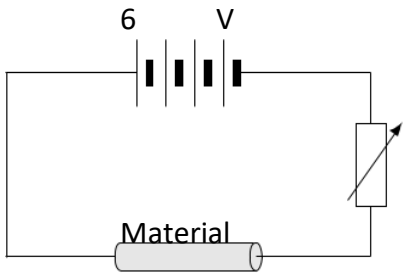
CURRENT,POTENTIAL DIFFERENCE AND RESISTANCE 1

Q:1 (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 marks)

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

_____

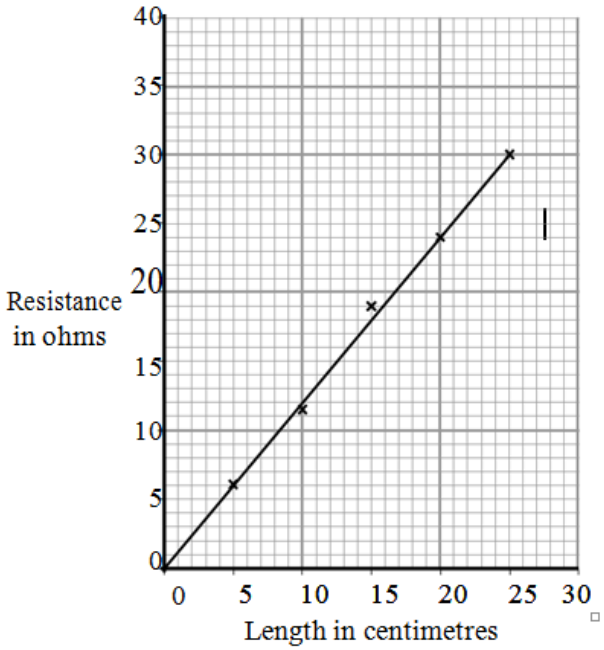
_____

(1 mark)

(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 mark)

(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 mark)

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

potential difference = current × resistance

Show clearly how you work out your answer.

_____

_____

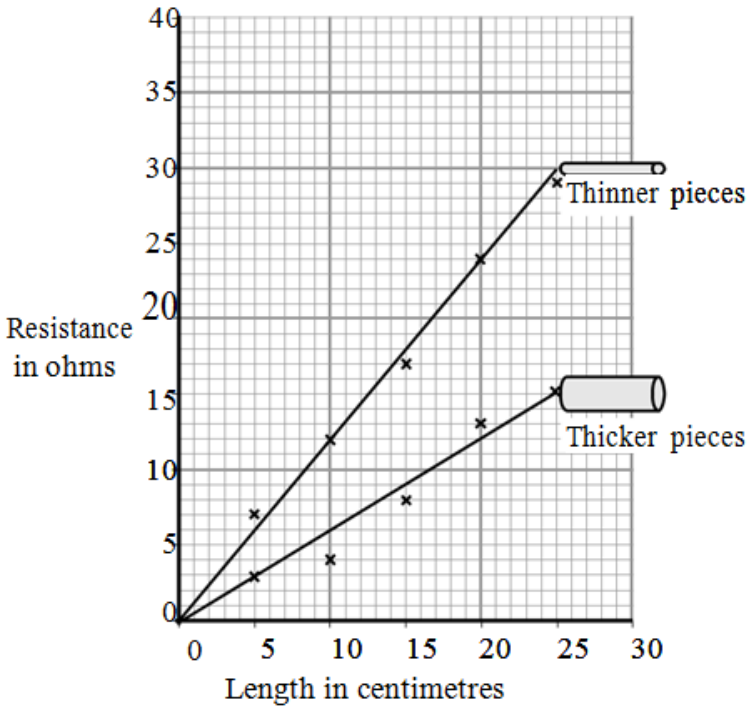
_____

Potential difference =_____ volts

(2 marks)

(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 mark)

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

_____

(1 mark)

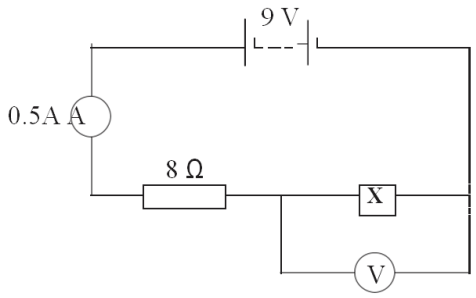
(iii) How could the reliability of the data have been improved?

_____

_____

(1 mark)

Q:2(a) The circuit diagram drawn below includes a component labelled X.



(i) Use the equation in the box to calculate the potential difference across the 8 ohm resistor.

potential difference = current × resistance

Show clearly how you work out your answer.

_____

_____

_____

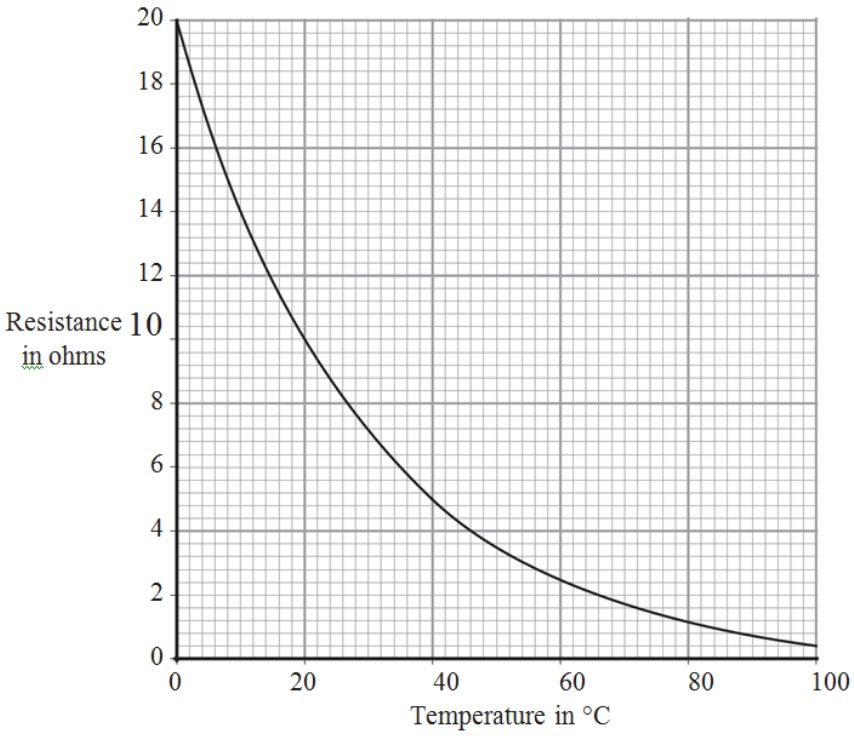
Potential difference = _____ volt (2 marks)

(a)(ii) What is the potential difference across component X?

_____

(1 mark)

(b) The graph shows how the resistance of component X changes with temperature.



(b)(i)What is component X?

_____

(1 mark)

(b)(ii) Over which range of temperatures does the resistance of component X change the most?

Put a tick (☒) in the box next to your choice.

0°C to 20 °C ☐

20°C to 40 °C ☐

40°C to 60 °C ☐

60°C to 80 °C ☐

80°C to 100 °C ☐

(1 mark)

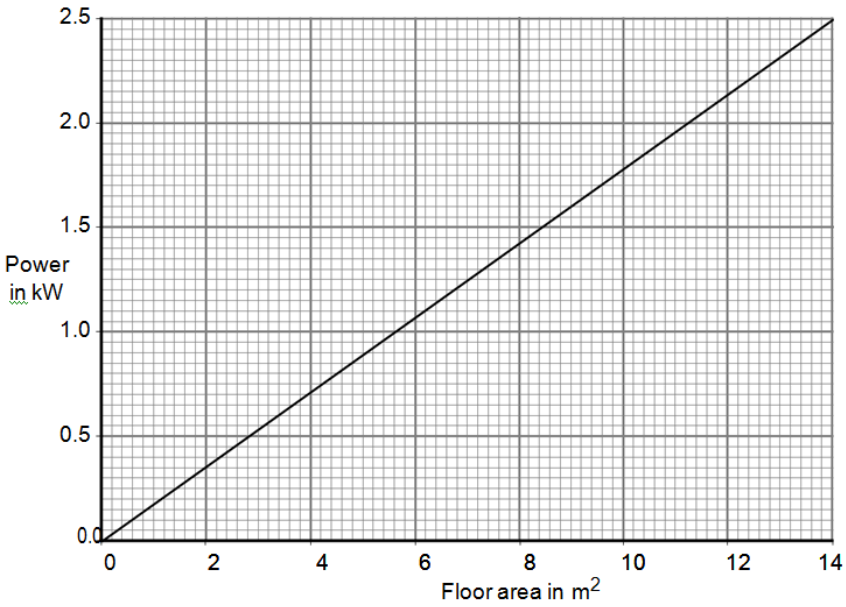
Q:3 A homeowner has installed electric underfloor heating in the kitchen. When the heating is switched on, an electric current flows through wires running under the tiled floor surface.

(a) What is an electric current?

_____

(1 mark)

(b)The graph shows how the power output of an underfloor heating system depends on the area of the floor that is heated.



The area of the homeowner's kitchen floor is 9.0 m2.

Use the graph and the equation in the box to calculate the current drawn from the 230 V mains supply by the heating system.

power = current × potential difference

Show clearly how you work out your answer and give the unit.

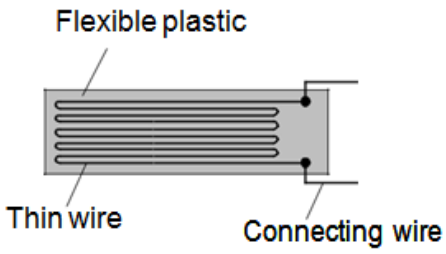
Current = _____

(4 marks)

Q:4 The diagram shows a strain gauge, which is an electrical device used to monitor a changing force.

Applying a force to the gauge causes it to stretch.

This makes the electrical resistance of the wire change.



(a) (i) Using the correct symbols, add to the diagram to show how a battery, an ammeter and a voltmeter can be used to find the resistance of the strain gauge drawn above.

(2 marks)

(a) (ii) When in use, the strain gauge is always connected to a d.c. power supply, such as a battery.

How is a d.c. (direct current) power supply different from an a.c. (alternating current) power supply?

_____

_____

(1 mark)

(b)Before any force is applied, the unstretched gauge, correctly connected to a

3.0 V battery, has a current of 0.040 A flowing through it.

(b) (i) Use the equation in the box to calculate the resistance of the unstretched gauge.

potential difference = current □ resistance

Show clearly how you work out your answer.

_____

_____

Resistance = ... Ω

(2 marks)

(b) (ii) Stretching the gauge causes the current flowing through the gauge to decrease. What happens to the resistance of the gauge when it is stretched?

_____

_____

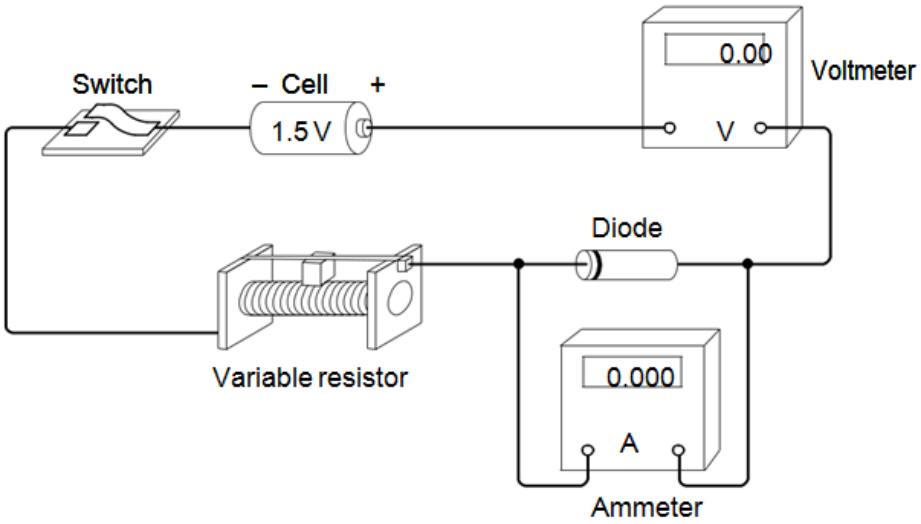
(1 mark)

(b) (iii) What form of energy is stored in the gauge when a force is applied and the gauge stretches?

_____

(1 mark)

Q:5 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



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

Diode	Variable resistor

(2 marks)

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

What two mistakes did the student make?

1 _____

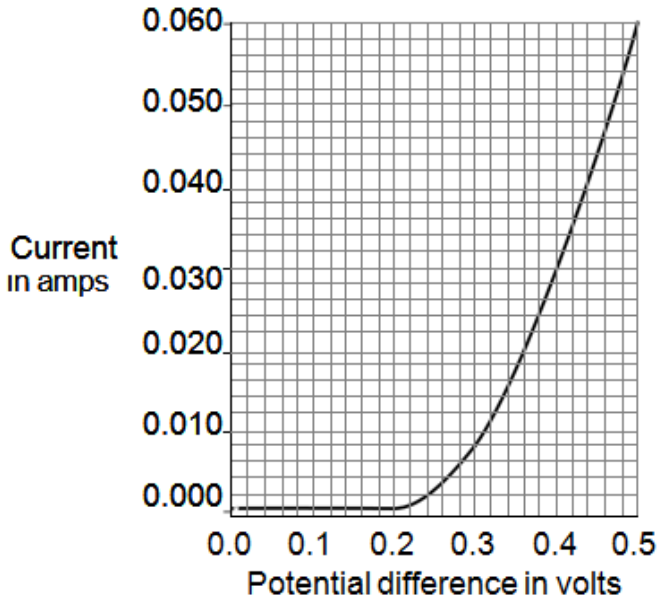
_____

2 _____

_____

(2 marks)

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



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

_____ V

(1 mark)

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

Use the correct equation from the Physics Equations Sheet.

_____

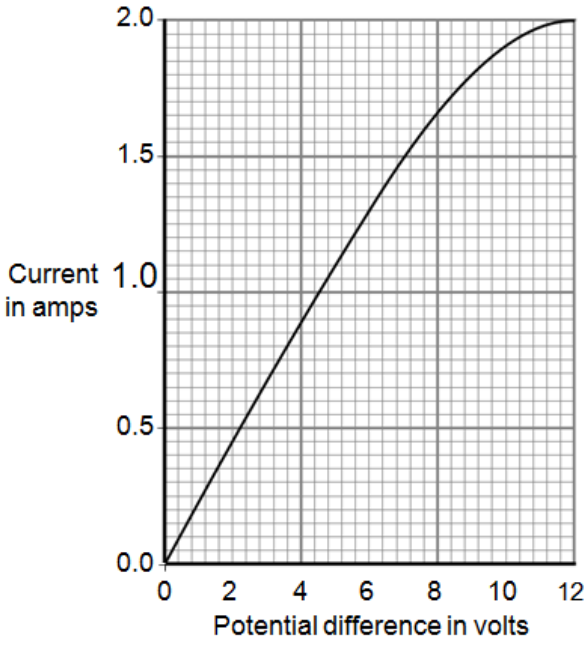
_____

_____

Resistance = _____ ohms

(3 marks)

Q:6 The graph shows how the electric current through a 12 V filament bulb varies with the potential difference across the bulb.



(a) What is the meaning of the following terms?

electric current

_____

_____

Potential difference

_____

_____

(2 marks)

(b)The resistance of the metal filament inside the bulb increases as the potential difference across the bulb increases.

Explain why.

_____

_____

_____

_____

(3 marks)

(c)Use data from the graph to calculate the rate at which the filament bulb transfers energy, when the potential difference across the bulb is 6 V.

Use the correct equation from the Physics Equations Sheet.

Show clearly how you work out your answer.

_____

_____

Rate of energy transfer = _____ W

(2 marks)

TOTAL MARKS=41