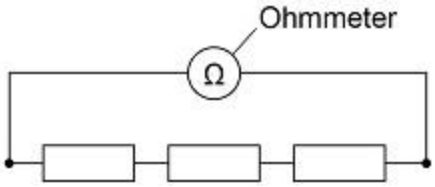
**Name of the Student**:_____
**Max. Marks : 26 Marks** **Time : 26 Minutes**

## Q1.

A student investigated how the total resistance of identical resistors connected in series varied with the number of resistors.

The student used an ohmmeter to measure the total resistance of the resistors.

The diagram below shows the student's circuit with 3 resistors.




The student repeated each reading of resistance three times.

The table below shows the student's results for 3 resistors in series.

| Number of resistors | Total resistance in Ω | | | |
|---|---|---|---|---|
| | Reading 1 | Reading 2 | Reading 3 | Mean |
| 3 | 35.9 | 36.0 | 36.1 | 36.0 |

(a) Calculate the mean resistance of 1 resistor.

_____

_____

_____

Resistance = _____ Ω

**(2)**

(b) What was the resolution of the ohmmeter the student used?

Tick (✓) **one** box.

0.1 Ω ☐ 0.2 Ω ☐ 1.1 Ω ☐ 36.0 Ω ☐

**(1)**

(c) How do the results show that the student's measurements were precise?

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Tick (✓) **one** box.

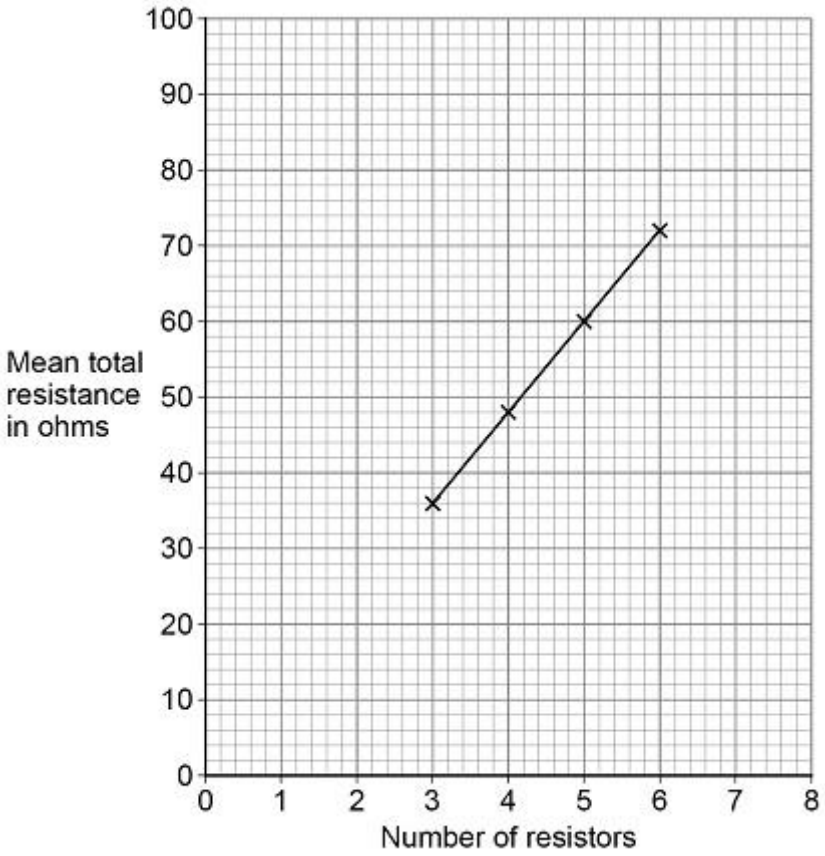
The measurements are accurate. ☐

The measurements are grouped closely together. ☐

The measurements are reproducible. ☐

**(1)**

The graph below shows the results.




(d) How do the results show that the total resistance is directly proportional to the number of resistors?

Tick (✓) **one** box.

The results give a line with a positive gradient. ☐

The results give a straight line that would go through the origin. ☐

The results show a linear relationship. ☐

**(1)**

(e) Predict the mean total resistance of 7 resistors.

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Use the graph above.

Mean total resistance of 7 resistors = _____ Ω

**(1)**

(f) Some resistors are connected in series with a battery.

When more resistors are added in series, the total resistance increases.

Complete the sentences.

Choose answers from the box.

Each answer may be used once, more than once or not at all.

| | | |
|---|---|---|
| **decreases** | **increases** | **remains the same** |

When the number of resistors increases, the potential difference across each resistor _____.

When the number of resistors increases, the current in the circuit _____.

**(2)**

**(Total 8 marks)**

## Q2.

A student heated water in an electric kettle.

(a) Water has a high specific heat capacity.

Complete the sentence.

Choose answers from the box.

| | | | | |
|---|---|---|---|---|
| **°C** | **J** | **kg** | **s** | **W** |

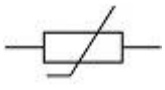
The specific heat capacity of a substance is the energy needed to raise the temperature of 1 _____ of the substance by 1 _____.

**(2)**

(b) The kettle circuit contains a thermistor which is used to switch the kettle off when the water reaches 100 °C.

What is the correct symbol for a thermistor?

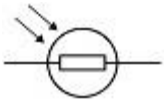
Tick (✓) **one** box.



☐



☐



☐

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**(1)**

(c) The resistance of the heating element in the kettle is 15 Ω.

The current in the heating element is 12 A.

Calculate the power of the heating element.

Use the equation:

$$\text{power} = (\text{current})^2 \times \text{resistance}$$

_____

_____

_____

_____

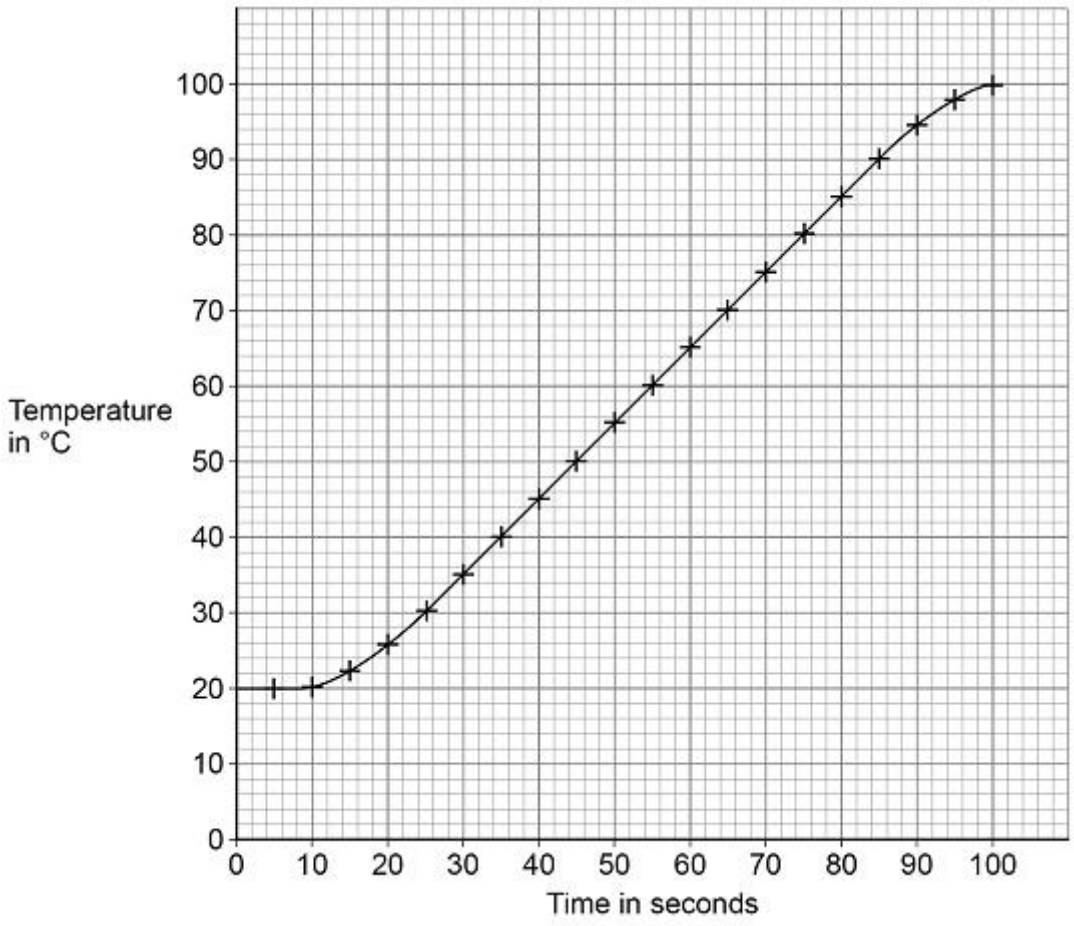
_____

Power = _____ W

**(2)**

The student investigated how quickly the kettle could increase the temperature of 0.50 kg of water.

The graph below shows the results of the investigation.




(d) The temperature of the water did **not** start to increase until 10 seconds after the kettle was switched on.

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What is the reason for this?

Tick (✓) **one** box.

| | |
|---|---|
| Energy is transferred from the surroundings to the kettle. | ☐ |
| The charge flows slowly through the kettle circuit. | ☐ |
| The heating element in the kettle takes time to heat up. | ☐ |
| The power output of the kettle increases slowly. | ☐ |

**(1)**

(e) Describe a method the student could have used to obtain the results shown in the graph.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

**(6)**

(f) The mass of water in the kettle was 0.50 kg.

The temperature of the water increased from 20 °C to 100 °C.

specific heat capacity of water = 4200 J/kg/°C

Calculate the energy transferred to the water.

Use the Physics Equations Sheet.

_____

_____

_____

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_____

_____

Energy = _____ J

**(3)**

(g) The water in the kettle boiled for a short time before the kettle switched off.

During this time 5.0 g of water changed to steam.

specific latent heat of vaporisation of water = 2 260 000 J/kg

Calculate the energy transferred to change the water to steam.

Use the Physics Equations Sheet.

_____

_____

_____

_____

_____

Energy = _____ J

**(3)**

**(Total 18 marks)**

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