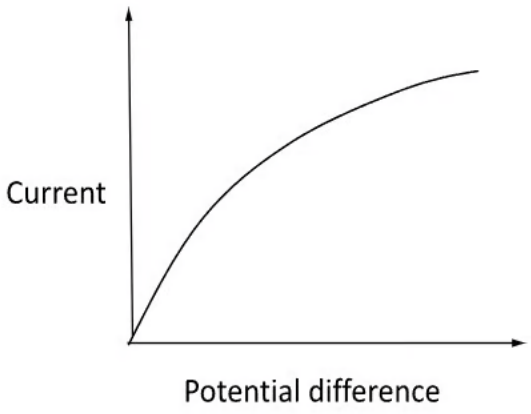
**Score:** /56

**Percentage:** /100

## Question 1a

**Figure 1** shows a graph of current against potential difference for a circuit component

**Figure 1**




(a)
What is the name of the component?

**[1 mark]**

**[1 mark]**

## Question 1b

(b)
Explain how the resistance of the component changes as the potential difference across it increases.

**[3 marks]**

**[3 marks]**

## Question 1c

(c)
LED lamps are considerably more energy efficient than the old filament bulbs that can be found in many houses.

What does 'more energy efficient' mean?

**[1 mark]**

**[1 mark]**

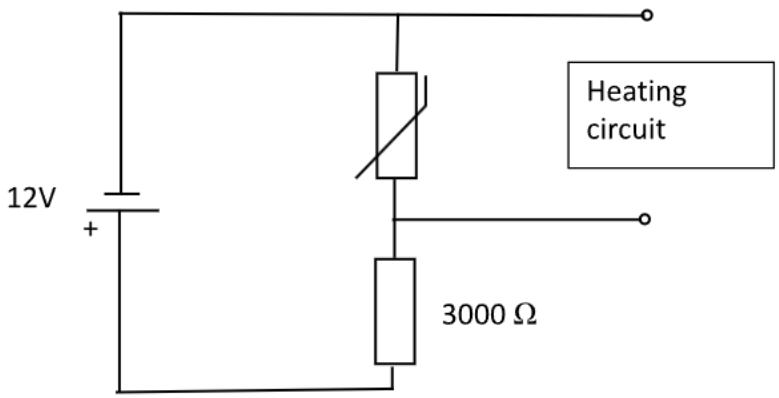
## Question 1d

(d)
It is useful to be able to detect temperature, and then to turn on a heater when it gets cold.

A thermistor is a component that allows us to do this.

Part of a control circuit for doing this is shown in **Figure 2.**

**Figure 2**




The temperature decreases.

What happens to the resistance of the thermistor, the current through the thermistor and the potential difference across it?

**[3 marks]**

Resistance _____ Ω

Potential difference _____

Current _____

**[3 marks]**

## Question 1e

(e)
What is the resistance of the thermistor when the potential difference across it is 3 V?

Give a reason for your answer.

Explain your answer.

**[2 marks]**

**[2 marks]**

## Question 1f

(f)
Calculate the current through the thermistor when the resistance of the thermistor is 5000 Ω.

Give your answer to 2 significant figures.

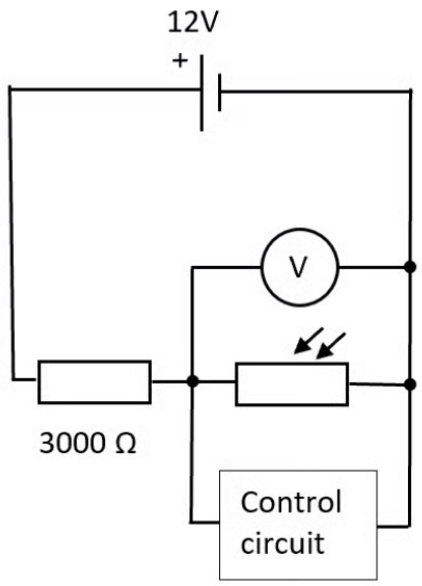
**[4 marks]**

**[4 marks]**

## Question 2a

The diagram in **Figure 3** below shows a sensing circuit which is used to control a set of automatic lights.

**Figure 3**




(a) What quantity is measured by the voltmeter?

**[1 mark]**

**[1 mark]**

## Question 2b

(b) Add an ammeter to the diagram which could measure the current through the LDR.

**[1 mark]**

**[1 mark]**

## Question 2c

(c) When the potential difference across the LDR is 6.4 V, the current in the circuit is 4.8 mA.

Calculate the resistance of the LDR.

**[3 marks]**

**[3 marks]**

## Question 2d

(d) Explain why the potential difference across the thermistor changes as the temperature in the house decreases.

**[2 marks]**

**[2 marks]**

## Question 2e

(e) The circuit is left to run for 10 minutes. Calculate the charge that flows in 10 minutes when the current in the circuit is 4.8 mA

**[3 marks]**

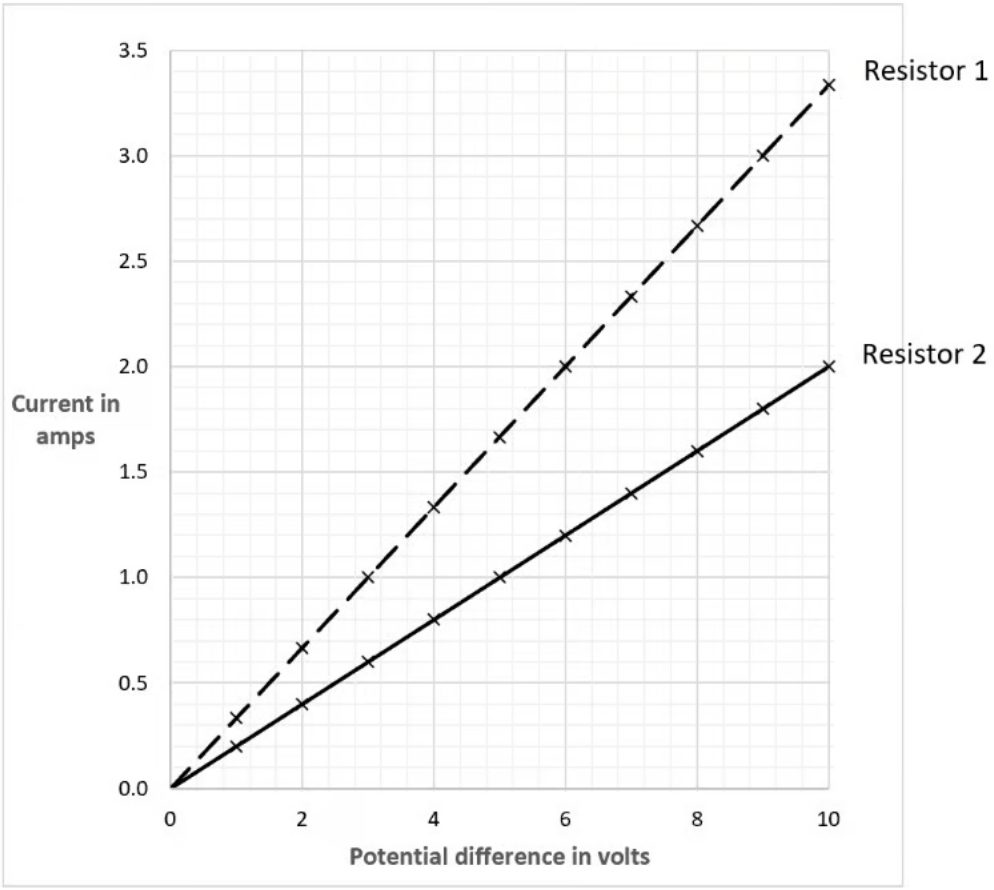
**[3 marks]**

## Question 3a

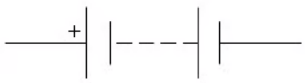
A student investigated how current varies with potential difference for two different resistors.

Her results are shown in **Figure 4** below.

**Figure 4**




(a) Complete the circuit diagram for the circuit that the student could have used to obtain the results shown in the figure above.




**[3 marks]**

**[3 marks]**

## Question 3b

(b) Resistor 2 has the **higher** resistance.

Explain how this is shown by the graph above in **Figure 4**.

**[2 marks]**

**[2 marks]**

## Question 3c

(c) Both resistors behave like ohmic conductors for the full range of potential differences used in this investigation.

Explain what an ohmic conductor is.

**[2 marks]**

**[2 marks]**

## Question 3d

(d) Use the graph above in **Figure 4** to calculate the resistance of both resistor 1 and resistor 2.

**[2 marks]**

**[2 marks]**

## Question 3e

(e) Resistor 1 and resistor 2 are placed in series with each other.

Calculate the Total resistance of this combination.

**[1 mark]**

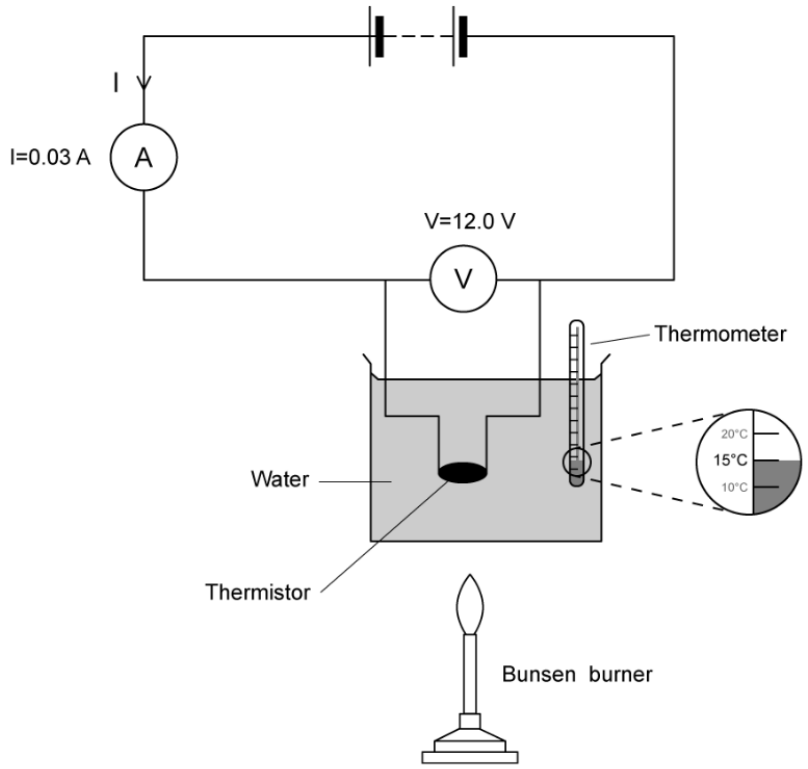
**[1 mark]**

## Question 4a

Thermistors can be used as digital thermometers if their resistance is known at a variety of different temperatures.

The apparatus required to obtain the data necessary to carry out this calibration is shown in **Figure 5** below.

**Figure 5**




(a) In the space below, draw the circuit symbol for a thermistor.

**[1 mark]**

**[1 mark]**

## Question 4b

(b) Calculate the resistance of the thermistor at 15°C, using the data from **Figure 5**.

**[2 marks]**

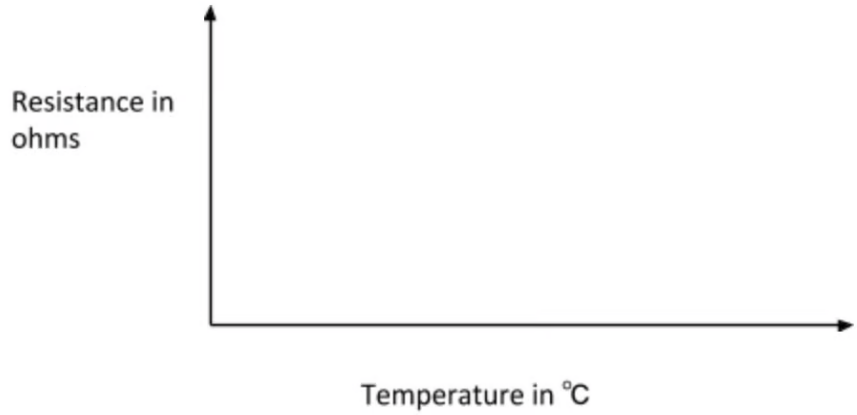
**[2 marks]**

## Question 4c

(c) Complete the sketch graph in **Figure 6** below to show how the resistance of a thermistor changes between the temperatures of 15 °C and 100 °C.

**[1 mark]**

**Figure 6**




**[1 mark]**

## Question 4d

(d) Give an example of a device that could include a thermistor

**[1 mark]**

[1 mark]

## Question 4e

(e) Ammeters, which are used in circuits have very low resistances.

Why is it important that ammeters have a very low resistance?

**[1 mark]**

[1 mark]

## Question 4f

(f) A student plans to change the experiment in **Figure 6** to investigate how the resistance of an LDR changes with the intensity of light shone on it.

Once change the student makes is to replace the thermistor with an LDR.

Suggest **two** further changes the student should make to the apparatus.

**[2 marks]**

[2 marks]

## Question 5a

Some students are investigating the I-V characteristics of a fixed resistor.

(a)
The students are given the following equipment:

- An ammeter
- A voltmeter
- A variable resistor
- Fixed resistors of 100 Ω, 200 Ω, 400 and 500 Ω
- A power pack
- Wires

Draw a circuit using the equipment from the list that would enable the students to gather valid data.

**[4 marks]**

**[4 marks]**

## Question 5b

(b)
Describe a method that would allow the students to obtain valid results.

**[5 marks]**

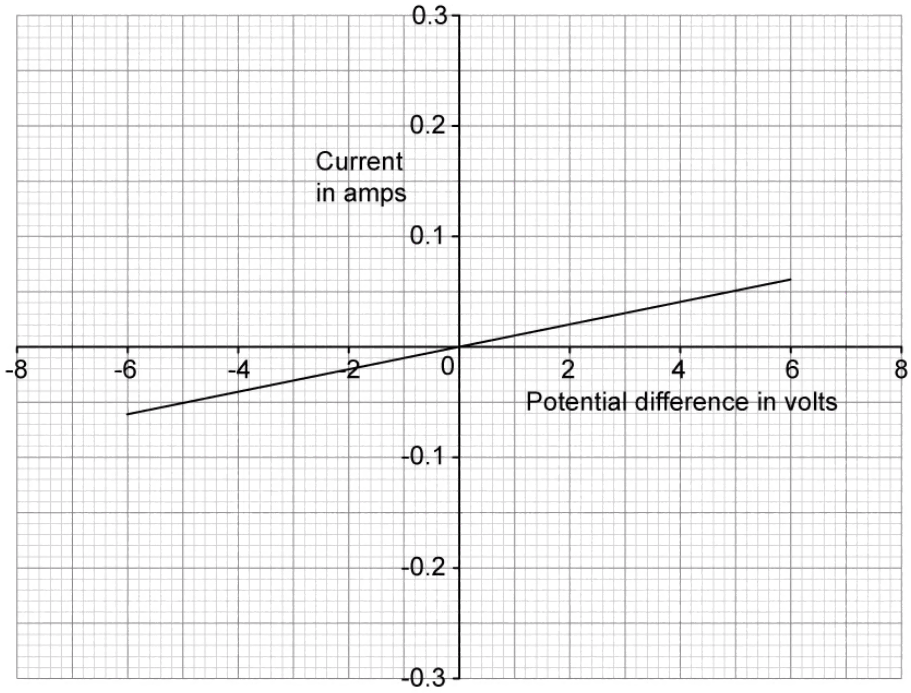
**[5 marks]**

## Question 5c

(c)

The students plotted their data and produced the graph shown in **Figure 1**.

**Figure 1**




Write down an expression for the gradient of the graph in terms of **resistance**.

**[1 mark]**

**[1 mark]**

## Question 5d

(d)

Use the graph to determine the resistance of the fixed resistor used by the students.

**[4 marks]**

Resistance = ..... Ω

**[4 marks]**