

# 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	Silver Level
Booklet	Question Paper 1

Time Allowed: 17 minutes

Score: /17

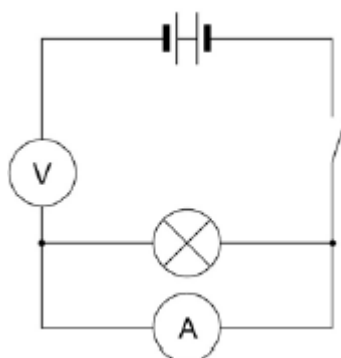
Percentage: /100

Grade Boundaries:

**Q1.** A student used electrical circuits to investigate the relationship between resistance, potential difference and current.

**Figure 1** shows how the student connects the first circuit he set up.

**Figure 1**



(a) The circuit does not work.

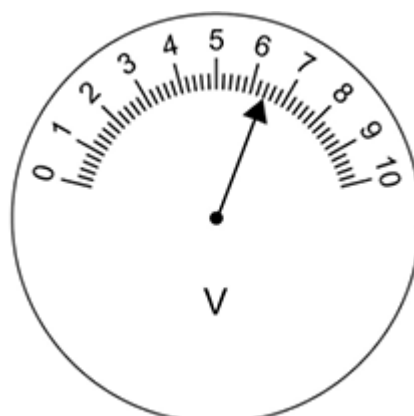
Draw the correct circuit.

(2)

(b) The student then sets up the circuit correctly.

Look at **Figure 2**.

**Figure 2**



What is the reading on the voltmeter?

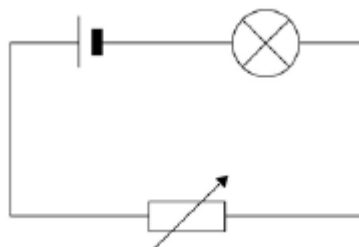
.....

(1)

- (c) The student then set up a circuit to investigate how resistance affects the brightness of a lamp.

**Figure 3** shows the circuit he set up.

**Figure 3**



The student increases the resistance of the variable resistor.

What effect does this have on the brightness of the lamp?

Explain your answer.

.....

.....

.....

.....

(2)

- (d) Write down the equation that links current, potential difference and resistance.

.....

(1)

- (e) When the potential difference across the lamp is 3.3 V the current is 0.15 A.

Calculate the resistance of the lamp in the student's experiment.

.....

.....

.....

Resistance = .....  $\Omega$

(3)

(Total 9 marks)

**Q2.**Electrical circuits have resistance.

- (a) Draw a ring around the correct answer to complete the sentence.

When the resistance of a circuit increases, the current in the circuit

decreases.

increases.

stays the same.

(1)

- (b) Use the correct answer from the box to complete each sentence.

**a filament bulb**

**an LED**

**an LDR**

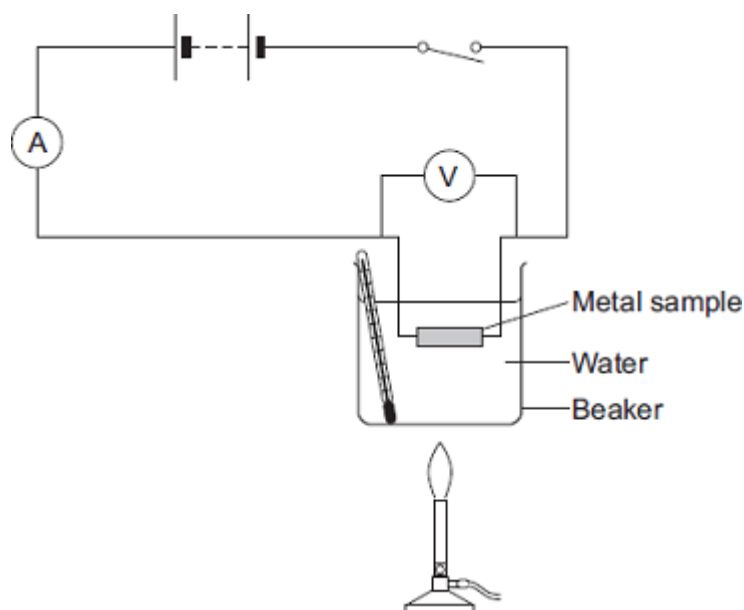
An electrical component which has a resistance that increases as the temperature increases is .....

An electrical component which emits light only when a current flows through it in the forward direction is .....

(2)

- (c) When some metals are heated the resistance of the metal changes.

The equipment for investigating how the resistance of a metal changes when it is heated is shown in the diagram.



*In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Describe an investigation a student could do to find how the resistance of a metal sample varies with temperature. The student uses the equipment shown.

Include in your answer:

- how the student should use the equipment
- the measurements the student should make
- how the student should use these measurements to determine the resistance
- how to make sure the results are valid.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

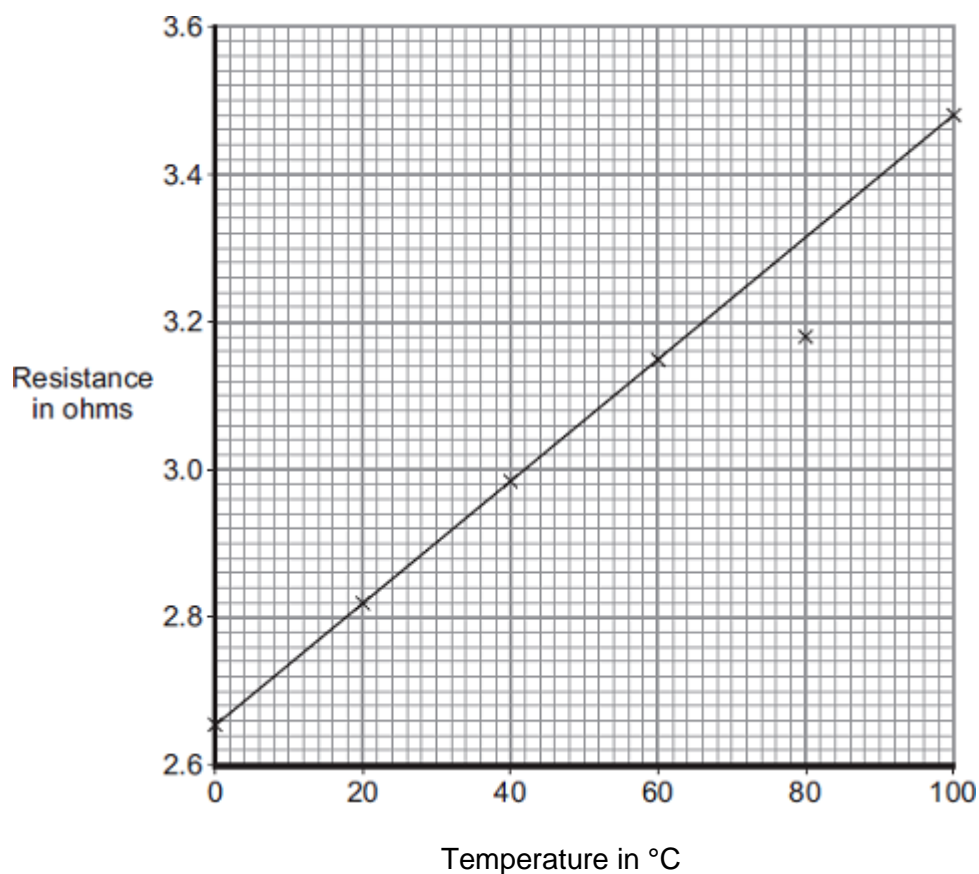
(6)

- (d) The table shows some data for samples of four metals **P**, **Q**, **R** and **S**.

The metal samples all had the same cross-sectional area and were the same length.

Metal sample	Resistance at 0°C in ohms	Resistance at 100°C in ohms
<b>P</b>	4.05	5.67
<b>Q</b>	2.65	3.48
<b>R</b>	6.0	9.17
<b>S</b>	1.70	2.23

A graph of the results for one of the metal samples is shown.



- (i) Which metal sample, **P**, **Q**, **R** or **S**, has the data shown in the graph?

(1)

- (ii) One of the results is anomalous. Circle this result on the graph.

(1)

- (iii) Suggest a reason for the anomalous result.

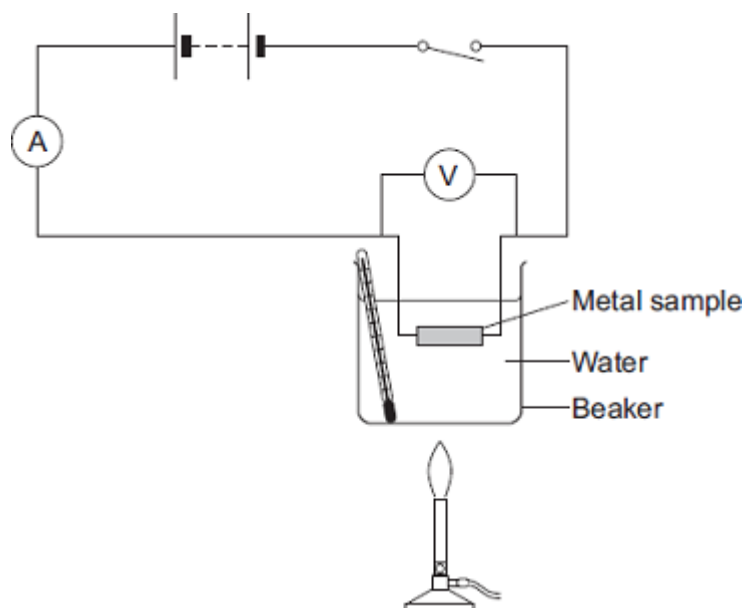
.....

.....

(1)

- (iv) The same equipment used in the investigation could be used as a

thermometer known as a ‘resistance thermometer.’



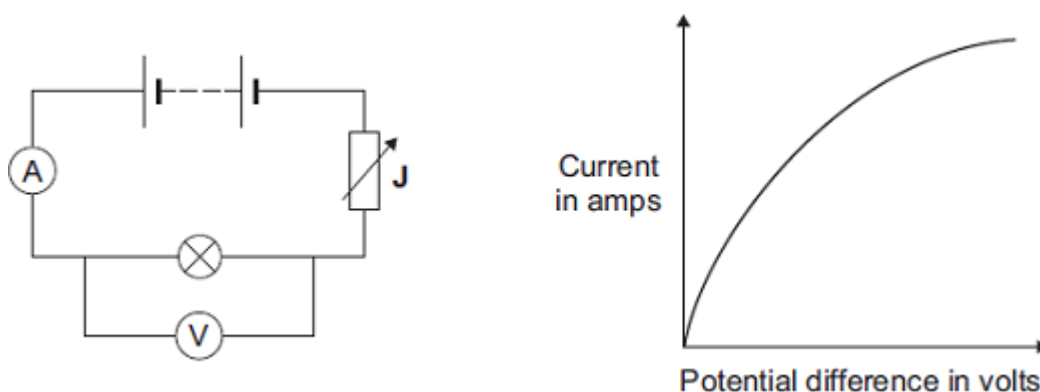
Suggest **two** disadvantages of using this equipment as a thermometer compared to a liquid-in-glass thermometer.

- 1 .....
- .....
- 2 .....
- .....

(2)  
(Total 14 marks)

**Q3.(a)** The diagram shows the circuit used to obtain the data needed to plot the current–potential difference graph for a filament bulb.





- (i) Why is the component labelled 'J' included in the circuit?

.....  
 .....

(1)

- (ii) The resistance of the bulb increases as the potential difference across the bulb increases. Why?

.....  
 .....

(1)

- (iii) The bulb is at full brightness when the potential difference across the bulb is 12 V.  
 The current through the bulb is then 3 A.

Calculate the power of the bulb when it is at full brightness and give the unit.

.....  
 .....  
 .....

Power = .....

(3)

- (b) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The table gives data about two types of light bulb people may use in their homes.

Type of light bulb	Energy efficiency	Cost of one light bulb	Average lifetime in hours
Halogen	10%	£1.95	2 000
Light Emitting Diode (LED)	32%	£11.70	36 000

Both types of light bulb produce the same amount of light.

Evaluate, in terms of cost and energy efficiency, the use of the two types of light bulb.

To gain full marks you must compare both types of light bulb and conclude which light bulb would be the best to use.

.....

.....

.....

.....

.....

.....

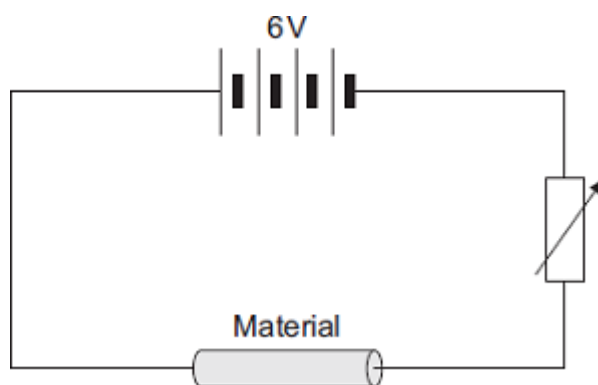
.....

.....

.....

(6)  
(Total 11 marks)

- Q4.(a)** The diagram shows the circuit used to investigate the resistance of a sample of a material.  
The diagram is not complete; the ammeter and voltmeter are missing.



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

(2)

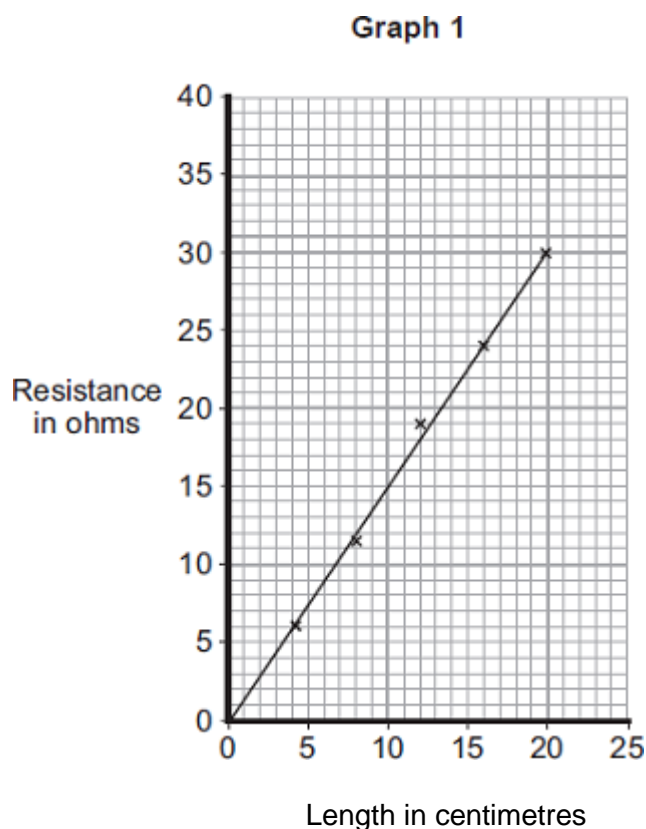
- (ii) How can the current through the material be changed?

.....  
.....

(1)

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

**Graph 1** shows how the resistance changes with length.



- (i) The current through a 25 cm length of conducting putty was 0.15 A.

Use **Graph 1** to find the resistance of a 25 cm length of conducting putty.

Resistance = ..... ohms

(1)

- (ii) Use your answer to **(b) (i)** to calculate the potential difference across a 25 cm length of conducting putty.

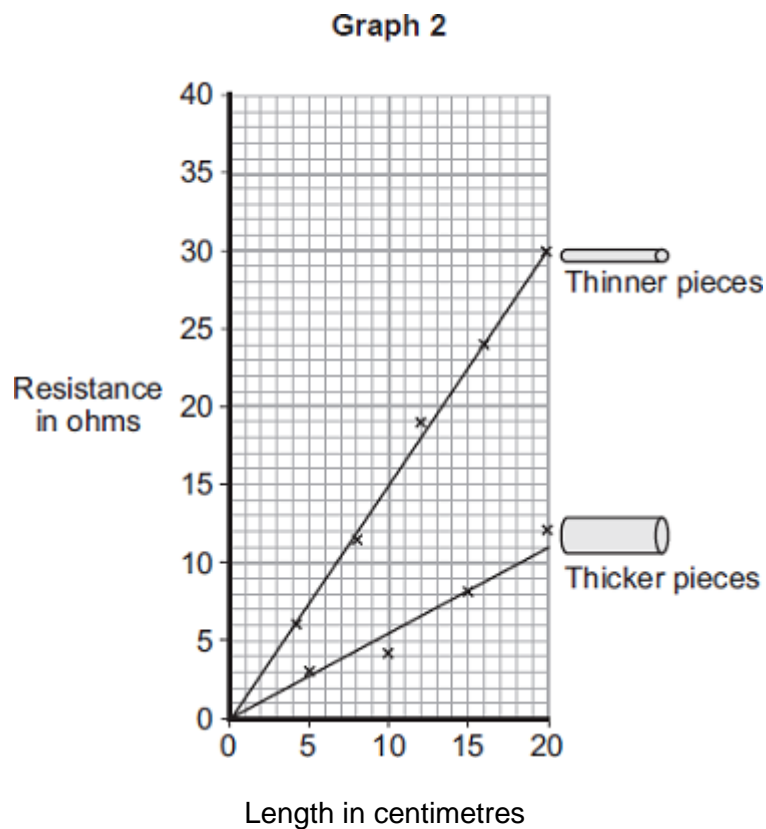
Show clearly how you work out your answer.

.....  
 .....  
 .....

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**.



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

.....  
 .....

(1)

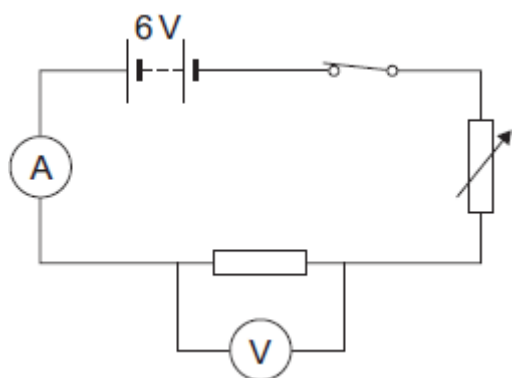
- (ii) Name **one** error that may have reduced the accuracy of the results.

.....

(1)

**(Total 8 marks)**

**Q5.**The diagram shows the circuit set up by a student.



- (a) The student uses the circuit to test the following hypothesis:

*'The current through a resistor is directly proportional to the potential difference across the resistor.'*

- (i) If the hypothesis is correct, what should the student predict will happen to the current through the resistor when the potential difference across the resistor is doubled?

.....  
.....

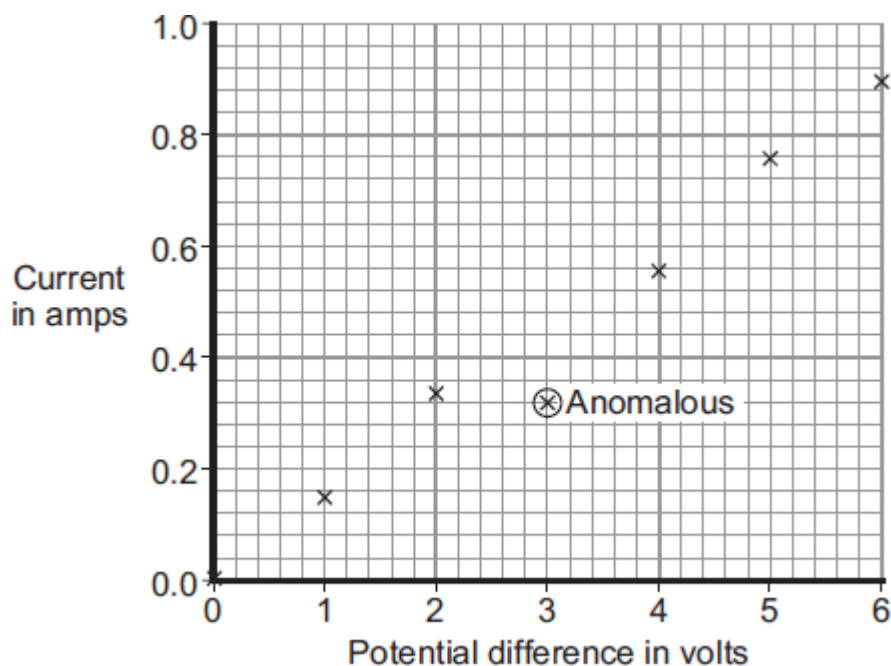
(1)

- (ii) Name the component in the circuit used to change the potential difference across the resistor.

.....

(1)

- (b) The student used the data obtained to plot the points for a graph of current against potential difference.



- (i) Why has the student plotted the points for a line graph and not drawn a bar chart?

.....  
 .....

(1)

- (ii) One of the points has been identified by the student as being anomalous.  
 What is the most likely cause for this anomalous point?

.....  
 .....

(1)

- (iii) Draw a line of best fit for these points.

(1)

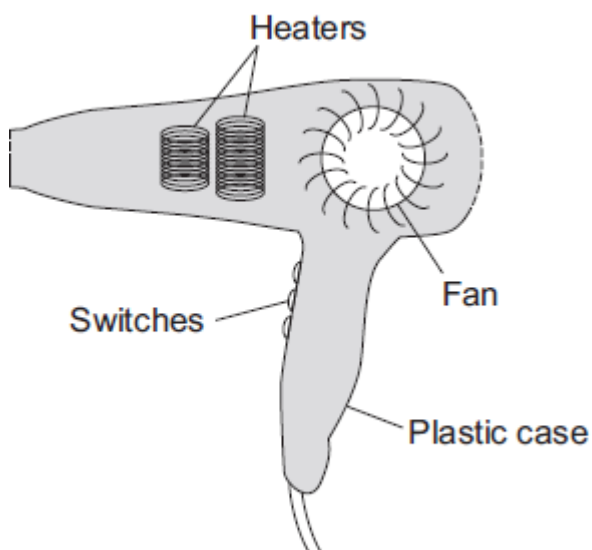
- (iv) Does the data the student obtained support the hypothesis?  
 Give a reason for your answer.

.....

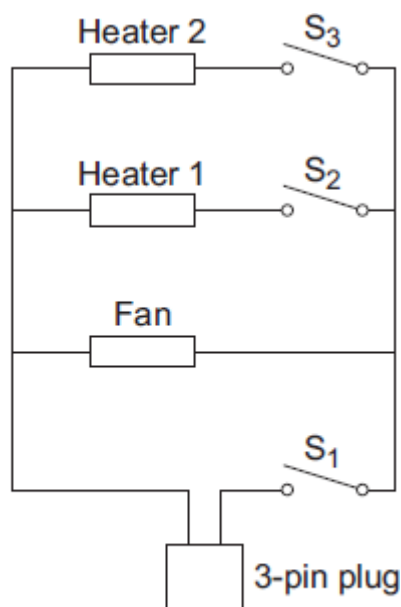
(1)  
(Total 6 marks)

**Q6.**Diagram 1 shows a hairdryer.

Diagram 2 shows how the heaters and fan of the hairdryer are connected to a 3-pin plug. The hairdryer does not have an earth wire.



**Diagram 1**



**Diagram 2**

- (a) What colour is the insulation around the wire connected to the live pin inside the plug?

.....

(1)

- (b) Why does the hairdryer **not** need an earth wire?

.....

.....

(1)



(c) All the switches are shown in the OFF position.

(i) Which switch or switches have to be ON to make:

(1) only the fan work; .....

(2) heater 2 work? .....

(2)

(ii) The heaters can only be switched on when the fan is also switched on.

Explain why.

.....

.....

.....

.....

.....

(2)

(d) The table shows the current drawn from the 230 volt mains electricity supply when different parts of the hairdryer are switched on.

	Current in amps
Fan only	1.0
Fan and heater 1	4.4
Fan and both heaters	6.5

Calculate the maximum power of the hairdryer.

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

.....

.....

Maximum power = .....

(3)

(Total 9 marks)

