Surname

Other Names

Candidate Signature

AQA

General Certificate of Education
Advanced Level Examination
June 2010

Physics   PHA6/B6/X
(Specifications A and B)

Unit 6   **Investigative and Practical Skills in A2 Physics**
              Route X Externally Marked Practical Assignment (EMPA)

Section A   Task 2

For this paper you must have:
- a calculator
- a pencil
- a ruler.

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Show all your working.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for Section A Task 2 is 16.

PHA6/B6/X

Section A   Task 2

Follow the instructions given below.

Answer **all** the questions in the spaces provided.

No description of the experiment is required.

In this experiment you are to make measurements on a chain of paper clips, supported at each end, which hangs in equilibrium in a vertical plane above the bench.

1 (a)   You are provided with a number of **unconnected** paper clips.
Place a metre ruler on the bench with the graduations uppermost and lay some paper clips against the edge of the ruler so they are aligned in a single row, each paper clip touching the next without overlapping, as shown in **Figure 2.**

Figure 2
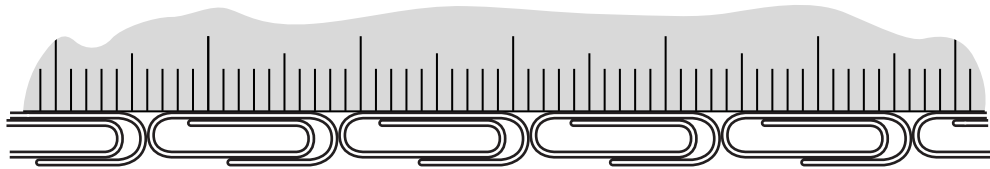
Make suitable measurements to determine the mean length, c, of one paper clip.

....

....

c = ...

(1 mark)

1 (b)   Using the micrometer screw gauge, make suitable measurements to determine the diameter, d, of the wire from which the paper clips have been formed.

....

....

d = ...

(1 mark)

1 **(c)** Adjust the height of the horizontally clamped supports until these are **close to the top** of the stands and the top surface of each is the **same vertical distance** above the bench. Position one metre of paper tape parallel to the edge of the bench, about 20 cm from the edge. Fix this down to the bench with Sellotape.

You are also provided with a chain of 24 paper clips.
Suspend one end of the chain from one horizontally-clamped support and the other end from the second horizontally-clamped support, so that the full length of the chain hangs in equilibrium in a vertical plane above the bench.
Adjust the positions of the stands to which the horizontal supports are clamped until the chain lies directly above the length of paper tape and the **horizontal distance**, s, between the ends of the paper clip chain is 750 mm.
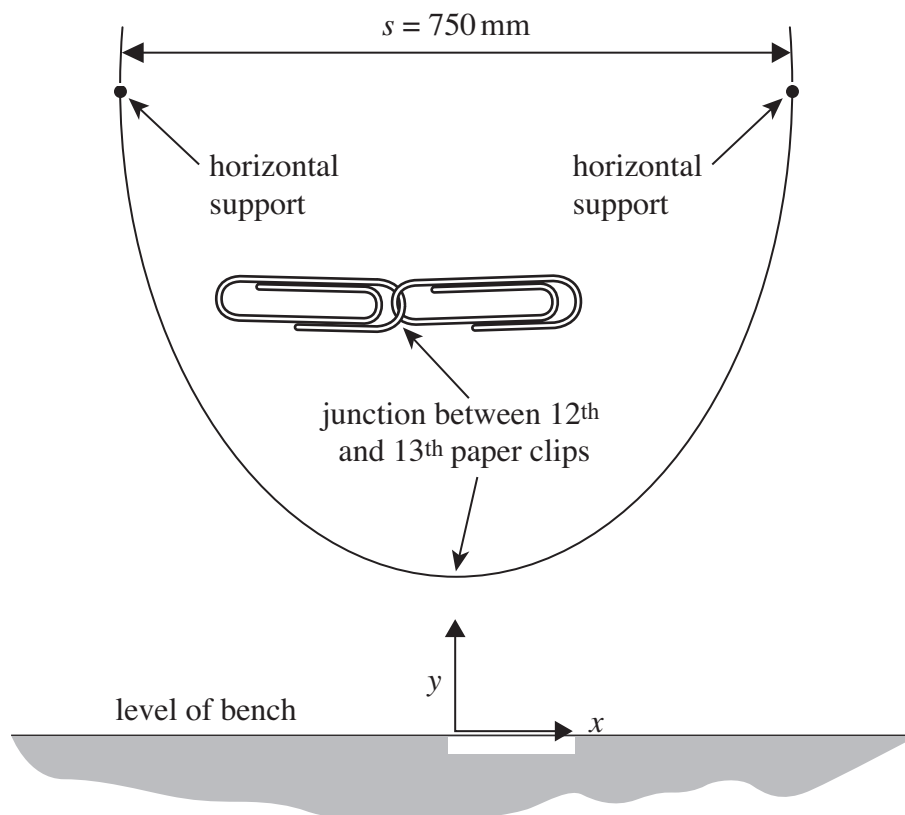
Mark on the tape the point **directly below** the centre of the chain.

Using the additional apparatus provided, measure and record values of x and y, which are the horizontal and vertical distances respectively, from the point marked on the paper tape to junctions between paper clips in the chain, as shown in **Figure 3**.
Take sufficient readings of x and y to define the shape of the chain from the **centre to the right-hand end** of the chain.

Record all your measurements and observations on **page 4**.

Figure 3

$s = 750$ mm

horizontal support   horizontal support

junction between 12th and 13th paper clips

y

level of bench x

Question 1 continues on the next page
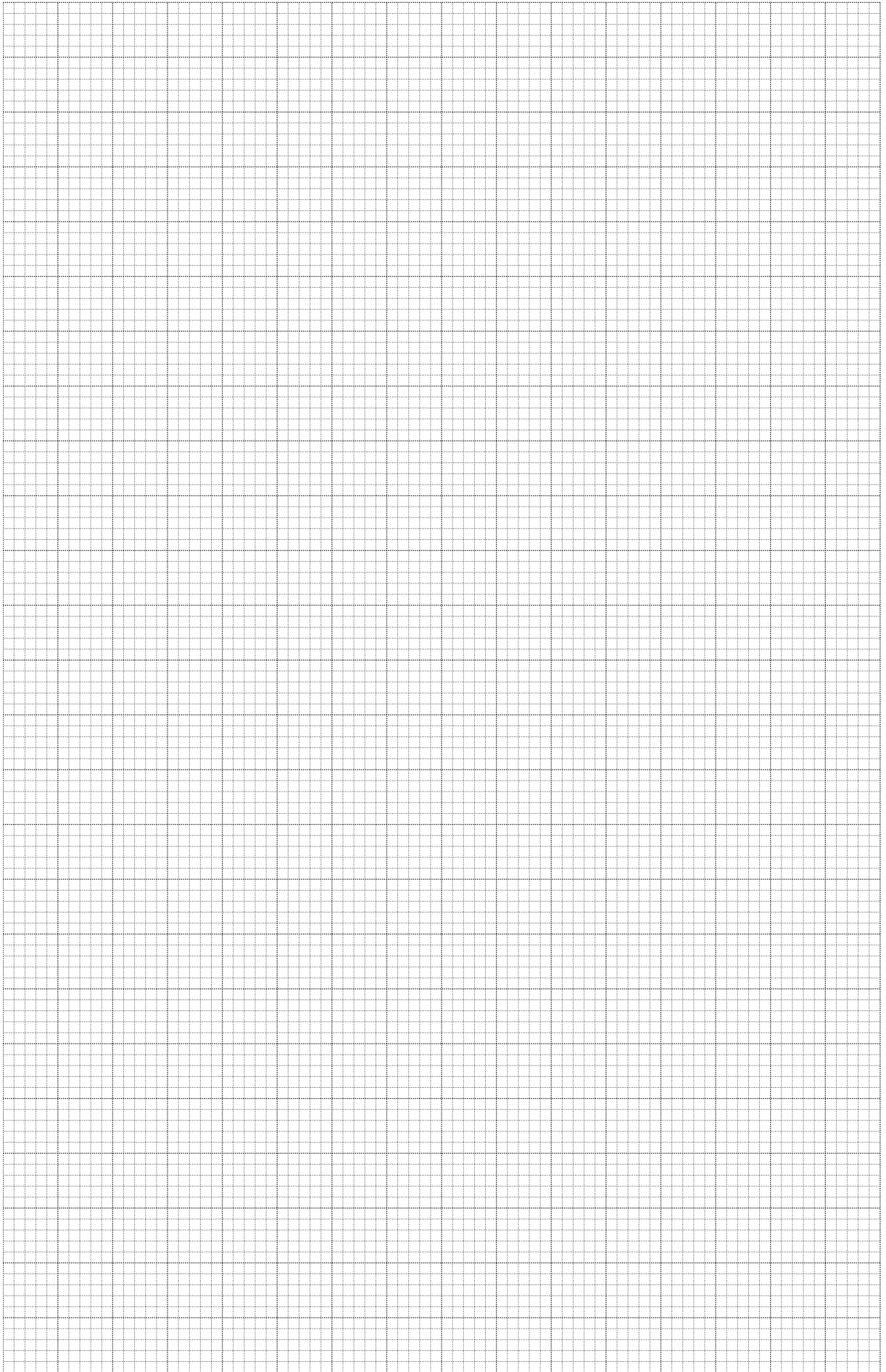
Measurements and observations.

(6 marks)

1 **(d)** Plot, on the grid opposite, a graph of *y* on the vertical axis and *x* on the horizontal axis.

(8 marks)

16

END OF QUESTIONS

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