Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2311490546

PHYSICS **9702/34**

Paper 3 Advanced Practical Skills 2 **October/November 2016**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **both** questions.
You will be allowed to work with the apparatus for a maximum of one hour for each question.
You are expected to record all your observations as soon as these observations are made, and to plan the presentation of the records so that it is not necessary to make a fair copy of them.
You are reminded of the need for good English and clear presentation in your answers.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

Additional answer paper and graph paper should be used only if it becomes necessary to do so.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
Total	

This document consists of **11** printed pages and **1** blank page.

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You may not need to use all of the materials provided.

1 In this experiment, you will investigate the oscillations of a wooden strip.

(a) Set up the apparatus as shown in Fig. 1.1, with the distance *x* approximately equal to 25 cm.

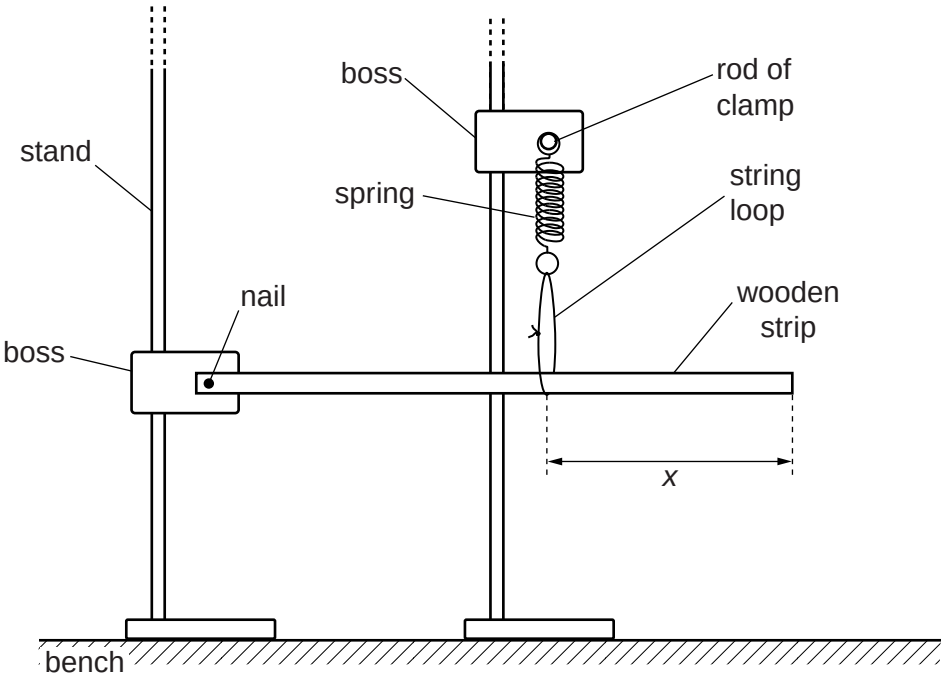


Fig. 1.1

(b) (i) Ensure that the spring is vertical and the wooden strip is parallel to the bench.

(ii) Measure and record the distance *x* between the string loop and the end of the wooden strip, as shown in Fig. 1.1.

x = ... [1]

(iii) Push down the free end of the wooden strip by approximately 2 cm. Release it so that it oscillates.

(iv) Take measurements to find the period *T* of the oscillations.
Record *T*.

T = ... s [2]

(c) Vary x by moving the string loop along the wooden strip and repeat **(b)** until you have six sets of values for x and T.
Do **not** use values of x less than 15 cm.

Include values for $\frac{1}{T^2}$ in your table.

[9]

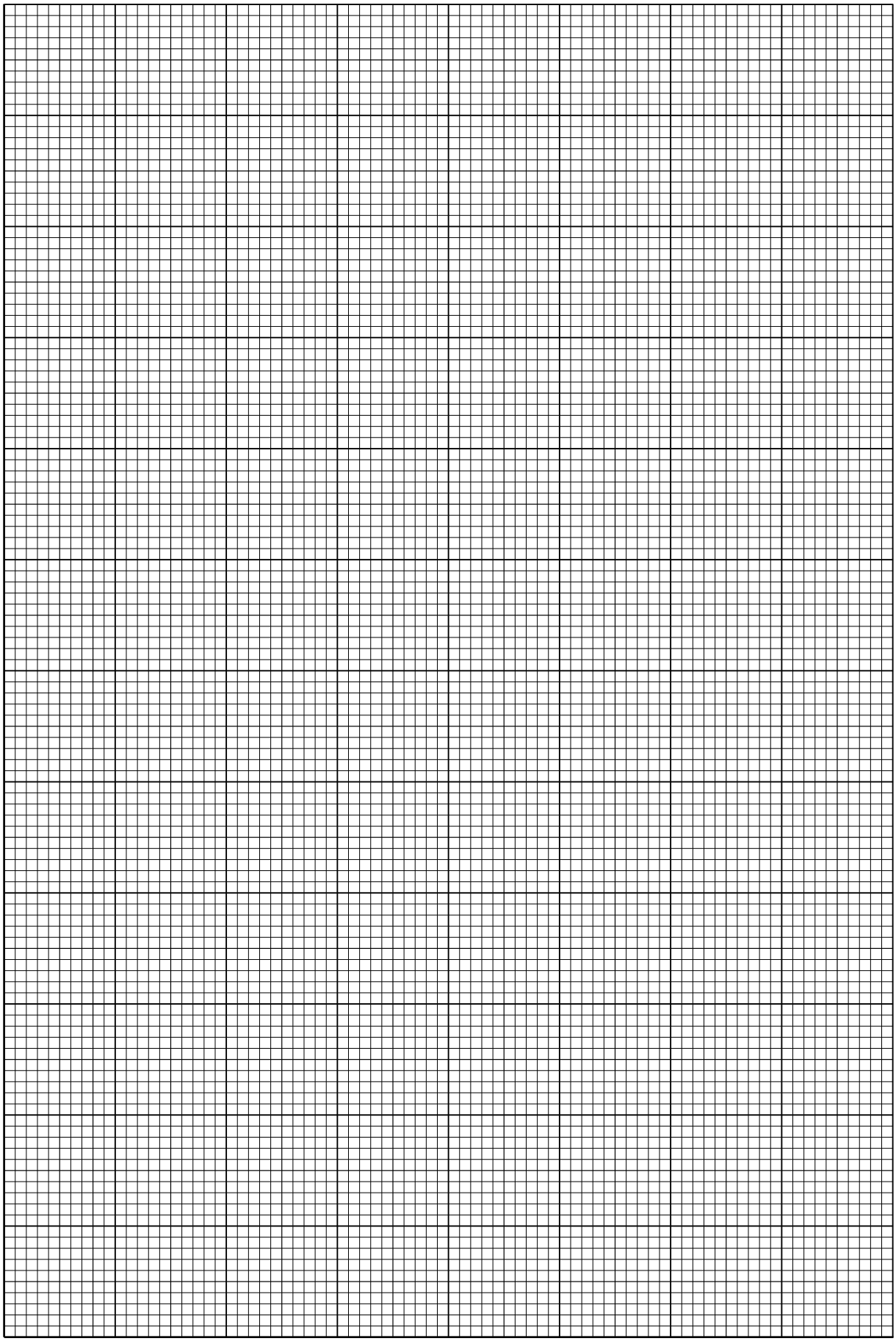
(d) **(i)** Plot a graph of $\frac{1}{T^2}$ on the y-axis against x on the x-axis. [3]

(ii) Draw the straight line of best fit. [1]

(iii) Determine the gradient and y-intercept of this line.

gradient = ...

y-intercept = ...
[2]



(e) The quantities x and T are related by the equation

$$\frac{1}{T^2} = px + q$$

where p and q are constants.

Use your answers from **(d)(iii)** to determine the values of p and q.
Give appropriate units.

p = ...

q = ...
[2]

[Total: 20]

You may not need to use all of the materials provided.

2 In this experiment, you will investigate the movement of a metre rule on two sliding supports.

(a) Set up the apparatus with the metre rule resting on the rods of the clamps, as shown in Fig. 2.1. The metre rule should be parallel to the bench.

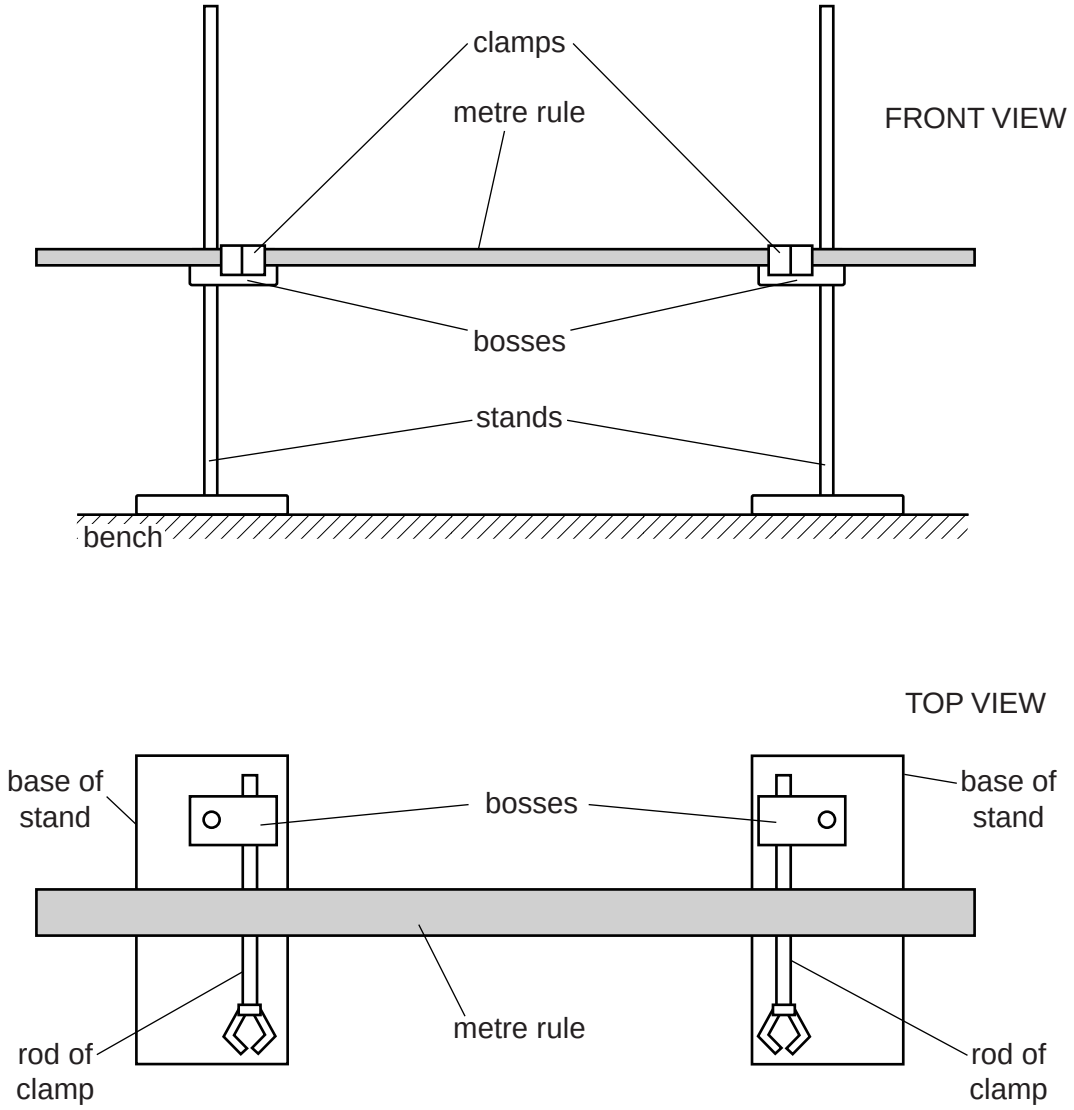


Fig. 2.1 (not to scale)

(b) Measure and record the length *L* of the wooden strip labelled A.

L = ... [1]

(c) (i) Position the stands so that the rod of one of the clamps is supporting the metre rule at the 10 cm mark, and the rod of the other clamp is supporting the metre rule at the 90 cm mark.

(ii) Using Blu-Tack, fix the wooden strip labelled A to the metre rule at the 0 cm end, as shown in Fig. 2.2.

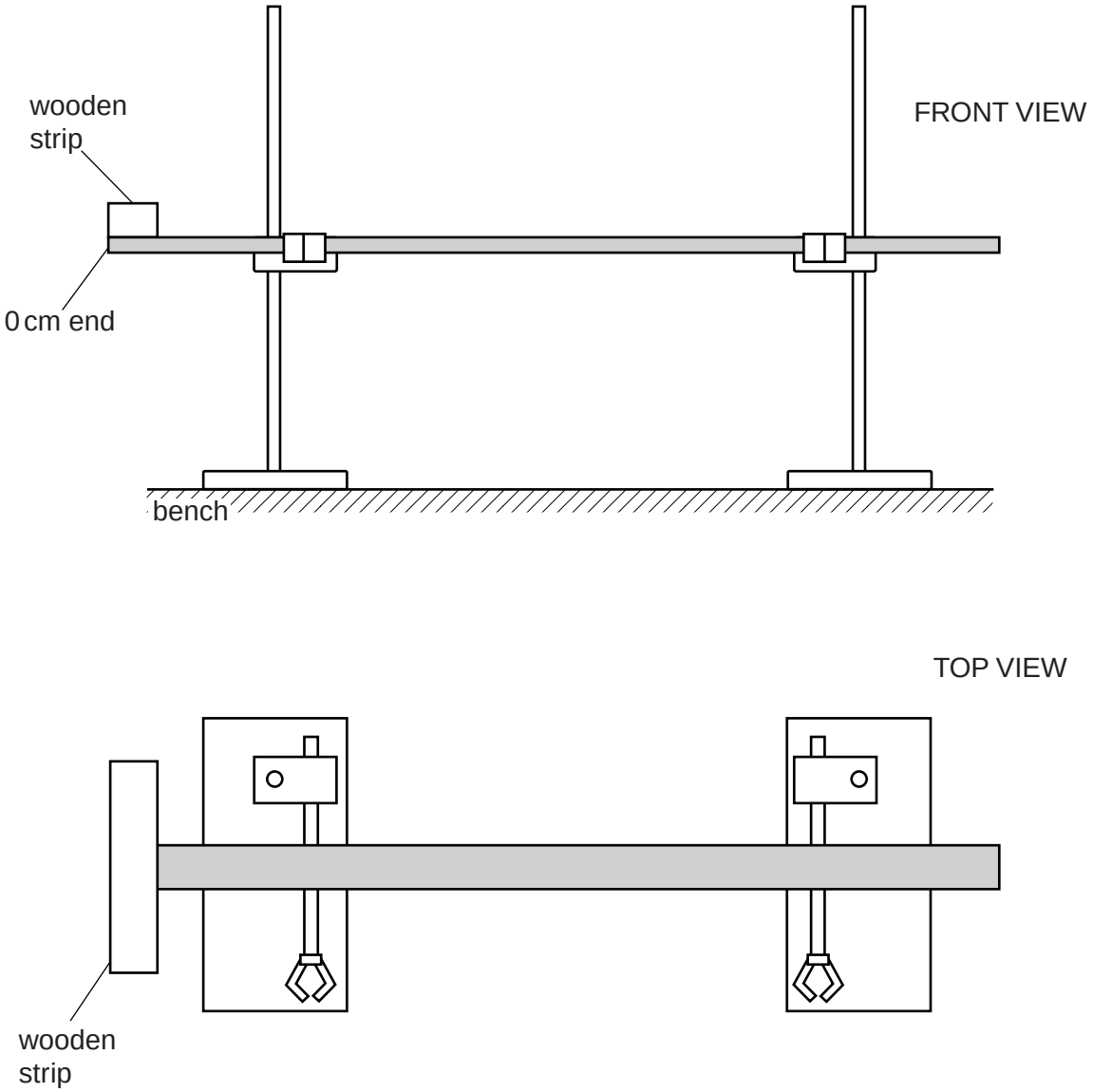


Fig. 2.2 (not to scale)

(iii) Without touching the metre rule, slowly slide the stands towards each other until their bases touch each other, as shown in Fig. 2.3.

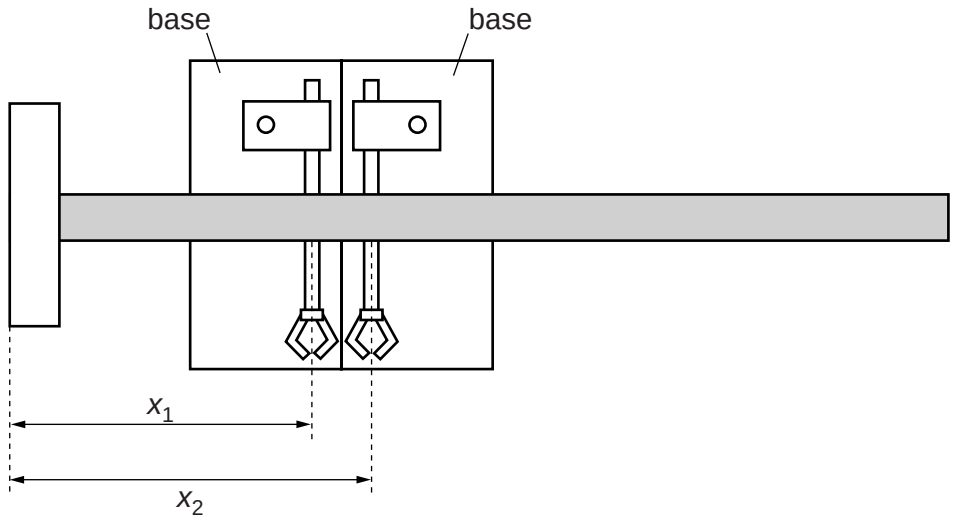


Fig. 2.3 (not to scale)

(iv) Measure and record the distances x_1 and x_2 of the points of contact from the end of the rule, as shown in Fig. 2.3.

x_1 = ... cm

x_2 = ... cm
[2]

(v) Calculate the value of X, where $X = \frac{(x_1 + x_2)}{2}$.

X = ... cm [1]

(d) Estimate the percentage uncertainty in your value of X.

percentage uncertainty = ... [1]

(e) Repeat **(b)** and **(c)** using the wooden strip labelled B.

L = ...

x_1 = ... cm

x_2 = ... cm

X = ... cm

[3]

(f) It is suggested that the relationship between L and X is

$$LX = k(d - X)$$

where d = 50.0 cm and k is a constant.

(i) Using your data, calculate two values of k.

first value of k = ...

second value of k = ...

[1]

(ii) Justify the number of significant figures you have given for your values of k.

.....

.....

..... [1]

(iii) Explain whether your results in **(f)(i)** support the suggested relationship.

.....

.....

.....

..... [1]

(g) Suggest the value of X you would expect to obtain if the experiment was repeated with an identical wooden strip fixed at each end of the metre rule.

X = ... cm [1]

Question 2 continues on the next page.

(h) (i) Describe four sources of uncertainty or limitations of the procedure for this experiment.

1. .....

.....

2. .....

.....

3. .....

.....

4. .....

.....

[4]

(ii) Describe four improvements that could be made to this experiment. You may suggest the use of other apparatus or different procedures.

1. .....

.....

2. .....

.....

3. .....

.....

4. .....

.....

[4]

[Total: 20]

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