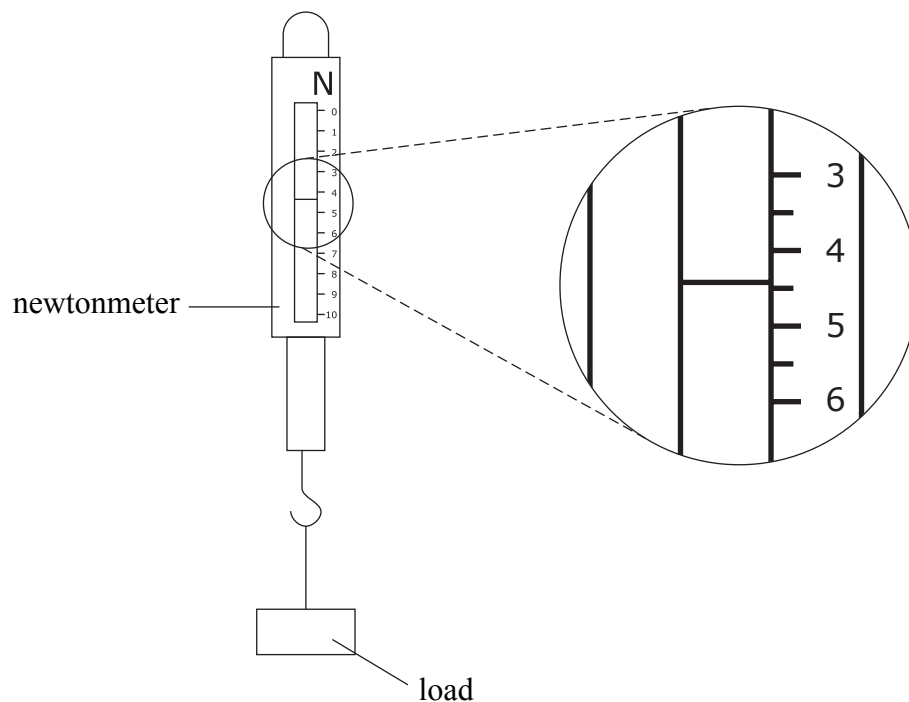




1. A newtonmeter is used to measure force.  
The diagram shows a newtonmeter with a load attached. An enlarged section of part of its scale is also shown.



- (a) What is the reading on the newtonmeter?

Reading = ..... N  
**(1)**

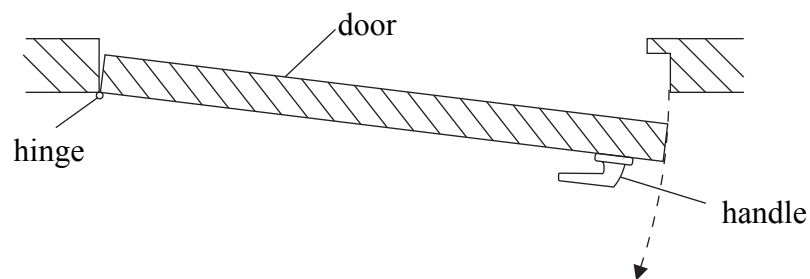
- (b) A teacher uses the newtonmeter to measure a different load.  
Without the load attached the reading is 0.3 N. When the load is attached the reading is 6.8 N.

Calculate the load.

.....  
Load = ..... N  
**(1)**



(c) The teacher asks you to measure the force needed to pull open a door using its handle.



Describe how you would use the newtonmeter to measure the force needed.

.....

.....

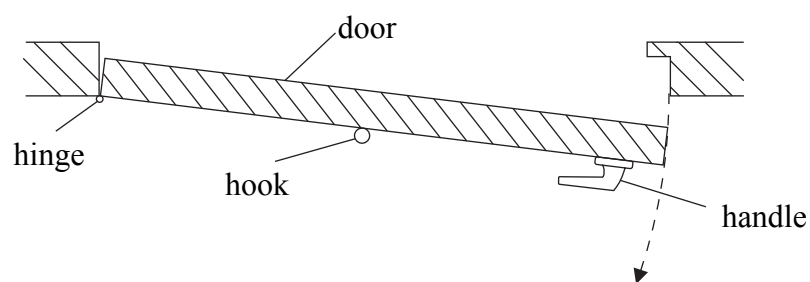
.....

.....

.....

(3)

(d) A hook is attached to the door as shown.



A student pulls the door open using the hook.  
Is the force needed less than, the same as, or more than the force needed using the handle?

.....

(1)

(Total 6 marks)

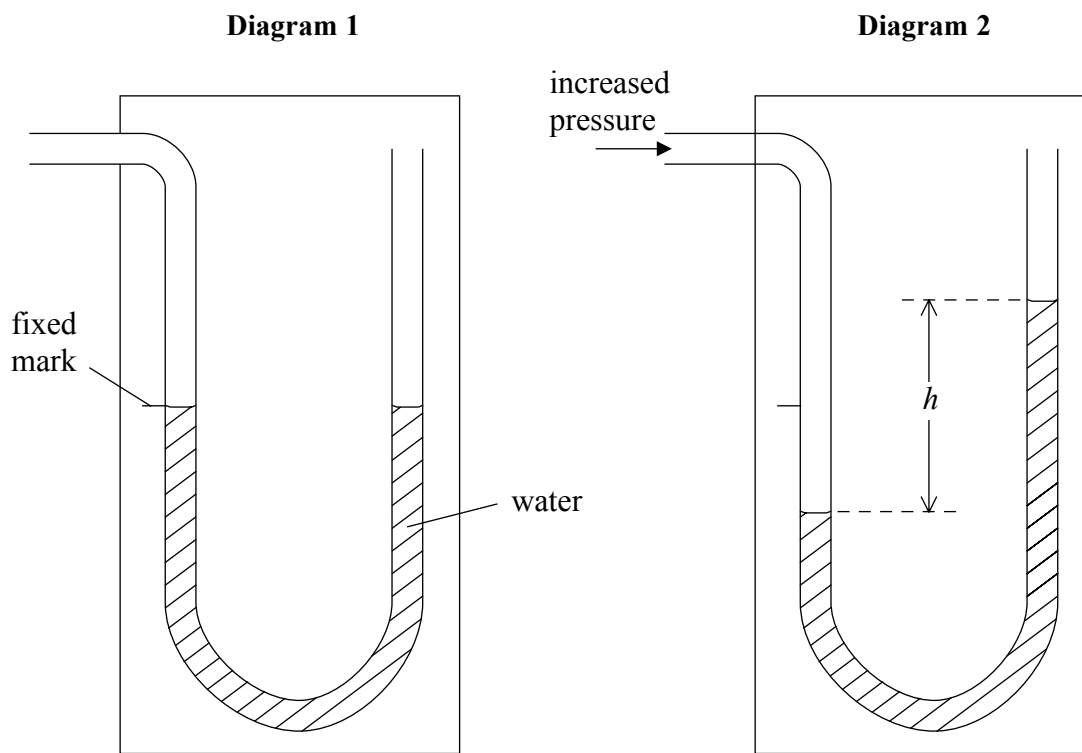
Q1



2. The diagrams show a U-shaped tube containing water. A teacher shows her class how to use it to measure pressure difference.

Diagram 1 shows the tube with the same pressure applied to both sides.

Diagram 2 shows the same tube after the pressure on its left side has been increased.



- (a) Use your ruler to measure the height difference between the liquid levels,  $h$ , in mm.

$h = \dots\dots\dots$  mm  
**(1)**

- (b) pressure difference = height difference  $\times$  density  $\times g$ .

For Diagram 2, use this equation to calculate the pressure difference in Pa.

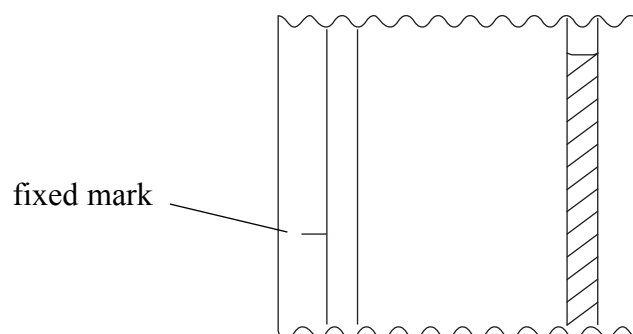
(density of water =  $1000 \text{ kg/m}^3$ :  $g = 10 \text{ N/kg}$ )

Pressure difference =  $\dots\dots\dots$  Pa  
**(3)**



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(c) A student uses the tube to measure pressure difference. He records the position of the level on the right but forgets to measure the position of the level on the left. The diagram shows part of the tube.



(i) Describe how the student can still find the value of  $h$ .

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

(2)

(ii) What is the value of  $h$ ?

$h = \dots\dots\dots$  mm  
(1)

(Total 7 marks)

Q2

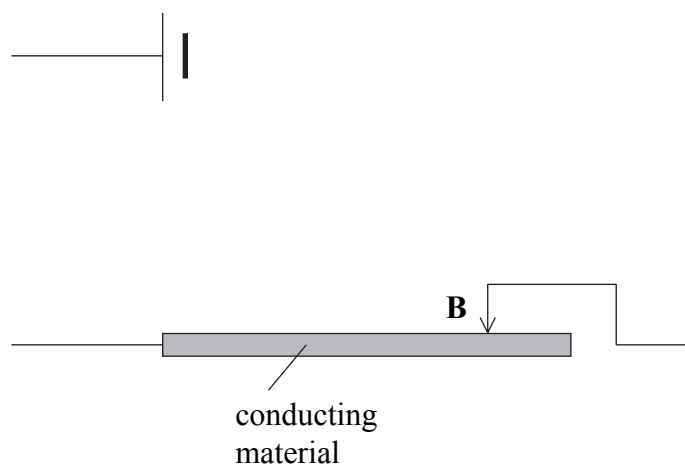


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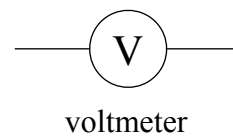
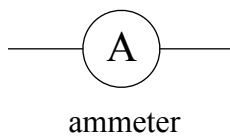
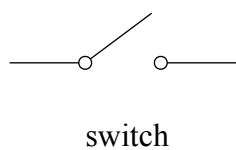


3. A circuit is used to see how the resistance of a conducting material varies with its length. The circuit includes a contact **B** which can be moved along the surface of the conducting material.

(a)

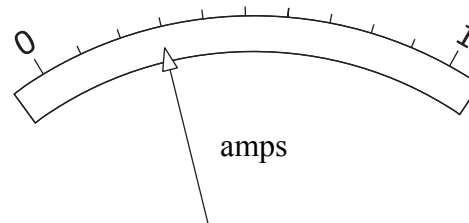
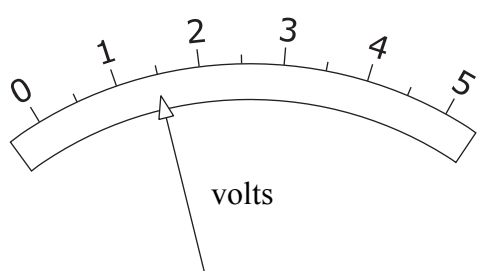


Complete the circuit diagram using the following components.



(3)

(b) During an experiment a student takes readings from the voltmeter and the ammeter. Record these meter readings.



Voltmeter reading = .....V

Ammeter reading = .....A

(2)

**QUESTION 3 CONTINUES ON THE NEXT PAGE**



(c) The student takes a series of readings and calculates resistance using the formula

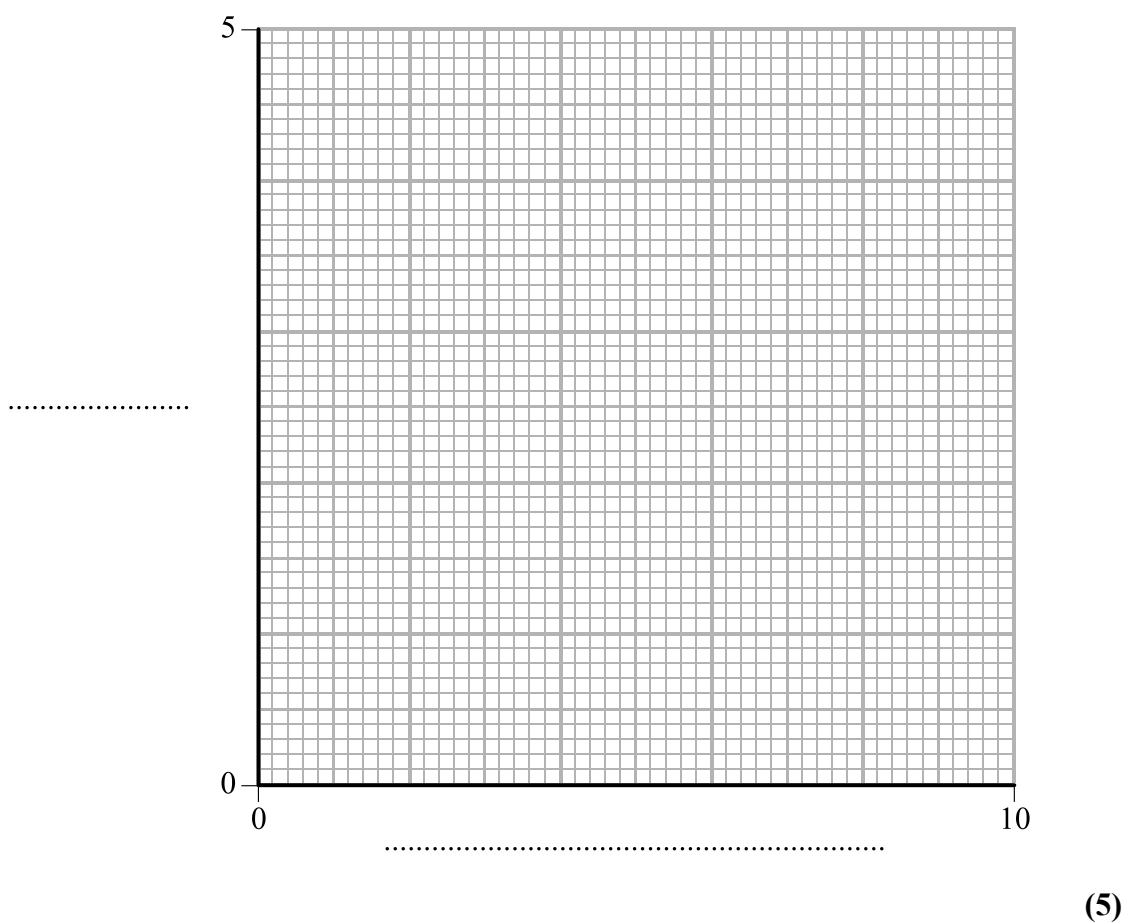
$$\text{voltage} = \text{current} \times \text{resistance}$$

The table shows her results.

Length (cm)	Resistance ( $\Omega$ )
2.0	1.3
4.0	2.1
6.0	2.9
8.0	0.27
10.0	4.5

On the grid, plot a graph of resistance ( $y$ -axis) against length ( $x$ -axis).

- Label the axes.
- Complete the scales on the axes.
- Plot the points.
- Draw the best straight line. (Note that the best straight line does not go through the origin.)





(d) The student retakes readings from the ammeter and voltmeter for a length of 8.0 cm. Her readings are the same as before. She has made a mistake in her calculation of resistance.

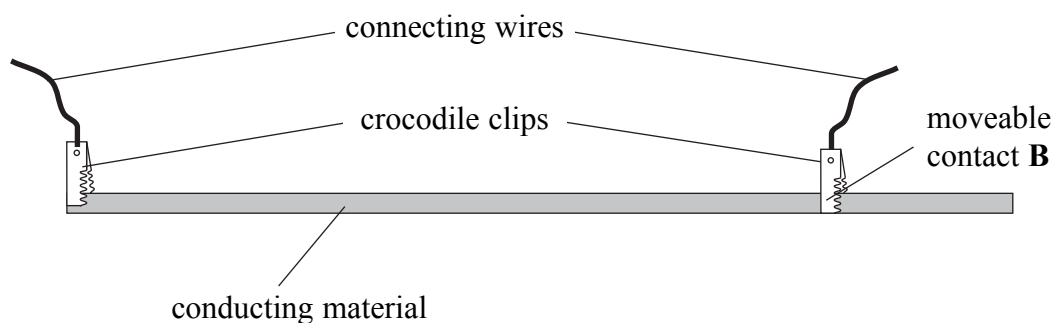
(i) Read from your graph the 'expected' value of resistance for a length of 8.0 cm.

.....  
**(1)**

(ii) Suggest the mistake she made in her calculation.

.....  
.....  
**(1)**

(e) The student used crocodile clips as shown in the diagram.



(i) Use your ruler to measure the length in mm of the conducting material between the crocodile clips.

Length = ..... mm  
**(1)**

(ii) The best straight line on the graph in (c) does not go through the origin. Give a reason for this.

.....  
.....  
.....  
**(2)**

**QUESTION 3 CONTINUES ON PAGE 11**

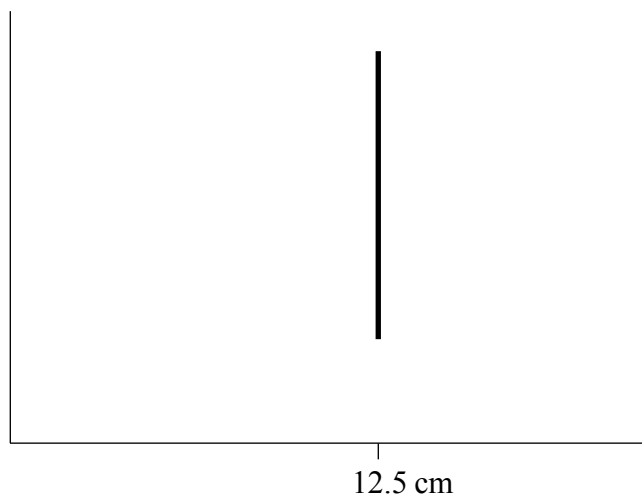


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- (f) Another student does the experiment but is not concentrating. His graph is shown below.



Suggest what he has done wrong to get this shape of graph.

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

(2)

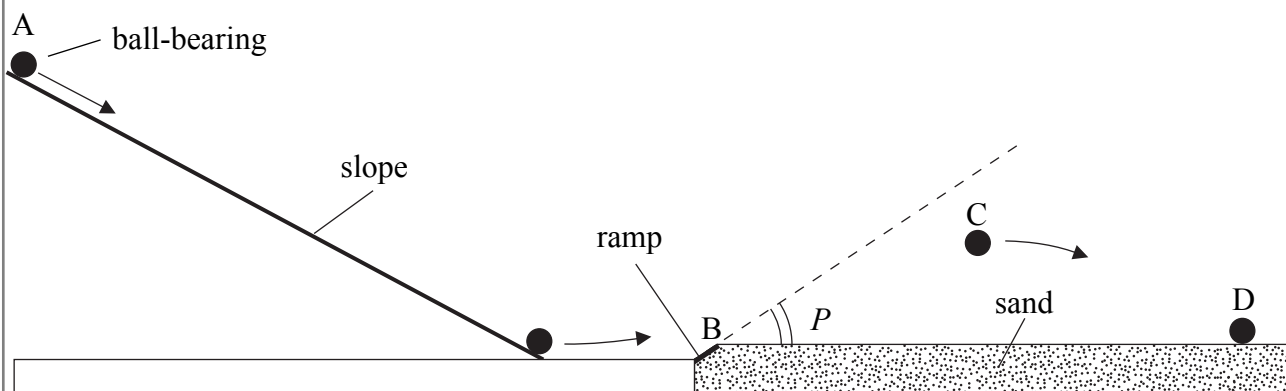
Q3

(Total 17 marks)

**TURN OVER FOR QUESTION 4**



4. Jack and Emily choose an investigation to do in a physics lesson. They build the apparatus shown below. Jack releases a small ball-bearing down a slope. The ball-bearing then runs up a short ramp and falls into some sand.



The ball-bearing is released from A. After leaving B, the ball-bearing is shown at its maximum height at C and where it lands in the sand at D.

(a) Take measurements from the diagram and record

(i) the maximum height, in mm, of the ball-bearing above the surface of the sand at C

Maximum height = ..... mm  
(1)

(ii) the horizontal distance BD in mm

Distance BD = ..... mm  
(1)

(iii) the angle  $P$  in degrees.

Angle  $P$  = .....<sup>o</sup>  
(1)



Leave  
blank

(b) Jack decides to see how the horizontal distance  $BD$  varies with the angle  $P$  for a range of values of  $P$ .

Describe how Jack should go about this investigation. State the instruments that Jack should use to take measurements.

.....

.....

.....

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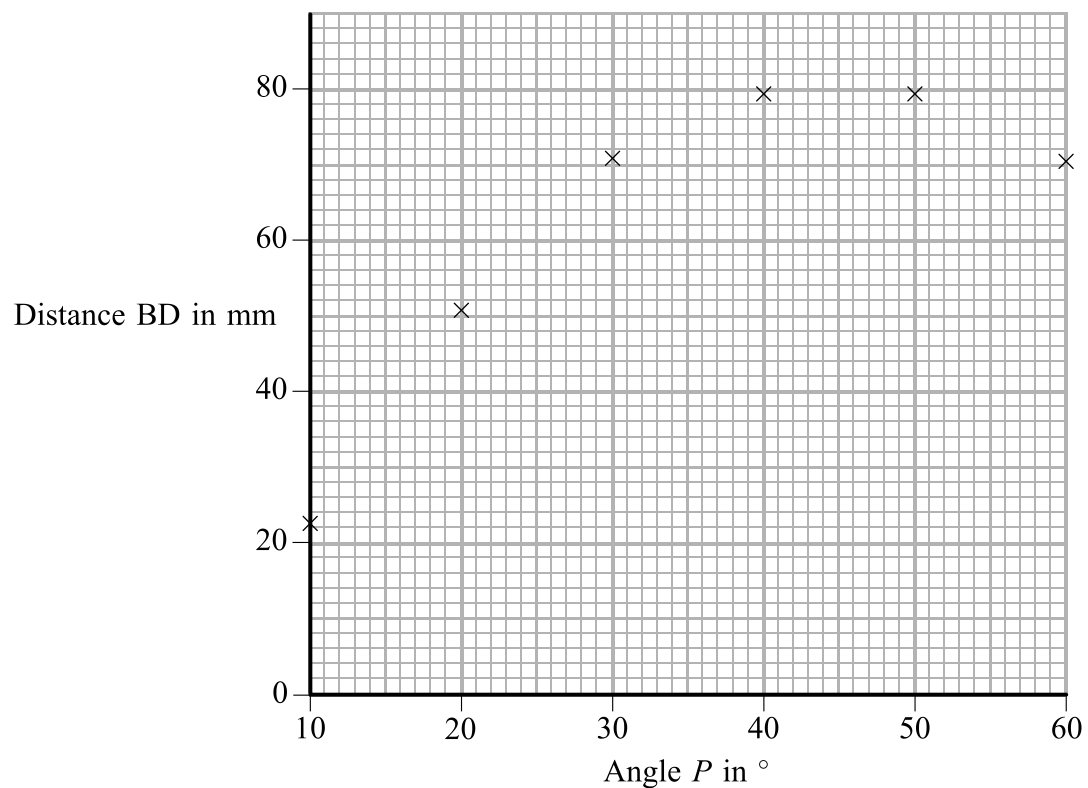
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(7)

**QUESTION 4 CONTINUES ON THE NEXT PAGE**



(c) Jack displays his results as a graph.



(i) What angle, in degrees, gives the greatest distance  $BD$ ?

Angle = .....<sup>o</sup>  
**(2)**

(ii) Suggest a reason why he did not use the following values of  $P$ .

1. Less than  $10^{\circ}$

.....  
 .....  
**(1)**

2.  $90^{\circ}$

.....  
 .....  
**(1)**

(d) What should Jack keep constant throughout his experiment?

.....  
**(1)**



- (e) Emily uses the apparatus. She varies the angle  $P$  and measures the maximum height reached by the ball-bearing above the sand.  
The table shows her results.

Maximum height (mm)	1	5	10	17	23	30
Angle $P$ ( $^\circ$ )	10	20	30	40	50	60

- (i) What simple pattern do these results show?

.....  
(1)

- (ii) How could Emily use a ruler to measure the maximum height of the ball-bearing above the sand?

.....  
.....  
.....  
.....  
(3)

- (iii) Which value in Emily's table was the most difficult to measure?

.....  
(1)

(Total 20 marks)

Q4

**TOTAL FOR PAPER: 50 MARKS**

**END**



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