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 Level Examination
June 2013

Physics PHA6/B6/XPM2

(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.

Section A Task 2

Follow the instructions given below.

Give the information required in the spaces provided.

No description of the experiment is required.

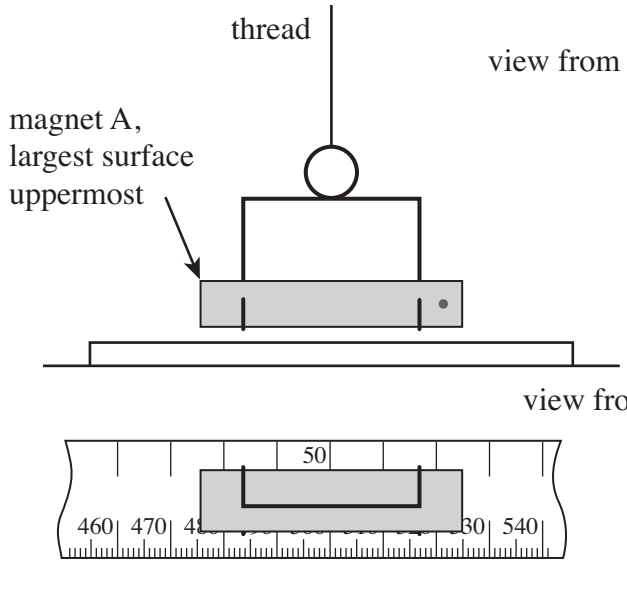
1 In this experiment you are to investigate the oscillation of a bar magnet suspended in a magnetic field of variable magnetic flux density.

You are provided with a bar magnet, supported in a stirrup suspended from a retort stand. Do not remove the stand or adjust the height of the clamp to which the stirrup is attached. Place the metre ruler on the bench with the graduated face uppermost and the centre of the magnet directly above the 50 cm graduation on the ruler.

Turn the metre ruler about its mid-point until it is aligned with the long axis of magnet A, as shown in **Figure 5a**.

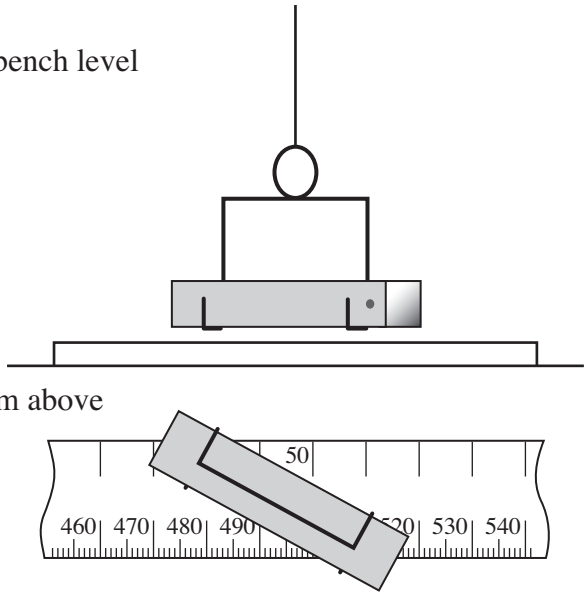
Keeping the largest surface of the magnet uppermost, the long axis of the magnet parallel to the bench and the thread supporting the magnet vertical, displace each end of the magnet in opposite directions so the magnet is rotated through a small angle, as shown in **Figure 5b**.

Figure 5a



ruler aligned with long axis of magnet A

Figure 5b



ends of magnet A displaced in opposite directions and thread kept vertical

1 (a) Simultaneously release both ends of magnet A so that it performs small-amplitude torsional oscillations. Make suitable measurements to determine T_0, the period of these oscillations.

.....

.....

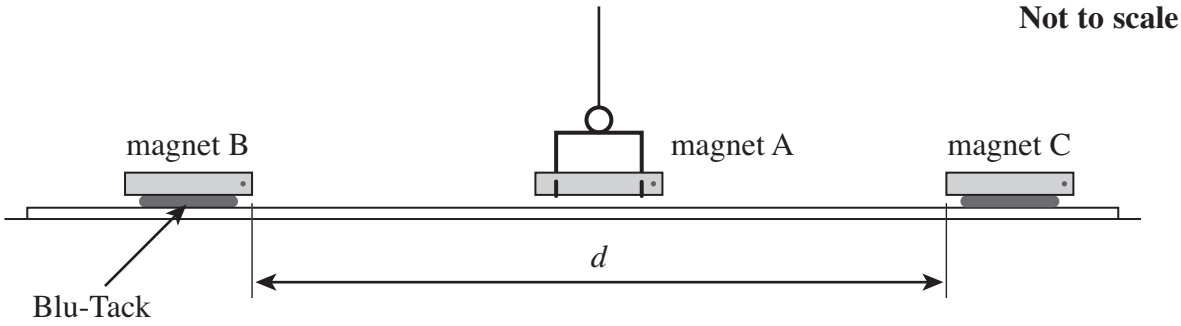
T_0 = ...

(1 mark)

1 (b) Position magnets B and C on the ruler, so that each attracts the nearest pole of magnet A. Use Blu-Tack below magnets B and C until all three magnets lie approximately in the same horizontal plane with their largest faces uppermost.
Do not alter the length of the thread supporting magnet A.

Adjust the positions of magnets B and C until they are equidistant from the nearer ends of magnet A, and the separation, d, is between 50 cm and 60 cm, as shown in **Figure 6**, which is not to scale.

Figure 6



Displace magnet A as before, then release it so that it performs small-amplitude torsional oscillations.
Measure and record the period, T, of these oscillations, then repeat the procedure for **four smaller** values of d: **do not** use values of d less than 25 cm.

Record your measurements below.
Note that the independent variable should be recorded in the **left-hand** column of your table.

(4 marks)

1 (c) Plot, on the grid opposite, a graph with $\log\left(\left(\frac{1}{T^2}-\frac{1}{T_0^2}\right)/\mathrm{s}^{-2}\right)$ on the vertical axis and $\log\,(d/\mathrm{cm})$ on the horizontal axis.

Tabulate below the data you will plot on your graph.

(11 marks)

16

END OF QUESTIONS

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