| Centre No. | | | | | | Paper Reference | | | | | | | Surname | Initial(s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Candidate No. | | | | | | | | | | / | | | Signature | |

Paper Reference(s)

**4420/03 4437/09**

Examiner's use only

| | | |
|---|---|---|

Team Leader's use only

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# London Examinations IGCSE

## Physics – 4420

Paper 3

## Science (Double Award) – 4437

Paper 9

# Foundation and Higher Tiers

Thursday 24 June 2010 – Afternoon

Time: 1 hour 15 minutes

| Materials required for examination | Items included with question papers |
|---|---|
| Ruler, protractor, compasses, pencil and calculator | Nil |

| Question Number | Leave Blank |
|---|---|
| 1 | |
| 2 | |
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**Instructions to Candidates**

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
The paper reference is shown at the top of this page. Write the one for which you have been entered.
Check that you have the correct question paper.
Answer **ALL** the questions. Write your answers in the spaces provided in this question paper.
Show all the steps in any calculations and state the units.
Calculators may be used.

**Information for Candidates**

The total mark for this paper is 50. The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 16 pages in this question paper. Any blank pages are indicated.

**Advice to Candidates**

Write your answers neatly and in good English.



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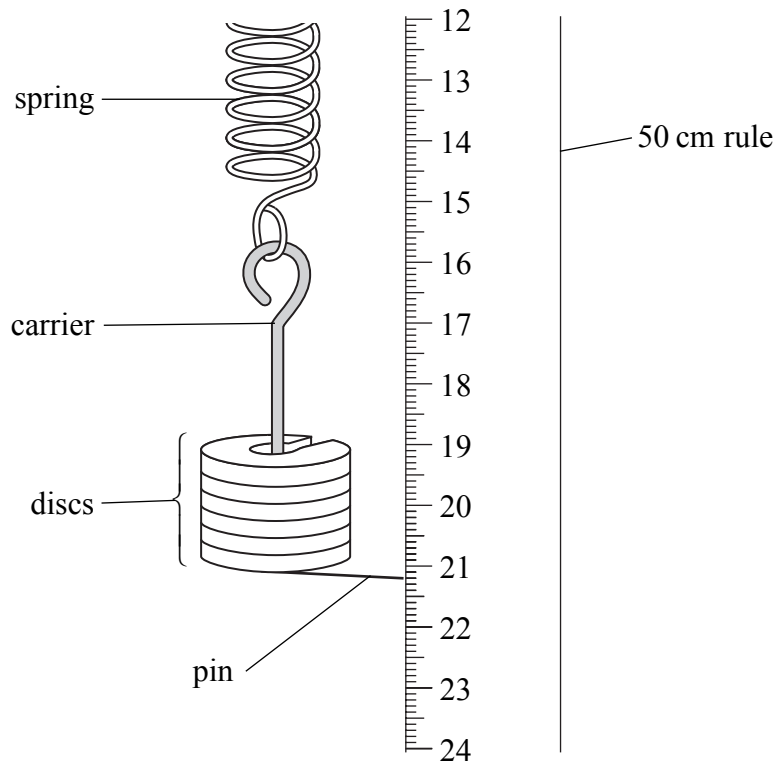
**1.** A student investigates the extension which occurs when a load is added to a plastic spring.
The diagram shows the equipment he uses.
The load is a carrier and discs.
The pin shows the position of the bottom of the load.




(a) (i) How many discs are on the carrier?

.....

**(1)**

(ii) The carrier and pin weigh 0.2 newtons and each disc weighs 0.1 newtons. Calculate the total load, in newtons, acting on the spring shown in the diagram.

.....

.....

.....

Total load = ..... N

**(2)**

(b) (i) What reading, in centimetres, is shown by the pin?

Reading = ..... cm

**(1)**

Leave blank

(ii) When additional discs are added to the carrier, the pin shows a reading of 22.1 cm. Calculate the increase in the extension, in millimetres, produced by this additional load.

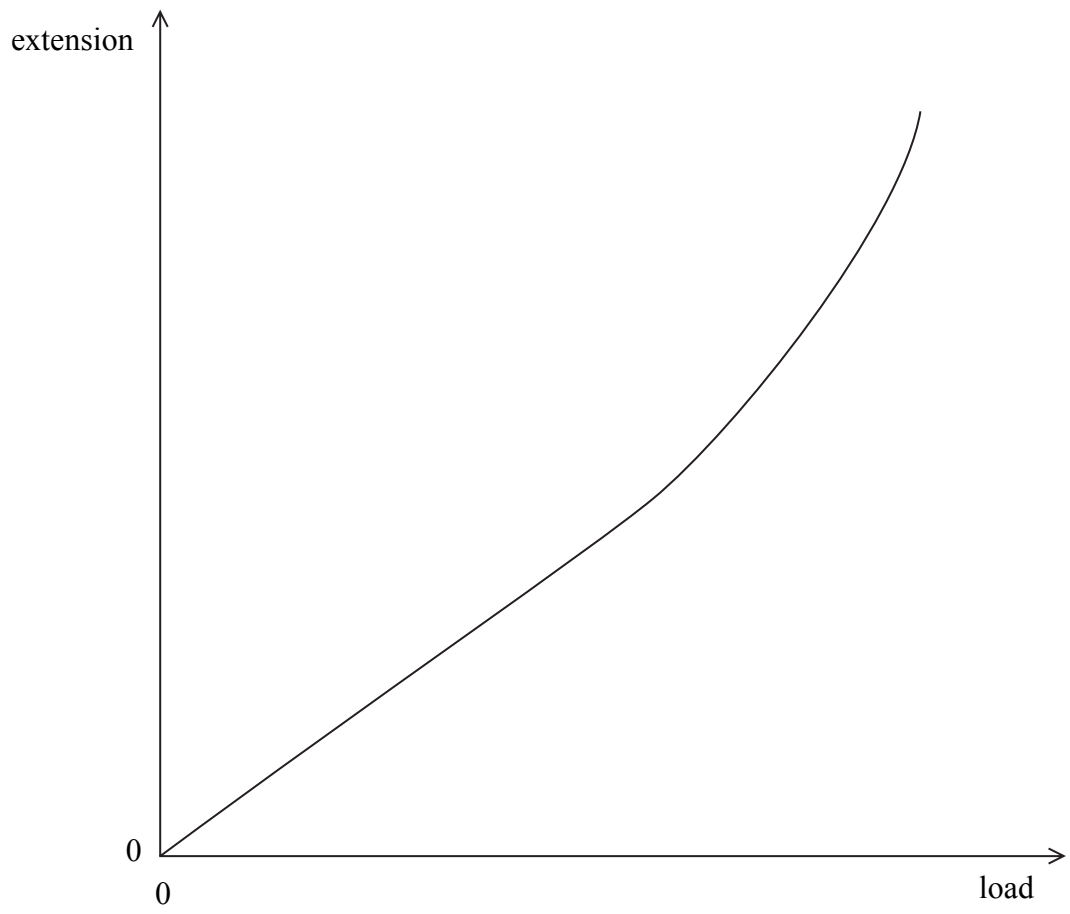
.....

.....

Increase in extension = ..... mm

**(2)**

(c) The student's friend carries out a similar investigation on a different spring. She draws a graph.




(i) Mark clearly on the graph **all** the section where extension is proportional to load.

**(1)**

(ii) A similar investigation is carried out using a spring which is **easier** to extend. Sketch, on the above axes, the graph you would expect.

**(1)**

**Q1**

**(Total 8 marks)**

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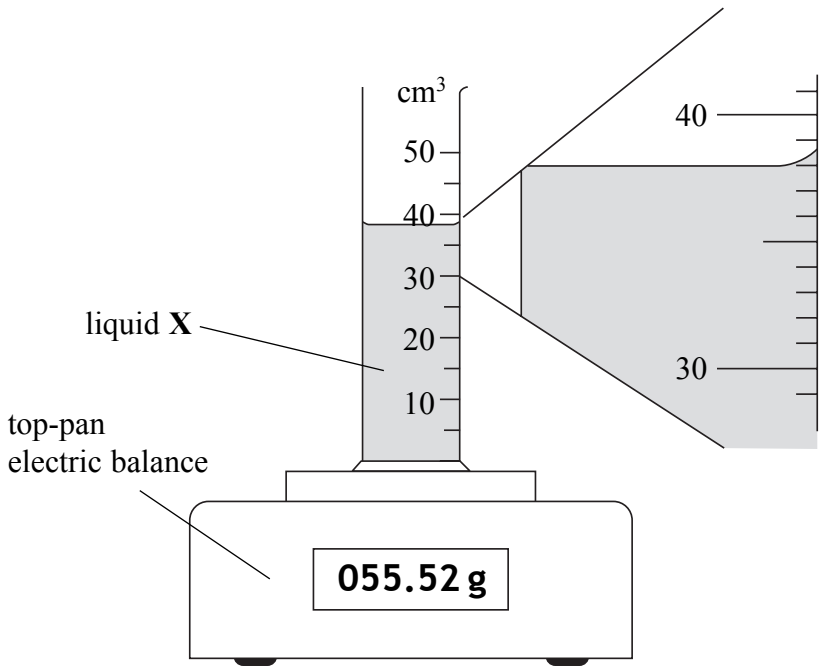
**2.** (a) A student investigates a liquid **X**.
She adds some of the liquid to a container and then puts the container on a top-pan electric balance.




(i) Name the container.

.....

**(1)**

(ii) What is the volume, to the nearest $cm^3$, of liquid **X**?

Volume = ..... $cm^3$

**(1)**

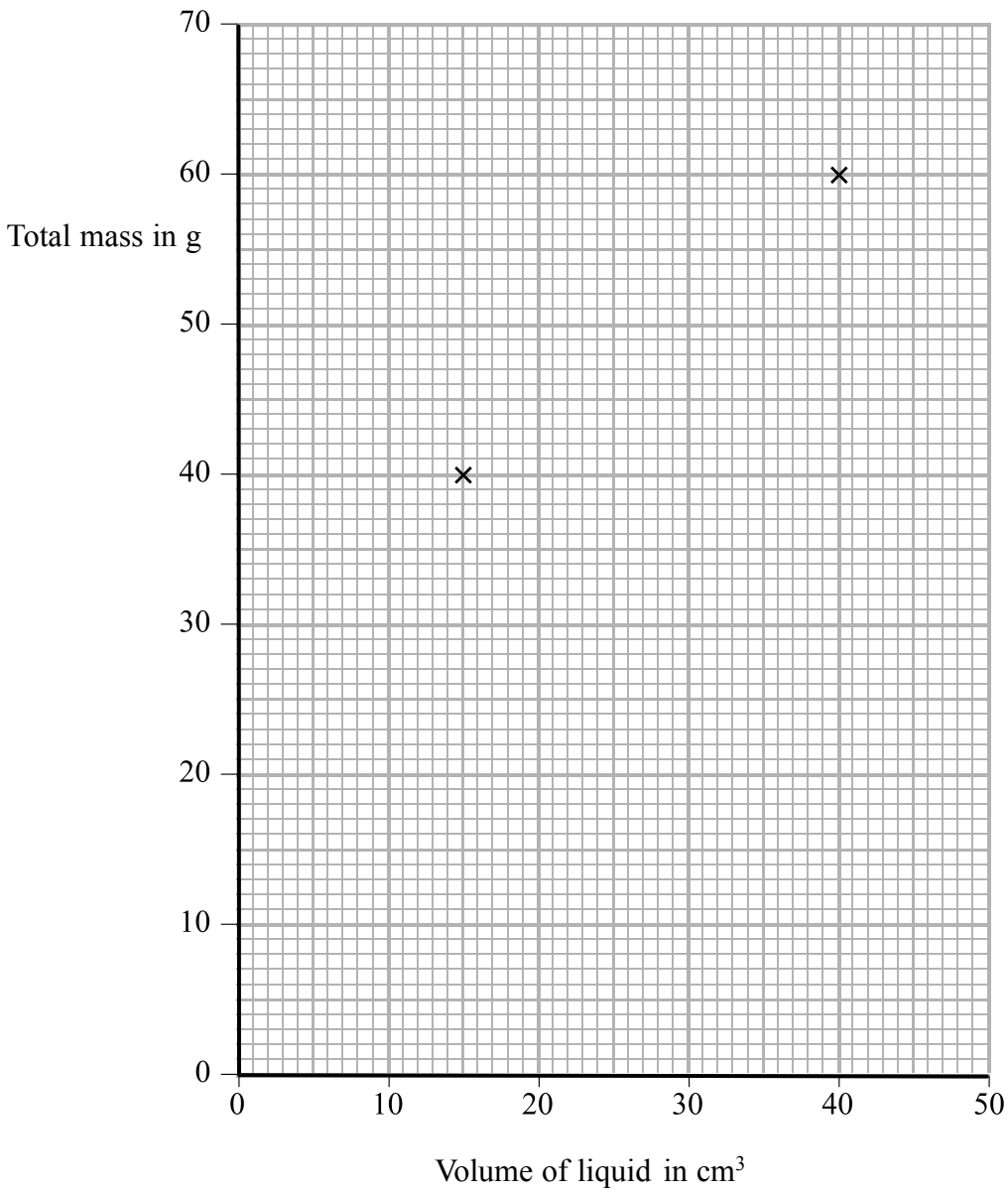
(iii) What is the reading, to the nearest gram, on the top-pan electric balance?

Reading = ..... g

**(1)**

Leave blank

(b) Another student carries out a similar investigation but he uses liquid **Y**.
He records two results for volume and total mass.
He plots these results on a graph.




(i) Draw a straight line through the points.
Use the line to find the mass, in grams, of the empty container.

Mass of container = ..... g
**(2)**

Leave blank

(ii) In this investigation the density of liquid **Y** is given by the equation

density in $g/cm^3$ = slope of the graph

Use the graph to calculate the density of liquid **Y**.

.....

.....

density = ..... $g/cm^3$

**(2)**

(iii) Explain the advantages of taking more than two results.

.....

.....

.....

.....

.....

.....

**(3)**

**Q2**

**(Total 10 marks)**

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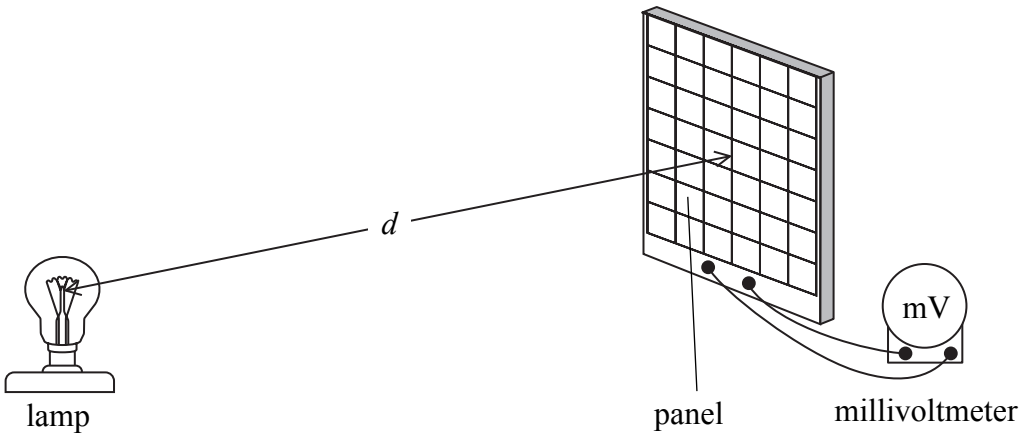
**3.** Photoelectric cells transfer light energy to electrical energy.

A photoelectric cell generates only a small voltage. Therefore a set of photoelectric cells, called a panel, is often used.

A student investigates the relationship between the voltage across a panel and the distance, *d*, between a lamp and the panel. All the student's distances are less than one metre.




(a) (i) What could the student use to measure *d* ?

.....

**(1)**

(ii) Suggest the difficulty the student will have in making an accurate measurement of *d*. Explain how the student could overcome this difficulty.

.....

.....

.....

.....

.....

**(3)**

Leave blank

(b) The student carries out the investigation in a darkened room.

Explain why.

.....

.....

.....

**(2)**

(c) The student makes a note of six pairs of results.

| | | |
|---|---|---|
| 38 cm, 80 mV | 70 cm, 34 mV | 50 cm, 56 mV |
| 90 cm, 26 mV | 14 cm, 190 mV | 30 cm, 104 mV |

(i) Put these results into a suitable table with column headings and units.

| | |
|---|---|
| | |
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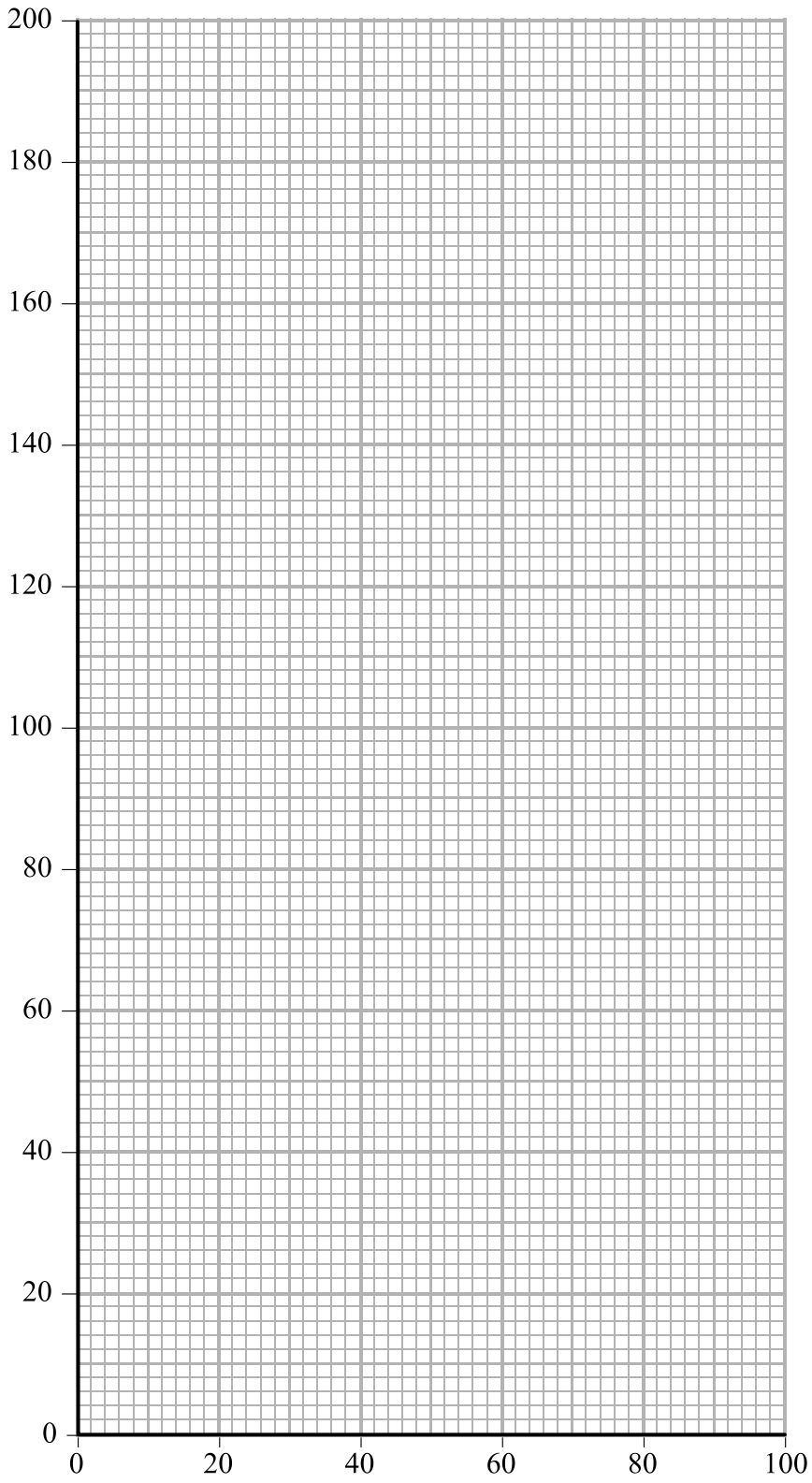
**(3)**

(ii) Plot these points on the grid on the opposite page.
Label the axes.
Decide whether a straight line of best fit or a curved line of best fit is appropriate and draw it on your graph.

**(4)**

Leave blank

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.....

(iii) Use your graph to find the value of the voltage, in millivolts, across the panel when $d$ is 25 cm.

voltage = ..... mV

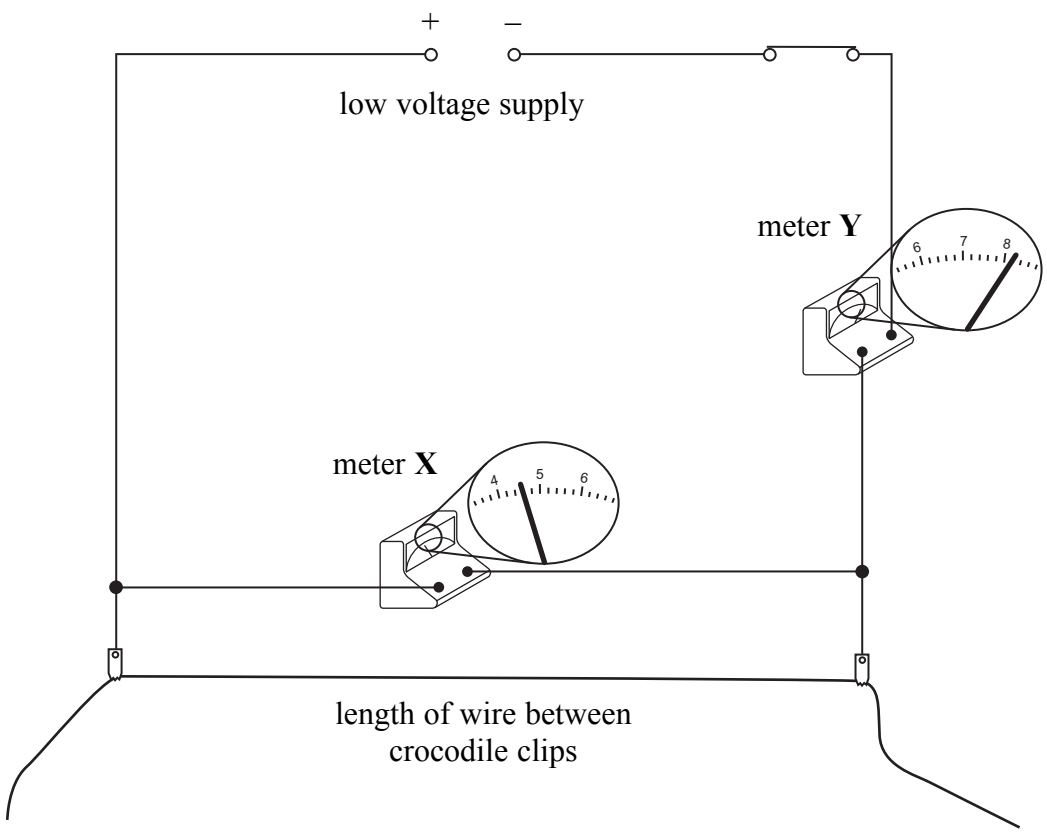
**(1)**

**Q3**

**(Total 14 marks)**

Leave blank

**4.** A student investigates the resistance of uniform wires.
The diagram shows the circuit which he uses.




(a) Explain the meaning of the word **uniform** by completing the sentence.

The thickness of a uniform wire .....

.....

**(1)**

(b) The circuit symbol ⟜ is shown in the diagram. Complete the sentence.

This is the circuit symbol for .....

**(2)**

Leave blank

(c) The diagram shows two meters, **X** and **Y**.

(i) What is the numerical reading on each meter?

reading on meter **X** = …… reading on meter **Y** = ……

**(2)**

(ii) Which of the two meters, **X** or **Y**, is an ammeter?
How can you tell?

Meter ..... is an ammeter because .....

.....

.....

**(1)**

(d) In a similar experiment, the student uses a very thin copper wire.
He records the following data.

| Voltage (V) | Current (A) | Length of wire (cm) |
|---|---|---|
| 0.32 | 2.7 | 26 |

(i) Use the equation

$$\text{resistance (ohms)} = \frac{\text{voltage (volts)}}{\text{current (amps)}}$$

to calculate the value of the resistance, in ohms, of this wire.
Give your answer to 2 significant figures.

.....

.....

Resistance = ..... Ω

**(2)**

(ii) Explain why it is **not** justified to give the answer to more than 2 significant figures.

.....

.....

.....

**(2)**

Leave blank

(iii) Calculate the value of the resistance per unit length, in ohms per metre, of this wire.

.....

.....

Resistance per unit length = ..... Ω/m
**(2)**

(iv) Explain why the student should **not** describe the value in part (iii) as a reliable value.

.....

.....

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

(e) His teacher tells the student that the equation in part (d)(i) will only give a constant value if the temperature remains constant.
He tells the student to switch on, and then read the meters quickly before the wire has a chance to warm up.

(i) Suggest a **disadvantage** of reading the meters quickly.

.....

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

(ii) Suggest and explain **one** practical method of keeping the length of wire at a constant temperature.

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.....
**(3)** **Q4**

**(Total 18 marks)**

**TOTAL FOR PAPER: 50 MARKS**

**END**

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