UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2285780019

PHYSICS **9702/34**

Advanced Practical Skills 2 **May/June 2011**

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 a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, 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 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 submitted only if it becomes necessary to do so.
You are reminded of the need for good English and clear presentation in your answers.

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.

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1	
2	
Total	

This document consists of **10** printed pages and **2** blank pages.

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1 In this experiment, you will investigate the angle through which a loaded beaker rolls as a turning force is applied.

(a) The apparatus has been assembled as shown in Fig. 1.1.

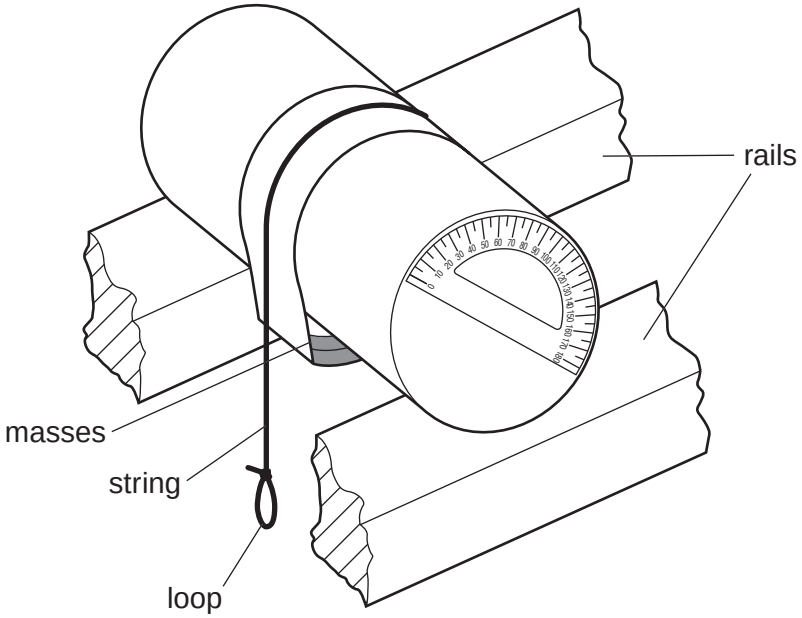


Fig. 1.1

(b) Make sure that the beaker is positioned so that the masses do not touch the rails.

(c) Using the set square, measure and record the angle *x*, as shown in Fig. 1.2.

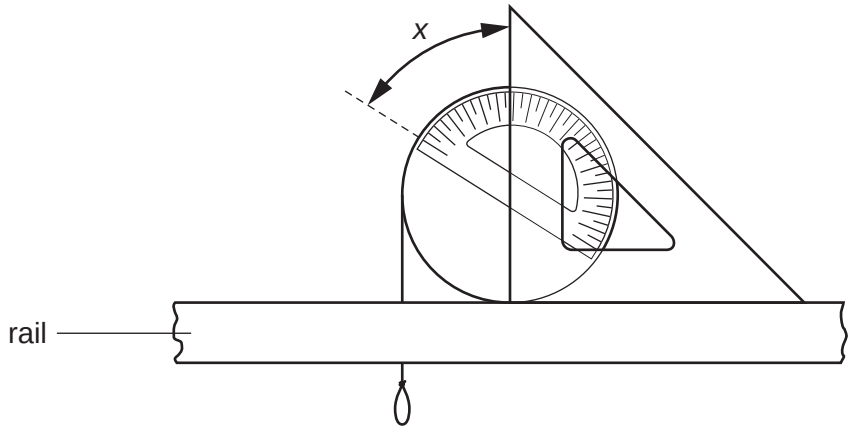


Fig. 1.2

x = ...[1]

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(d) (i) Hook the mass hanger on the string loop. Record the mass m that is suspended from the loop.

m = ...

(ii) Wait for the beaker to stop moving, making sure that the beaker is positioned so that the masses do not touch the rails.

(iii) Using the set square, measure and record the angle y, as shown in Fig. 1.3.

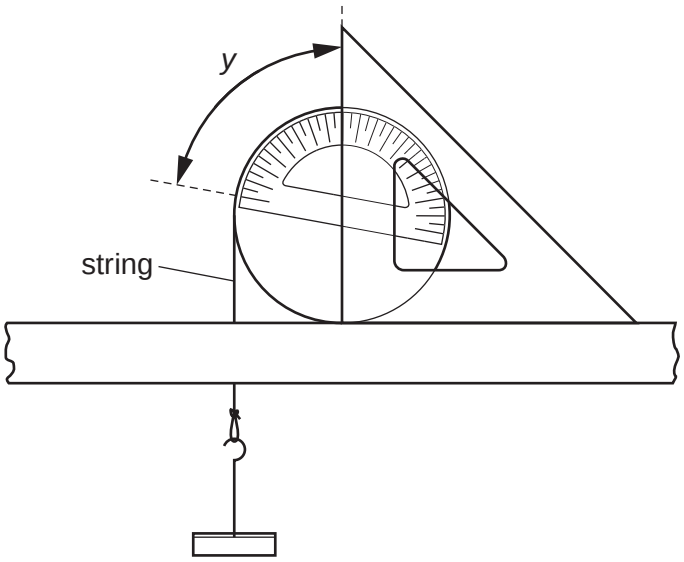


Fig. 1.3

y = ...[1]

(iv) Calculate θ, where $\theta = y - x$.

θ = ...

(e) Change m by adding masses to the hanger and repeat **(d)(ii)**, **(d)(iii)** and **(d)(iv)**. Repeat this procedure until you have six sets of values for m (the total suspended mass) and angle y.
Include in your table values for θ (using your answer from **(c)**) and $\sin\theta$.

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[9]

(f) **(i)** Plot a graph of $\sin\theta$ on the y-axis against m on the x-axis. [3]

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

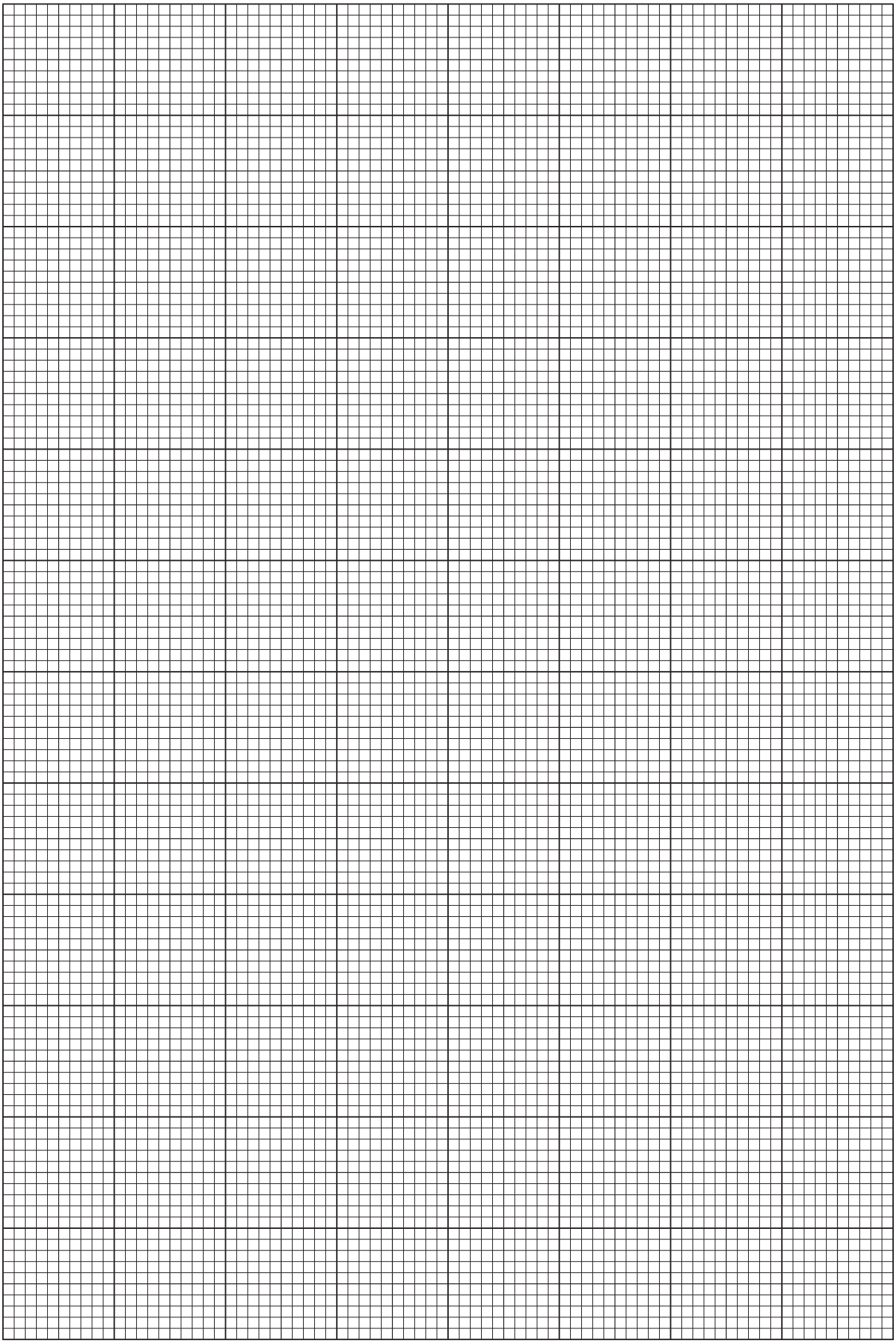
(iii) Determine the gradient and y-intercept of this line.

gradient = ...

y-intercept = ...

[2]

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(g) **(i)** Unhook the masses from the string loop and remove the beaker from the rails.

(ii) Take measurements to determine the radius r of the beaker.

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r = ...[1]

(h) It is suggested that the relationship between θ and m is

$$\sin\theta = \frac{r\,m}{a} + b$$

where a and b are constants.

Using your answers from **(f)(iii)** and **(g)(ii)**, determine the value of a. Give an appropriate unit.

a = ...[2]

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2 In this experiment you will investigate the motion of a mass suspended from a rubber band.

(a) (i) Suspend the rubber band from the retort stand and hang the 100 g mass hanger from the rubber band, as shown in Fig. 2.1

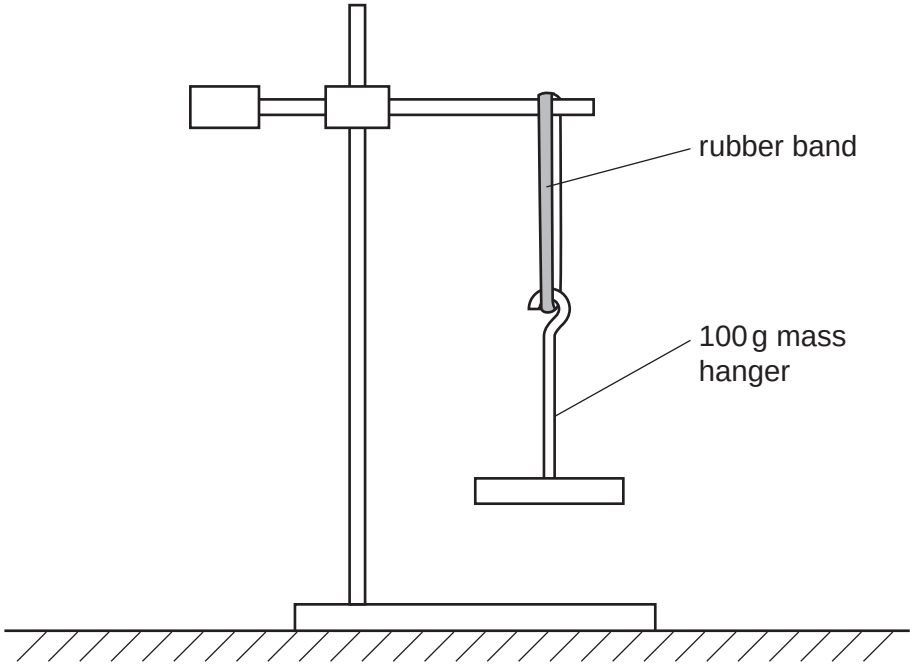


Fig. 2.1

(ii) Determine and record the radius *R* of the suspended mass hanger at its widest point.

R = ...[2]

(iii) Estimate the percentage uncertainty in *R*.

percentage uncertainty = ...[1]

(b) (i) Twist the mass hanger about half a turn and release it so that it turns between positions A and B, as shown in Fig. 2.2.

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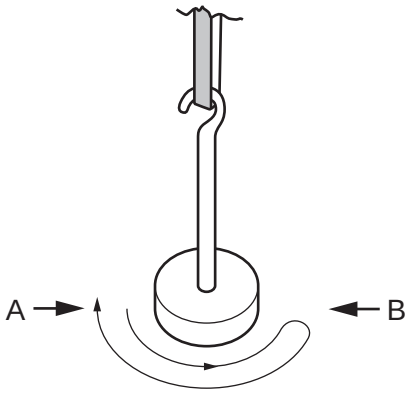


Fig. 2.2

(ii) Take measurements to determine the time T for the mass hanger to rotate from A to B and back to A.
(This may be determined accurately by using the time for several turns.)

T = ... [2]

(c) For a mass hanger of mass m and radius R, it is suggested that T is related to a quantity C, where $C = mR^2$.
Calculate the value of C for this mass hanger. Give an appropriate unit.

C = ... [1]

(d) (i) Remove the 100 g mass hanger and suspend the 50 g mass hanger from the rubber band.

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(ii) Repeat **(a)(ii)**, **(b)** and **(c)** for this new suspended mass hanger.

R = ...

T = ...

C = ...

[4]

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

$$T^2 = k\,C$$

where k is a constant.
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 in **(e)(i)**.

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.....

.....

.....

.....[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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