

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
TOTAL	



General Certificate of Education
Advanced Subsidiary Examination
June 2012

Physics

(Specifications A and B)

PHA3/B3/XPM2

Unit 3 Investigative and Practical Skills in AS 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 15.

There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

Section A Task 2

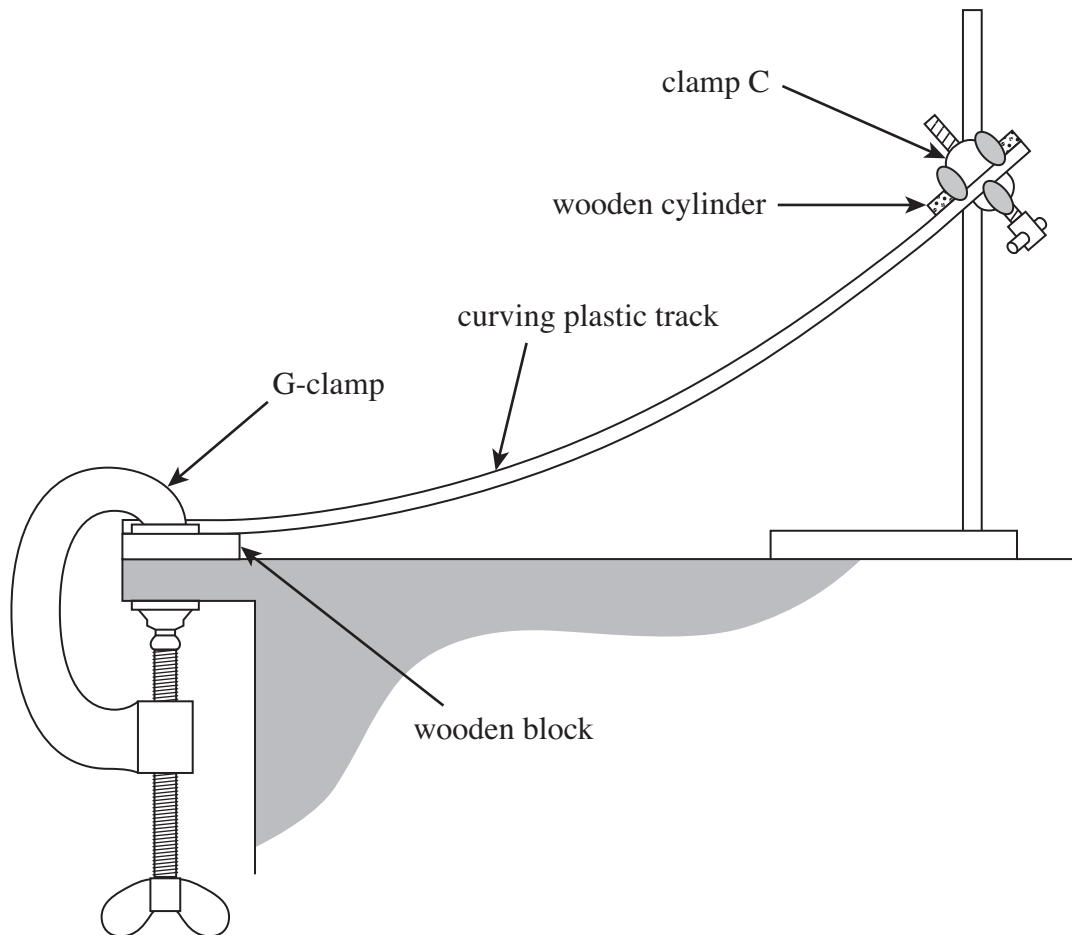
Follow the instructions given below.

Provide the information required in the spaces provided.

No description of the experiment is required.

- 1** In this experiment you are to investigate the trajectory of a ball bearing.
You are provided with the apparatus shown in **Figure 4**.

Figure 4



The lower end of a curving plastic track is attached to a wooden block; a G-clamp is used to fix this wooden block to the bench.

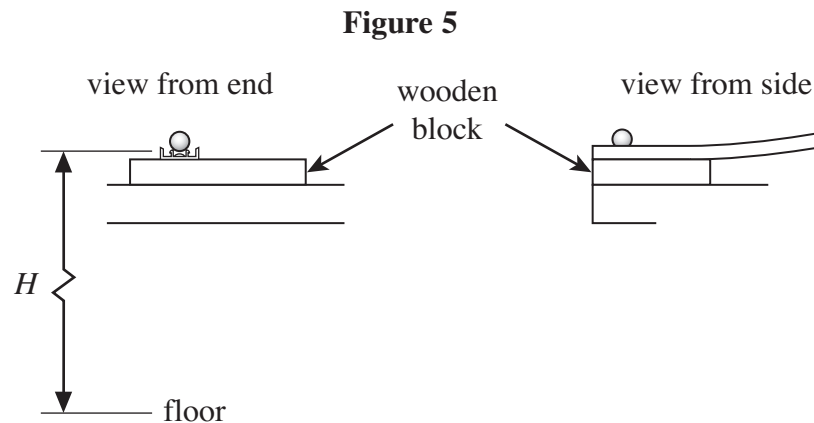
Do not remove the G-clamp during the experiment.

A short wooden cylinder has been placed inside the plastic track at the raised end of the track; a clamp, C, is used to keep this cylinder in place and support the raised end of the track.

Do not remove clamp C from the raised end of the track during the experiment.

Turn over ►

- 1 (a) Place a ball-bearing on the horizontal part of the plastic track as shown in **Figure 5**. Note that the G-clamp is not shown in either of the views.



- 1 (a) (i) Measure and record the vertical height, H , between the bottom of the ball bearing and the floor.

$$H = \dots\dots\dots$$

You are provided with an additional stand to which has been clamped a horizontal nail. Do not adjust the height of the clamped nail at any stage.

- 1 (a) (ii) Place this stand on the floor then measure and record the vertical height h , between the top of the nail and the floor.

$$h = \dots\dots\dots$$

(1 mark)

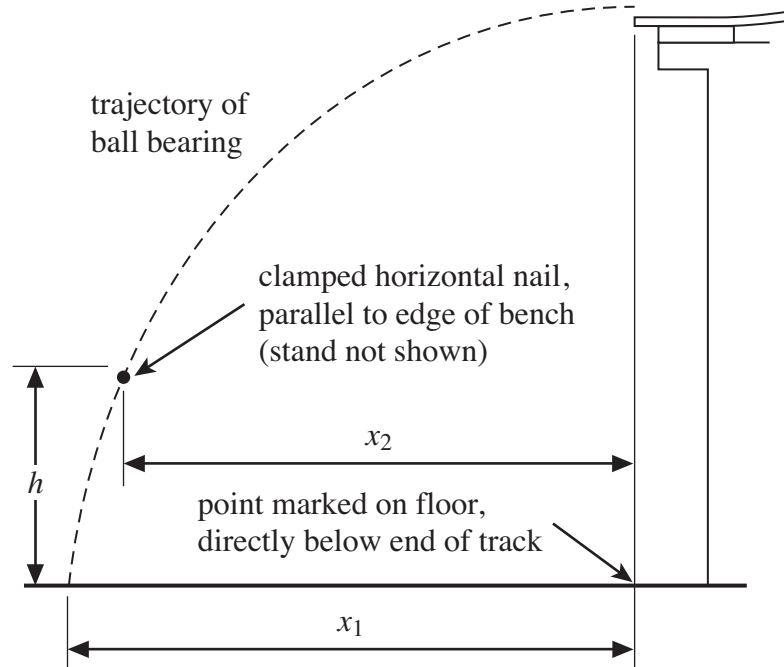
- 1 (b) Locate and mark the point on the floor directly below the end of the track. Place the ball bearing on the track so that it is in contact with the wooden cylinder. Release the ball bearing from rest and note where it lands. Place a piece of clean blank paper on the floor with the centre of the paper at the position where the ball bearing landed. Release the ball bearing as before to check that it lands near the centre of the paper. Secure the paper to the floor using masking tape.

You are provided with a piece of carbon paper; position this, carbon side down, over the paper. Release the ball bearing as before so that it lands on the carbon paper. The impact of the ball bearing will produce a mark on the paper below the carbon. Repeat the procedure to ensure that a consistent result is achieved.

1 (b) Record all your measurements and observations for part (b)(i), (b)(ii) and (b)(iii), on page 6 of this question paper/answer booklet.

1 (b) (i) Measure and record the horizontal distance, x_1 , as shown in **Figure 6**.

Figure 6



1 (b) (ii) Place the stand to which the nail is attached on the floor so the nail is parallel to the edge of the bench, as shown in **Figure 6**. Ensuring that the height, h , of the top of the nail above the floor remains unchanged, adjust the position of the stand so that, after an identical release to that which gave the reading of x_1 , the ball bearing hits the nail centrally.

Measure and record the horizontal distance, x_2 , from the nail to the point you marked directly below the end of the track.

1 (b) (iii) Loosen the boss holding clamp C and reduce the height of the raised end of the curving plastic track above the bench by about 5 cm. Tighten up the boss to secure the track in this new position. Make any small adjustments that are necessary to clamp C to ensure that in this new position, the track forms a continuous smooth curve and is free from any twisting.

Using the same method as before, obtain further values of x_1 and x_2 for the new track positions.

Repeat the procedure until you have a total of **six sets** of readings for x_1 and x_2 .

Turn over ►

Measurements and observations.

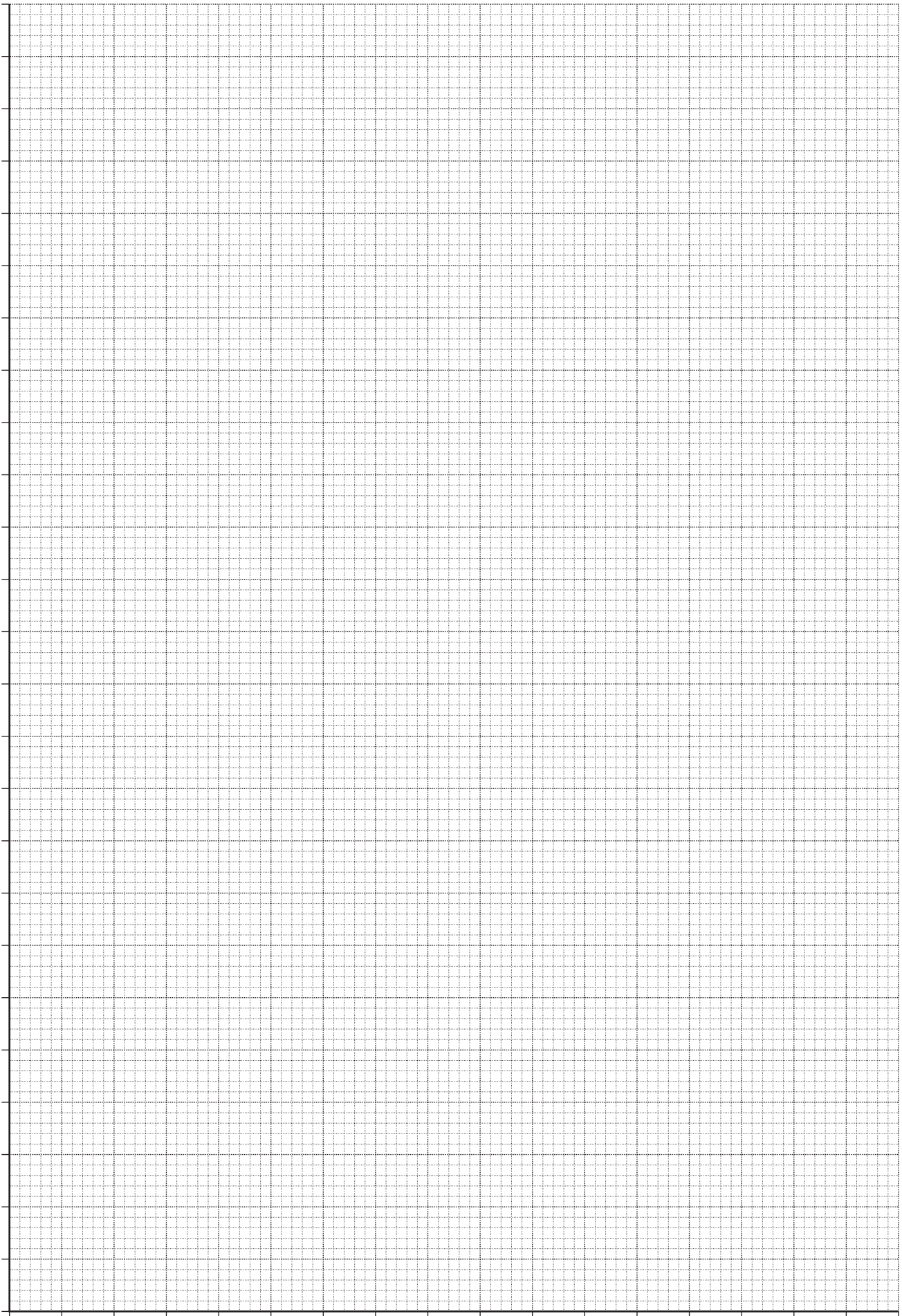
(5 marks)

- 1 (c) Plot, on the grid opposite, a graph with x_1 on the vertical axis and x_2 on the horizontal axis.

(9 marks)

15

END OF QUESTIONS



There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**