

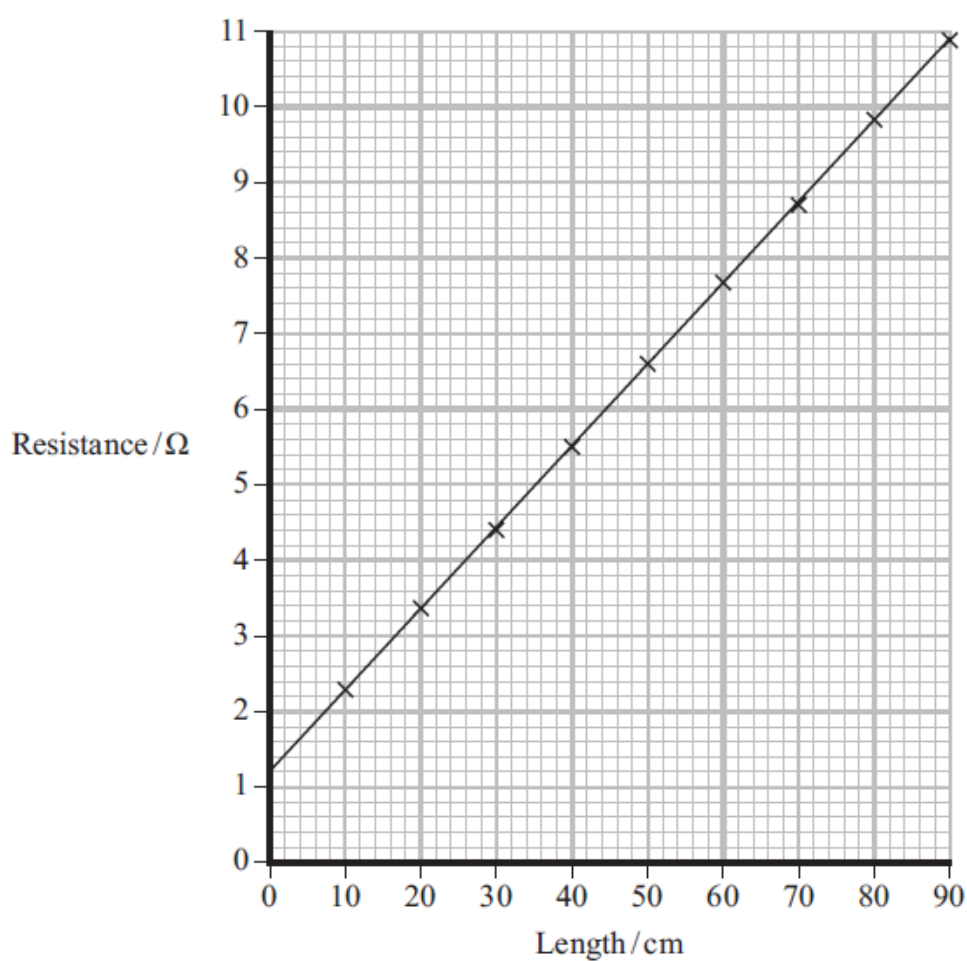
Questions

Q1.

A student determined the resistivity for a metal in the form of a wire.

The student measured the resistance for different lengths of the wire.

She plotted the graph shown.



The table shows the resistivity of some metals.

Metal	Resistivity / $\Omega \text{ m}$
constantan	4.90×10^{-7}
nichrome	1.07×10^{-6}
copper	1.55×10^{-8}

Deduce which of these metals the wire was made from.

diameter of wire = 0.24 mm

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for question = 5 marks)

Q2.

A student is planning an experiment to determine a value for the resistivity of a metal in the form of a wire, by a graphical method.

(a) State the physical quantities she should measure, suggesting a suitable measuring instrument for each quantity.

(3)

.....

.....

.....

.....

.....

.....

(b) Describe how she should use her measurements to determine an accurate value for the resistivity of the wire using a graphical method.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

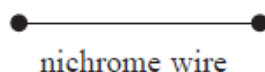
(Total for question = 6 marks)

Q3.

A student carried out an experiment to determine the resistivity of nichrome wire. Her circuit included an ammeter, a voltmeter and a variable resistor.

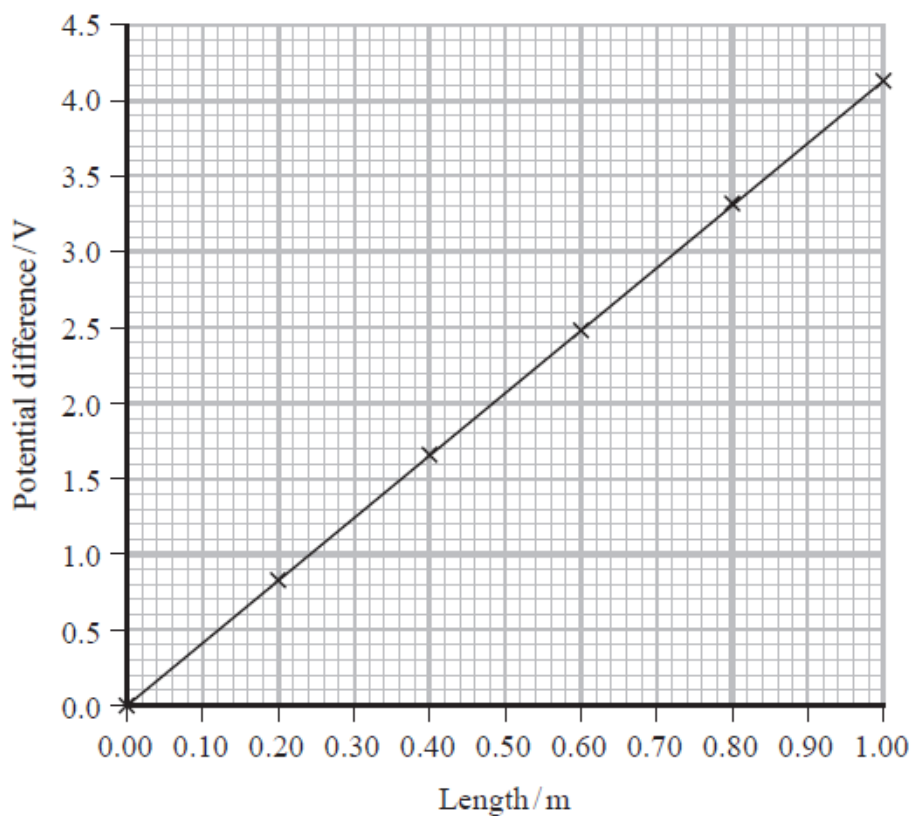
(a) Complete the circuit diagram for this experiment.

(2)



(b) The student varied the length of the nichrome wire in the circuit. For each length, she measured the potential difference across the nichrome wire. She used the variable resistor to keep the current in the wire at 0.200 A during the experiment.

The student plotted a graph of potential difference against length of nichrome wire.



(i) Determine the resistivity of nichrome.

cross sectional area of nichrome wire = $5.31 \times 10^{-8} \text{ m}^2$

(4)

.....

.....

.....

.....

.....

.....

.....

.....

Resistivity of nichrome = ...

(ii) Calculate the power dissipated from the nichrome wire to the surroundings when the length of the wire is 0.75 m.

(3)

.....

.....

.....

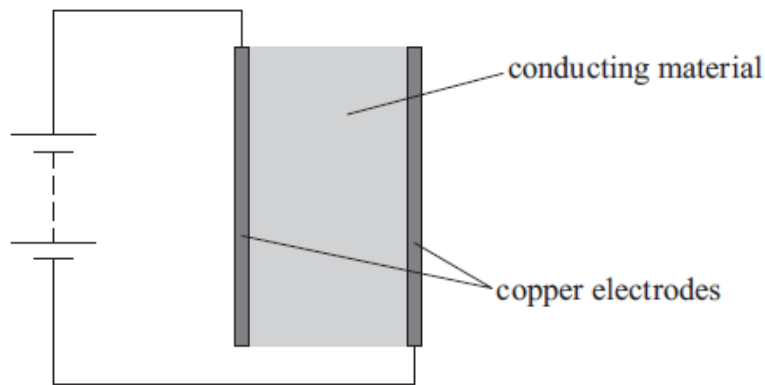
Power dissipated = ...

(Total for question = 9 marks)

Q4.

An electrical heating system consists of heating panels.

Each panel is made from a thin sheet of conducting material attached to two copper electrodes. The electrodes are connected to a power supply, as shown.



(a) A student uses a sample of the conducting material to determine its resistivity.

(i) State what is meant by resistivity of a material.

(1)

(ii) Describe how the student could determine a value for the resistivity of the conducting material.

You do **not** need to draw a circuit diagram.

(4)

.....

.....

.....

.....

.....

(b) Copper has a low resistivity compared with the resistivity of the conducting material.

Explain how the low resistivity of copper affects the drift velocity of electrons in the copper electrodes.

(2)

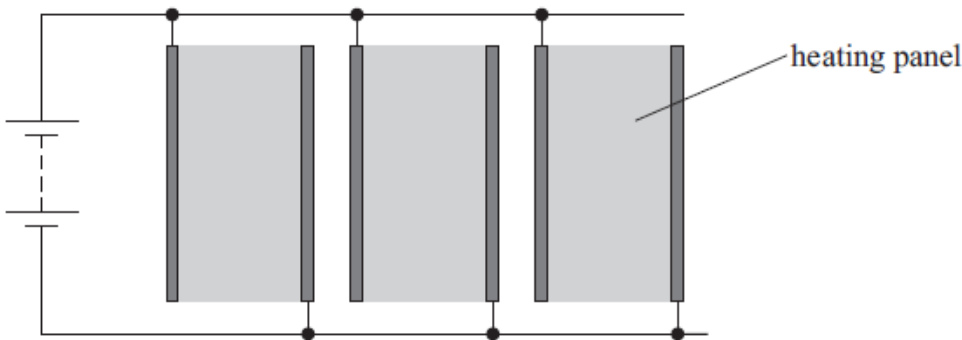
.....

.....

.....

.....

(c) The power output of the heating system can be changed by connecting more panels in parallel with the power supply, as shown.



Explain how adding panels in parallel changes the power output of the system.

(2)

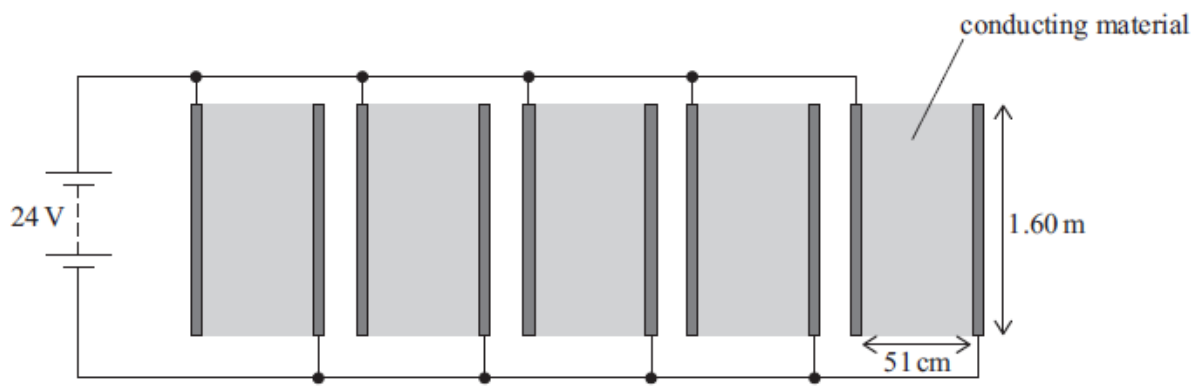
.....

.....

.....

.....

(d) A student designs a heating system using five heating panels, as shown.



To be safe, the maximum power of the student's heating system should be less than 350 W.

Deduce whether the student's heating system is safe.

resistivity of conducting material = $6.4 \times 10^{-3} \, \Omega \, \text{m}$

thickness of conducting material = 0.48 mm

(5)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for question = 14 marks)