

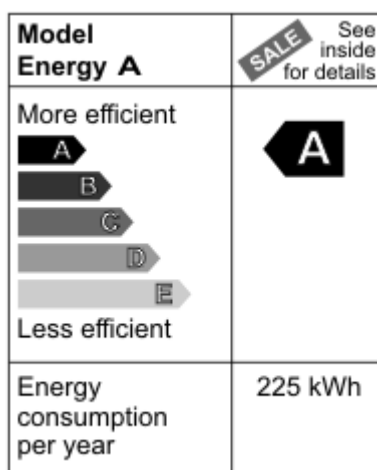
Name of the Student: _____

Max. Marks : 20 Marks

Time : 20 Minutes

Q1.

The diagram shows the label from a new freezer.



- (a) An old freezer has an energy consumption per year of 350 kWh.

Use the equation in the box to calculate the extra cost of using the old freezer for one year compared with using a new 'A' rated freezer.

$\text{total cost} = \text{number of kilowatt-hours} \times \text{cost per kilowatt-hour}$
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Assume 1 kilowatt-hour (kWh) of energy costs 12 p.

Show clearly how you work out your answer.

Extra cost per year = £ _____

(2)

- (b) The price of the new freezer was reduced in a sale.

Reducing the price reduces the payback time for replacing the old freezer from 12 years to 9 years.

Calculate, in pounds, how much the new freezer was reduced in the sale.

Show clearly how you work out your answer.

Price reduced by = £ _____

(2)

- (c) An advertisement in a shop claims that:

‘Replacing an old freezer with a new ‘A’ rated freezer will benefit the environment.’

Do you agree that replacing the freezer will benefit the environment?

Answer yes or no. _____

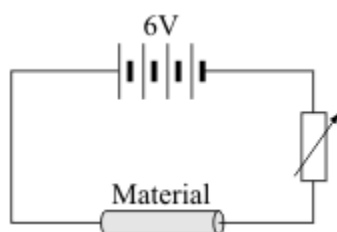
Explain the reasons for your answer.

(2)

(Total 6 marks)

Q2.

- (a) The diagram shows the circuit used to investigate the resistance of a material. The diagram is incomplete; the ammeter and voltmeter are missing.



- (i) Draw the symbols for the ammeter and voltmeter on the diagram in the correct places.

(2)

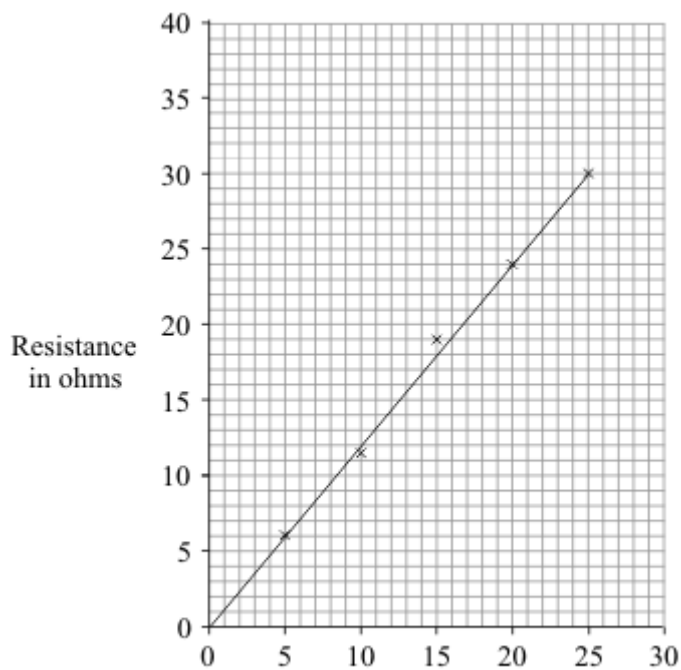
- (ii) How can the current through the material be changed?

(1)

- (b) The material, called conducting putty, is rolled into cylinders of different lengths but with equal thicknesses.

Graph 1 shows how the resistance changes with length.

Graph 1



- (i) Why has the data been shown as a line graph rather than a bar chart?

(1)

- (ii) The current through a 30 cm length of conducting putty was 0.15 A.

Use **Graph 1** to find the resistance of a 30 cm length of conducting putty.

Resistance = _____ ohms

(1)

- (iii) Use your answer to (b)(ii) to calculate the potential difference across a 30 cm length of conducting putty.

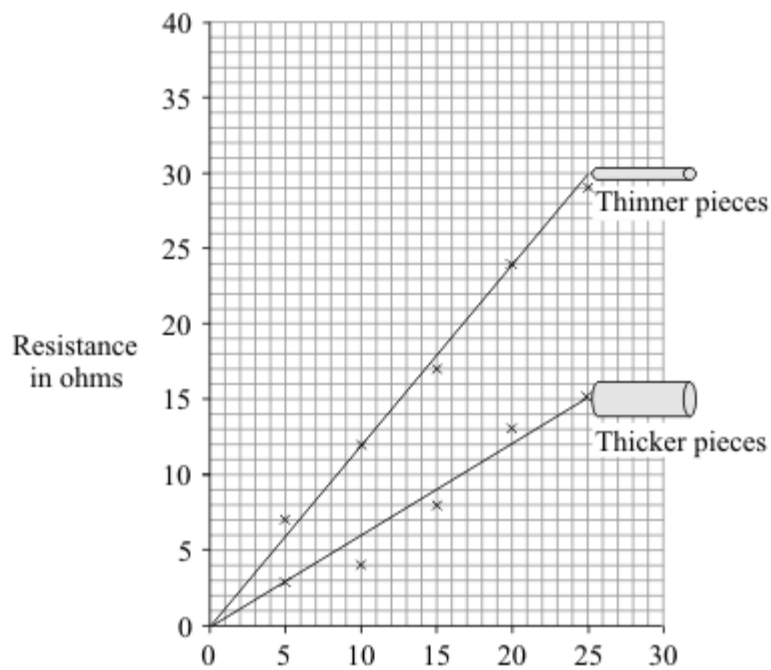
Show clearly how you work out your answer.

Potential difference = _____ volts

(2)

- (c) A second set of data was obtained using thicker pieces of conducting putty. Both sets of results are shown in **Graph 2**.

Graph 2



- (i) What is the relationship between the resistance and the thickness of the conducting putty?

(1)

- (ii) Name **one** error that may have reduced the accuracy of the results.

(1)

- (iii) How could the reliability of the data have been improved?

(1)

(Total 10 marks)

Q3.

During car journeys, the driver will often become electrostatically charged.

This is more noticeable on dry days than on damp, humid days.

- (a) Explain what happens to cause the driver to become charged.

(2)

- (b) Scientists were asked to find out whether the build-up of charge on the driver depends on the type of material used to make the driver's clothes. The results of the investigation are given in the table.

Material	Humidity	Temperature in °C	Charge on the driver in millicoulombs
Nylon	48%	18	3.0 to 3.2
Wool	48%	18	2.4 to 2.5
Cotton	48%	18	1.4 to 1.7

Humidity is a measure of how much water vapour the air can hold.

- (i) Why was it important that the scientists controlled the humidity?

(1)

- (ii) Does the data in the table show that the charge on the driver would always be less if they were to wear cotton clothing?

Give a reason for your answer.

(1)

(Total 4 marks)