

Current Potential Diff and Resistance

Question Paper 1

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.2 Electricity
Sub-Topic	Current Potential Diff and Resistance
Difficulty Level	Gold Level
Booklet	Question Paper 1

Time Allowed: 59 minutes

Score: /57

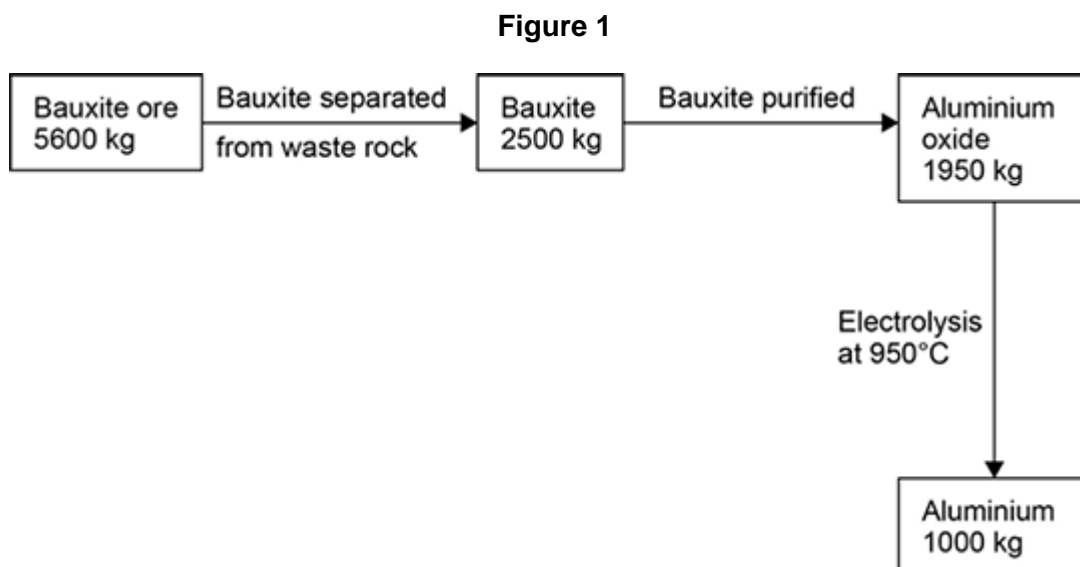
Percentage: /100

Grade Boundaries:

Q1. Aluminium is produced from an ore called bauxite.

Bauxite contains aluminium oxide.

Look at **Figure 1**.



- (a) Calculate the percentage of bauxite that is converted into aluminium oxide.

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Percentage =

(2)

- (b) Show by calculation that the mass of aluminium produced is less than that expected from 1 950 kg aluminium oxide (Al_2O_3).

You should state the difference in the mass of aluminium expected and the mass of aluminium produced to three significant figures.

Relative atomic masses (A_r): O = 16; Al = 27

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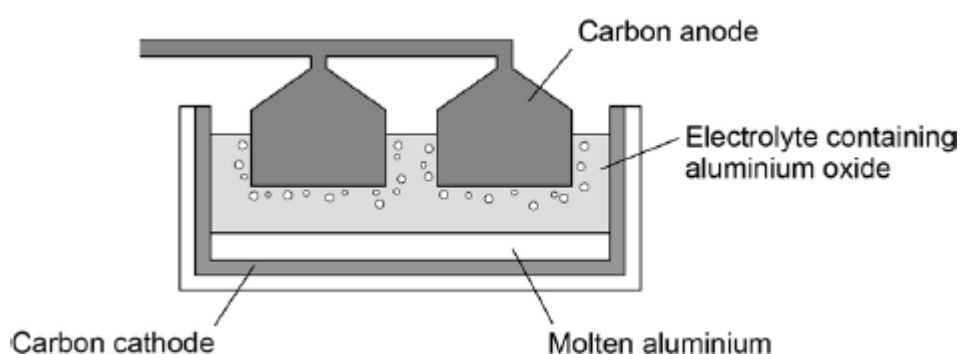
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(3)

- (c) **Figure 2** shows an electrolysis cell used to extract aluminium.

Figure 2



Why does the carbon anode used in the electrolysis cell need to be continually replaced?

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(3)

- (d) In an electrolysis cell the current is 1.5×10^5 A, at a potential difference of 4V.
Calculate the energy transferred by the electrolysis cell in 24 hours.

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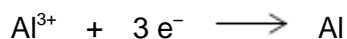
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Energy transferred = J

(5)

- (e) The half equation at the cathode is:



Calculate the number of moles of electrons needed to produce 1 000 kg of aluminium.

Give your answer to three significant figures.

Relative atomic mass (A_r): Al = 27

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Answer = moles

(3)

(Total 16 marks)

Q2.A student is investigating some electrical components.

- (a) Describe how the student could set up a circuit to find the resistance of a lamp.

You should include a circuit diagram in your answer.

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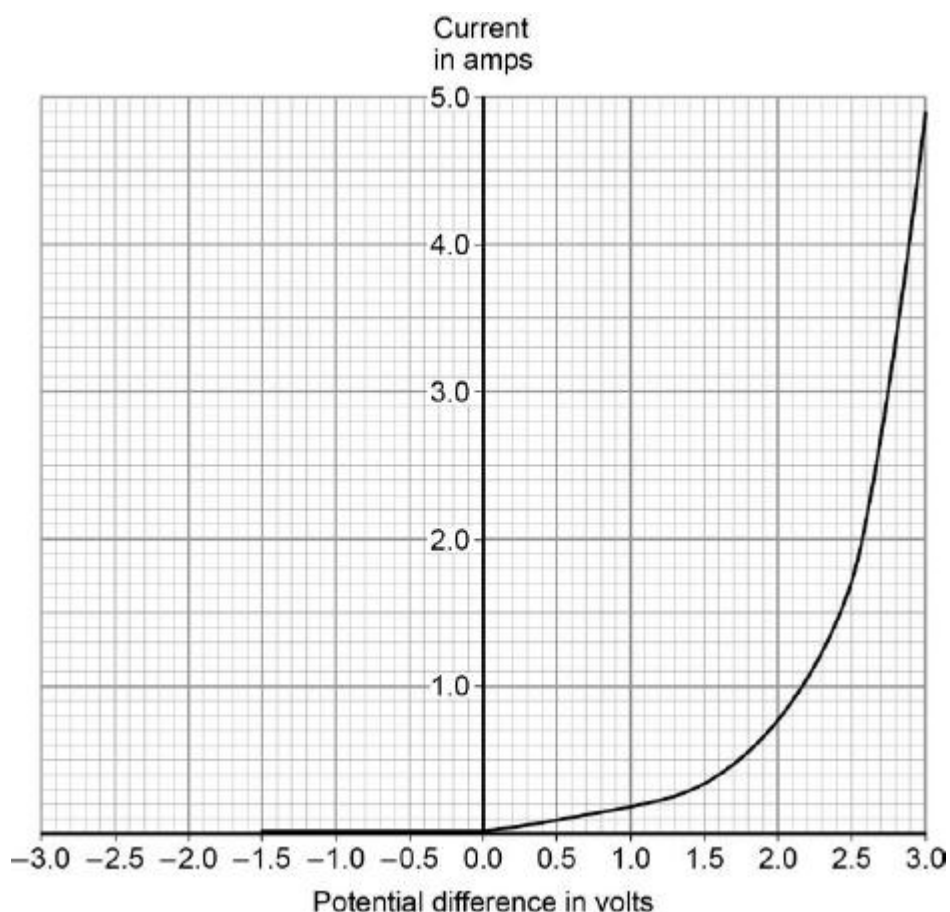
(4)

- (b) The student is given an electrical component in a sealed box.

She has to find out what the electrical component is by experiment.

The student records the current and the potential difference for the component.

Her results are shown in the figure below.



Explain how the student could know that the electrical component in the sealed box is **not** an ohmic conductor.

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(2)

- (c) What is the electrical component in the sealed box?

Explain your answer.

Component

Explanation

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(3)

- (d) Use the graph to determine the resistance of the component at 2.3 V.

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Resistance = Ω

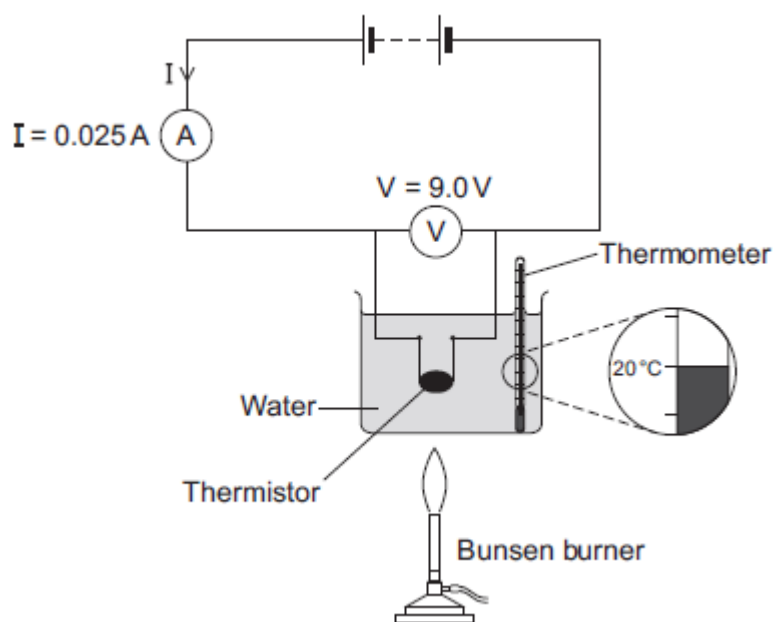
(4)

(Total 13 marks)

- Q3.(a)** **Figure 1** shows the apparatus used to obtain the data needed to calculate the resistance of a thermistor at different temperatures.

Figure 1

Power supply



- (i) In the box below, draw the circuit symbol for a thermistor.



(1)

- (ii) Use the data given in **Figure 1** to calculate the resistance of the thermistor at 20 °C.

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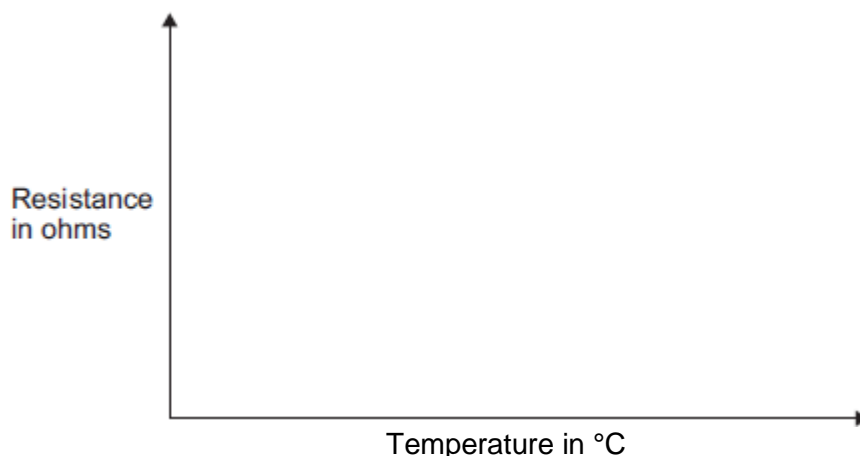
Resistance = ohms

(2)

- (iii) **Figure 2** shows the axes for a sketch graph.

Complete **Figure 2** to show how the resistance of the thermistor will change as the temperature of the thermistor increases from 20 °C to 100 °C.

Figure 2



(1)

- (iv) Which **one** of the following is most likely to include a thermistor?

Tick (✓) **one** box.

An automatic circuit to switch a plant watering system on and off.

☐

An automatic circuit to switch an outside light on when it gets dark.

☐

An automatic circuit to switch a heating system on and off.

☐

(1)

- (b) The ammeter used in the circuit has a very low resistance.

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

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(1)

- (c) The table below gives the temperature of boiling water using three different temperature scales.

Temperature	Scale
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100	Celsius (°C)
212	Fahrenheit (°F)
80	Réaumur (°Re)

Scientists in different countries use the same temperature scale to measure temperature.

Suggest **one** advantage of doing this.

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(1)

- (d) A student plans to investigate how the resistance of a light-dependent resistor (LDR) changes with light intensity.

The student starts with the apparatus shown in **Figure 2** but makes three changes to the apparatus.

One of the changes the student makes is to replace the thermistor with an LDR.

Describe what other changes the student should make to the apparatus.

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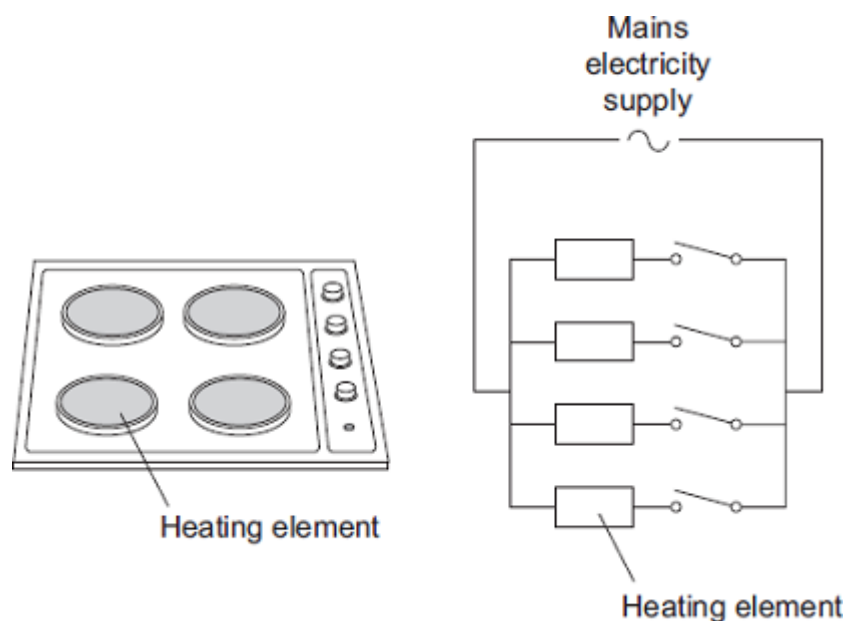
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(2)

(Total 9 marks)

Q4. The picture shows an electric cooker hob. The simplified circuit diagram shows how the four heating elements connect to the mains electricity supply. The heating elements are identical.



When all four heating elements are switched on at full power the hob draws a current of 26 A from the 230 V mains electricity supply.

- (a) Calculate the resistance of one heating element when the hob is switched on at full power.

Give your answer to 2 significant figures.

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Resistance = Ω

(3)

- (b) The table gives the maximum current that can safely pass through copper wires of different cross-sectional area.

Cross-sectional area in mm^2	Maximum safe current in amps
1.0	11.5
2.5	20.0
4.0	27.0
6.0	34.0

The power sockets in a home are wired to the mains electricity supply using cables containing 2.5 mm^2 copper wires. Most electrical appliances are connected to the mains electricity supply by plugging them into a standard power socket.

It would **not** be safe to connect the electric cooker hob to the mains electricity supply by plugging it into a standard power socket.

Why?

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(2)

- (c) Mains electricity is an alternating current supply. Batteries supply a direct current.

What is the difference between an alternating current and a direct current?

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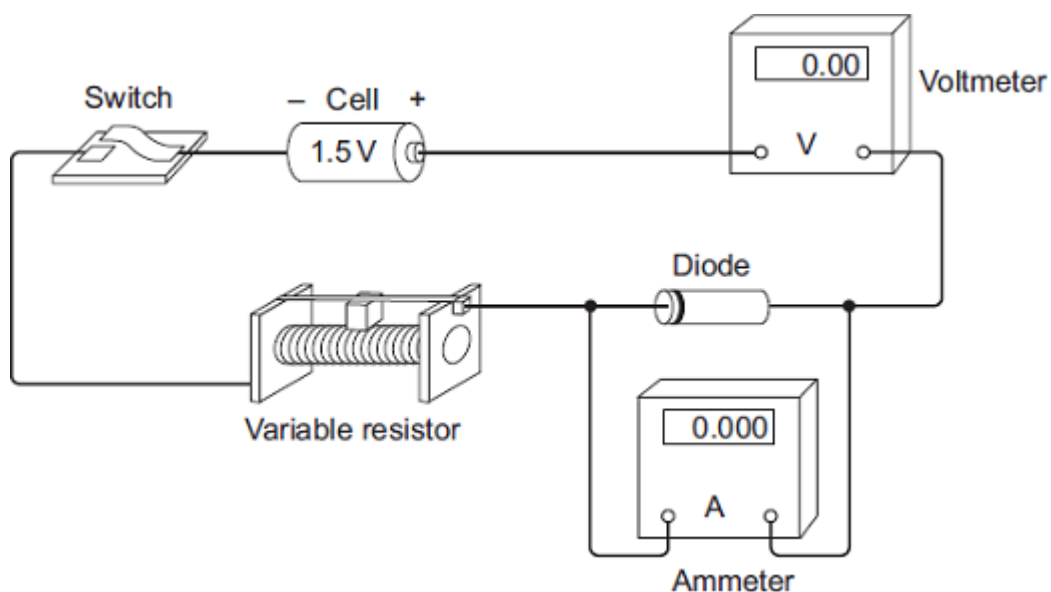
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(2)

(Total 7 marks)

- Q5.(a)** A student set up the circuit shown in the diagram. The student uses the circuit to obtain the data needed to plot a current - potential difference graph for a diode.



- (i) Draw, in the boxes, the circuit symbol for a diode and the circuit symbol for a variable resistor.

Diode

Variable resistor

(2)

- (ii) The student made two mistakes when setting up the circuit.

What **two** mistakes did the student make?

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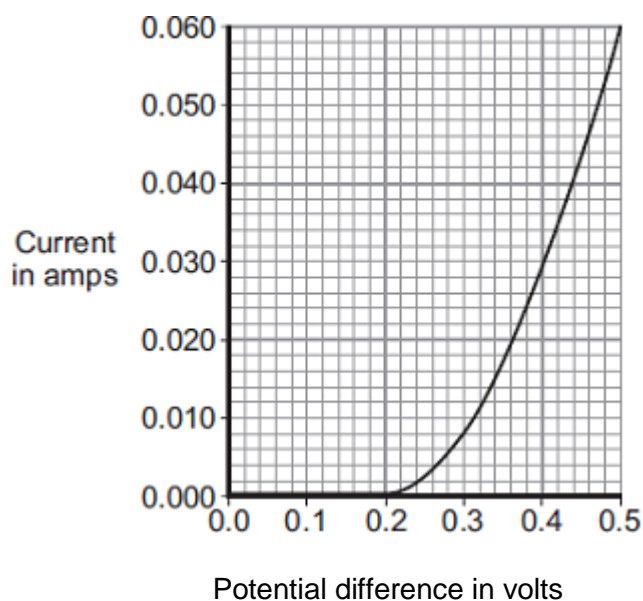
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(2)

- (b) After correcting the circuit, the student obtained a set of data and plotted the graph below.



- (i) At what potential difference did the diode start to conduct an electric current?

..... V

(1)

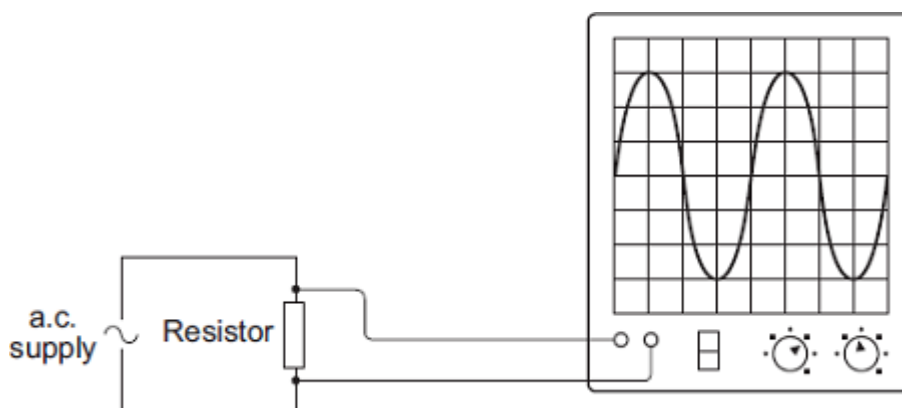
- (ii) Use data from the graph to calculate the resistance of the diode when the potential difference across the diode is 0.3 V.

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Resistance = ohms

(3)

- (c) The diagram shows the trace produced by an alternating current (a.c.) supply on an oscilloscope.



Each horizontal division on the oscilloscope screen represents a time of 0.01s.

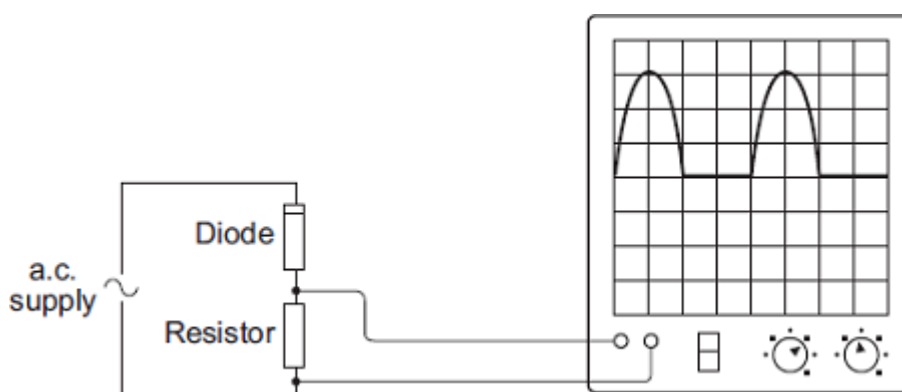
- (i) Calculate the frequency of the a.c. supply.

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Frequency = hertz

(2)

- (ii) A diode is now connected in series with the a.c. power supply.



Why does the diode cause the trace on the oscilloscope screen to change?

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(2)

(Total 12 marks)

