Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2838980519

PHYSICS **9702/35**

Paper 3 Advanced Practical Skills 1 **October/November 2014**

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	

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

1 In this experiment, you will investigate the motion of masses suspended from springs.

(a) (i) Set up the apparatus as shown in Fig. 1.1.

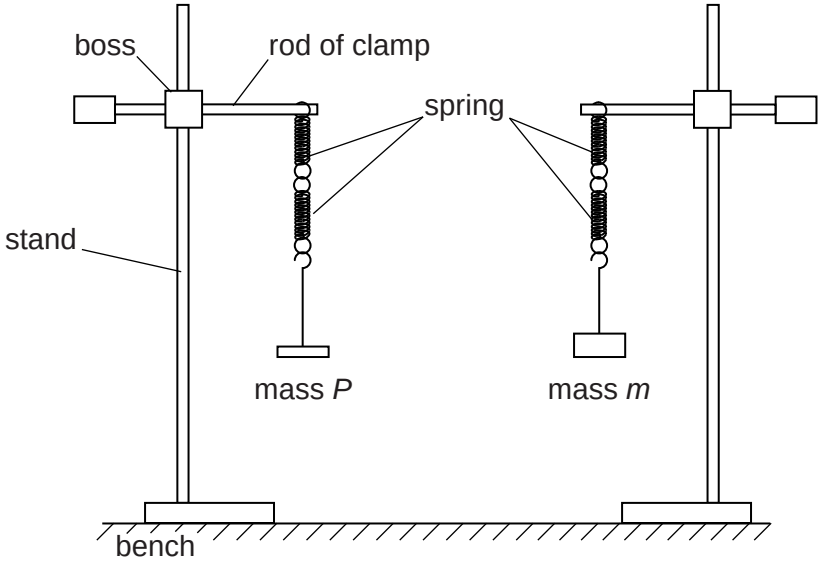


Fig. 1.1

The mass P must be 200 g and **must remain constant throughout the experiment**.
The mass m should be 250 g.

(ii) Calculate and record $(m - P)$.

$(m - P) =$ .....[1]

(b) (i) Pull both masses down through a short distance.
Release both masses at the same time and watch the movement.
The two masses will move up and down becoming out of step.
After a time the masses will be back in step so that they reach the lowest point together.

(ii) Pull both masses down through a short distance. Release both masses at the same time.
Start the stopwatch when the masses are back in step and reach the lowest point together for the **first** time.

Measure and record the time t taken for the masses to reach their lowest point together for the **sixth** time.

t = ...[1]

(c) Increase m and repeat **(a)(ii)** and **(b)(ii)** until you have six sets of readings of m and t.

Include values of $\frac{1}{t^2}$ and $(m - P)$ in your table.

[10]

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

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

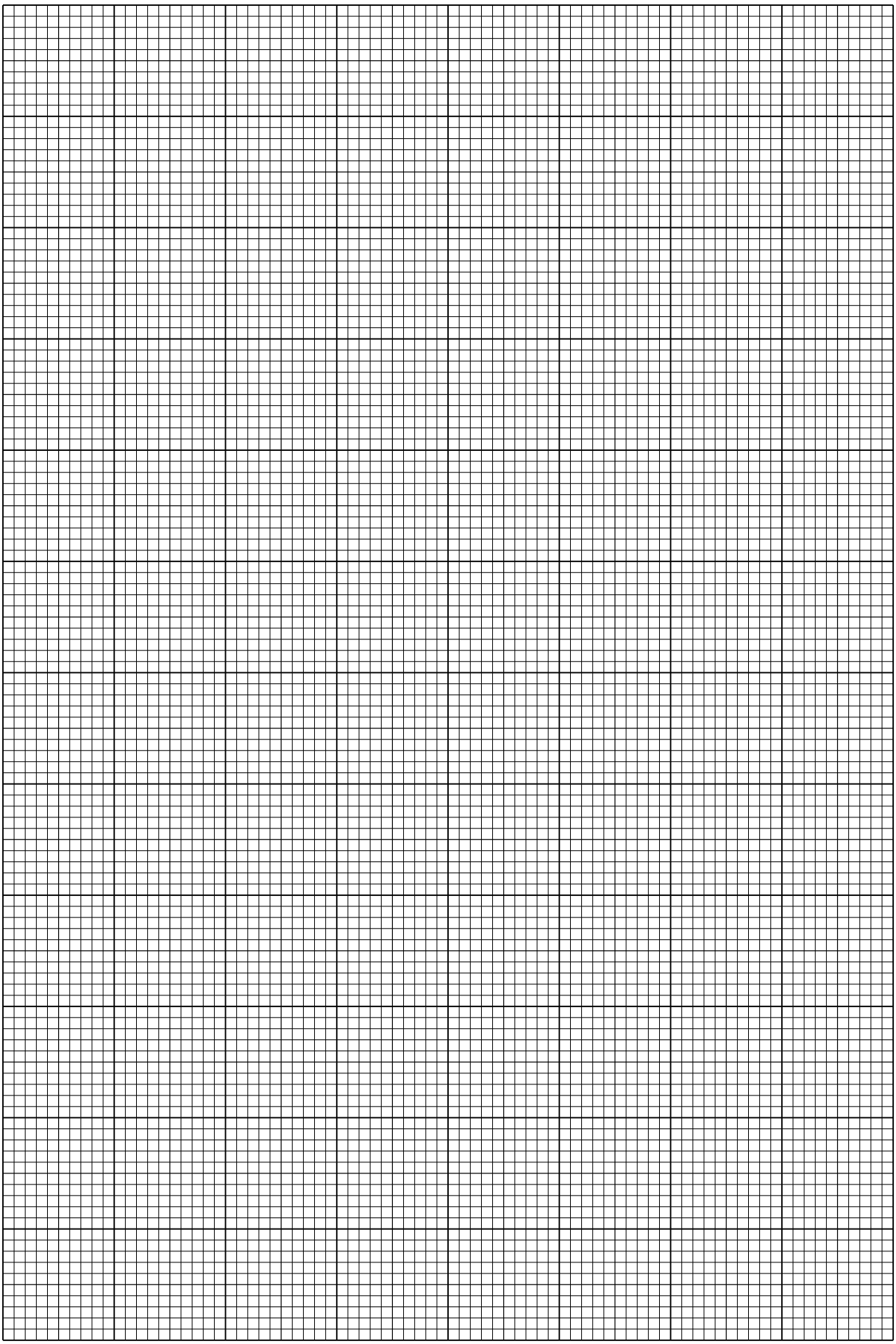
(iii) Determine the gradient and y-intercept of this line.

gradient = ...

y-intercept = ...

[2]

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(e) It is suggested that the quantities t, m and P are related by the equation

$$\frac{1}{t^2} = U\,(m - P) + V$$

where U and V are constants.

Use your answers in **(d)(iii)** to determine the values of U and V.
Give appropriate units.

$U =$ .....

$V =$ .....

[2]

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

2 In this experiment, you will investigate the motion of a plastic cup in water.

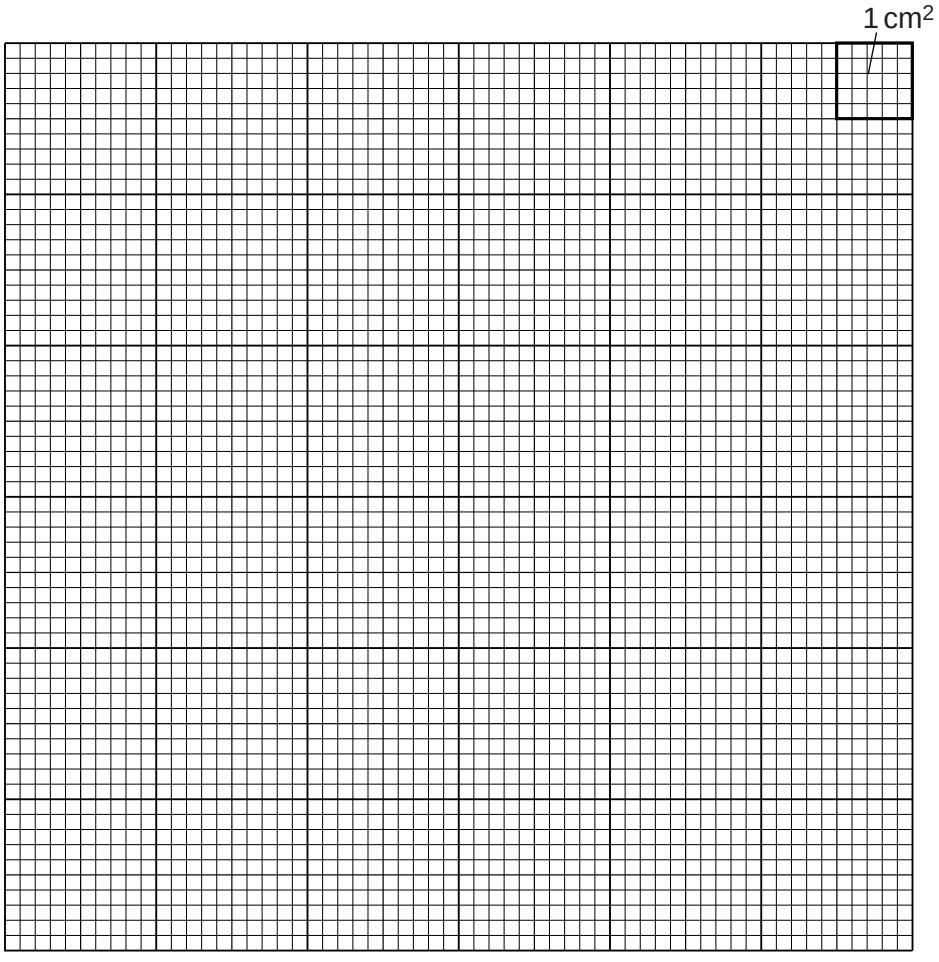
(a) You have been provided with two plastic cups labelled C and D.
Cup C has had part of the base removed. Cup D has had all of the base removed.

Measure and record the thickness x of the plastic of the two cups.

x = ...[1]

(b) **(i)** Place cup C on the grid below and draw around the hole with the pencil.

Use the grid to determine the area A of the hole in cup C.



A = ...cm^2 [1]

(ii) Estimate the percentage uncertainty in your value of A.

percentage uncertainty = ...[1]

(iii) Calculate the volume V of the plastic removed to make the hole, where

$$V = Ax.$$

V = ...[2]

(iv) Justify the number of significant figures that you have given for your value of V.

.....

.....

.....[1]

(c) (i) Using tape, attach the mass to cup C, as shown in Fig. 2.1.

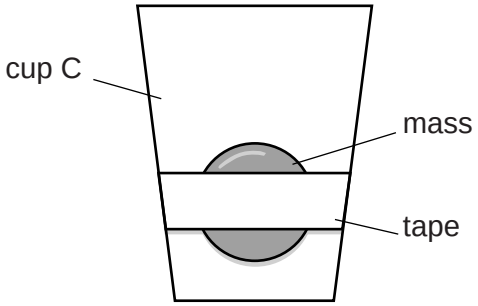


Fig. 2.1

(ii) Hold the cup so that it rests on the surface of the water in the bucket as shown in Fig. 2.2.

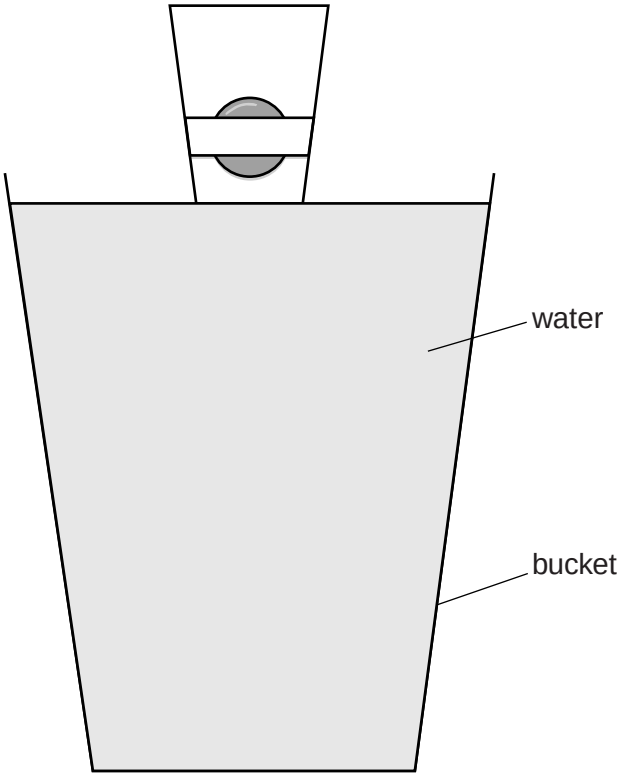


Fig. 2.2

(iii) Release the cup and measure the time T for the cup to reach the bottom of the bucket.

T = ...[1]

(d) Repeat **(b)(i)**, **(b)(iii)** and **(c)** for cup D.

A = ... cm^2

V = ...

T = ...
[3]

(e) It is suggested that the relationship between T and V is

$$T^2 = \frac{k}{V}$$

where k is a constant.

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

first value of k = ...

second value of k = ...

[1]

(ii) Explain whether your results support the suggested relationship.

.....

.....

.....

.....[1]

(f) **(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]

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