O-Level Physics

Paper 4

Unsolved Topical

Past Papers With Marking Scheme
According to New Syllabus (2023-2025)

2014-2021

Title O-LEVEL Physics Paper 4

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PREFACE

Excellence in learning cannot be claimed without application of concepts in a dexterous way. In this regard one of the logical approach is to start in chunks; like chapter wise learning and applying the concept on exam based questions.

This booklet provides an opportunity to candidates to practice topic wise questions from previous years to the latest. Extensive working of Team MS Books has tried to take this booklet to perfection by collaborating with top of the line teachers.

We have added answer key / marks scheme at the end of each topic for the candidate to compare the his/her answer to the best.

MS Books strives to maintain actual spacing between consecutive questions and within options as per CAIE format which gives students a more realistic feel of attempting question.

Review, feedback and contribution in this booklet by various competent teachers of a subject belonging to renowned school chains make it most valuable resource and tool for both teachers and students.
With all belief in strength of this resource material I can confidently claim that it is worth in achieving brilliance.

Our sincere thanks and gratification to **Mr. Mirza Irshad Baig** who took out special time to help compile and manage this booklet. We would also like to appreciate physics faculty for reviewing and indorsing it.

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PAPER 4

CONTENT TABLE

Physical Quantities and Measurement

Q3/41/M/J/14

1 A student has five measuring cylinders.

Fig. 3.1 gives information about the measuring cylinders.

cylinder	volume / cm^3	smallest division / cm^3	diameter / cm	height / cm
A	5	0.1	0.7	12
B	10	0.2	1.3	14
C	50	1	2.6	20
D	100	1	3.1	25
E	250	2	4.2	32

Fig. 3.1

(a) The student uses a measuring cylinder to measure the volume of a marble of diameter 1.0 cm.

(i) Estimate the volume of the marble.

volume = ...[1]

(ii) State and explain which measuring cylinder is the best to use.

.....

.....

.....

.....[2]

(iii) The student half-fills the measuring cylinder with water. Describe how the measuring cylinder is then used to find the volume of the marble.

.....

.....

.....[1]

(b) Fig. 3.2 shows the water surface in two measuring cylinders. One cylinder is made of glass and the other is made of plastic.

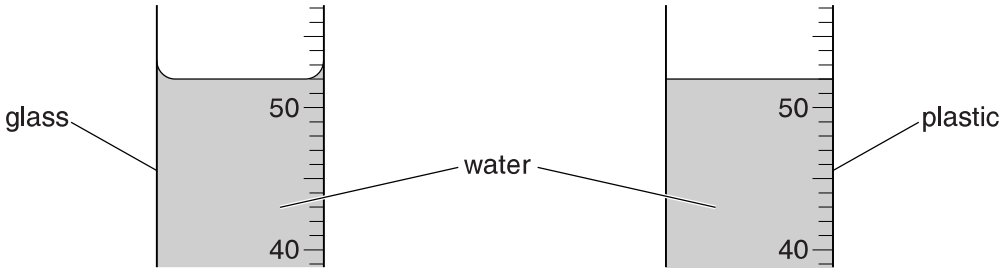

Fig. 3.2

Suggest two reasons why plastic measuring cylinders are often preferred to glass ones.

1. .....

2. .....

[2]

Q1/41/O/N/14

2 A student hangs two pendulums A and B from a metre rule, as shown in Fig. 1.1.

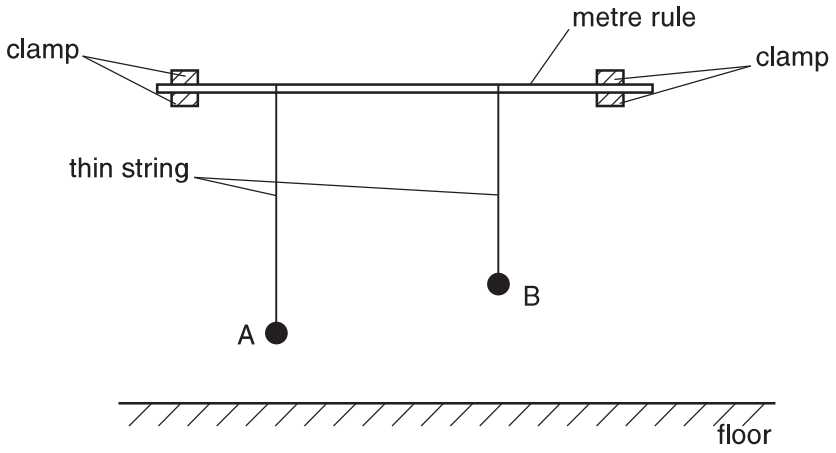

Fig. 1.1

(a) Describe how the student checks that the metre rule is horizontal. You may draw on Fig. 1.1 if you wish.

.....

.....

.....[1]

(b) Pendulum A has length 85.0 cm and its length does not change during the experiment.

Pendulum B is shorter than pendulum A, by a length *x*.

(i) On Fig. 1.1, mark and label the length *x*. [1]

(ii) Describe how the student can measure *x* accurately.

.....

.....[1]

(c) The student pulls A and B towards him and releases them at exactly the same time.
Pendulum A takes longer to complete one swing than pendulum B.
At the start, A and B swing backwards and forwards together, in step. They then become out of step and, after a while, A is swinging forwards when B is swinging backwards.
They then become back in step swinging backwards and forwards together.

The student counts the number *N* of swings of A until A and B are exactly back in step.

The student repeats the experiment and finds *N* for different values of *x*.

The results are recorded in Fig. 1.2.

x/cm	*N*
3.0	55
5.0	32
7.0	22
9.0	17
11.0	13
13.0	10

Fig. 1.2

On Fig. 1.3, plot the graph of *N* on the *y*-axis against *x*/cm on the *x*-axis.
Start your axes from the origin. Draw the smooth curve of best fit. [4]

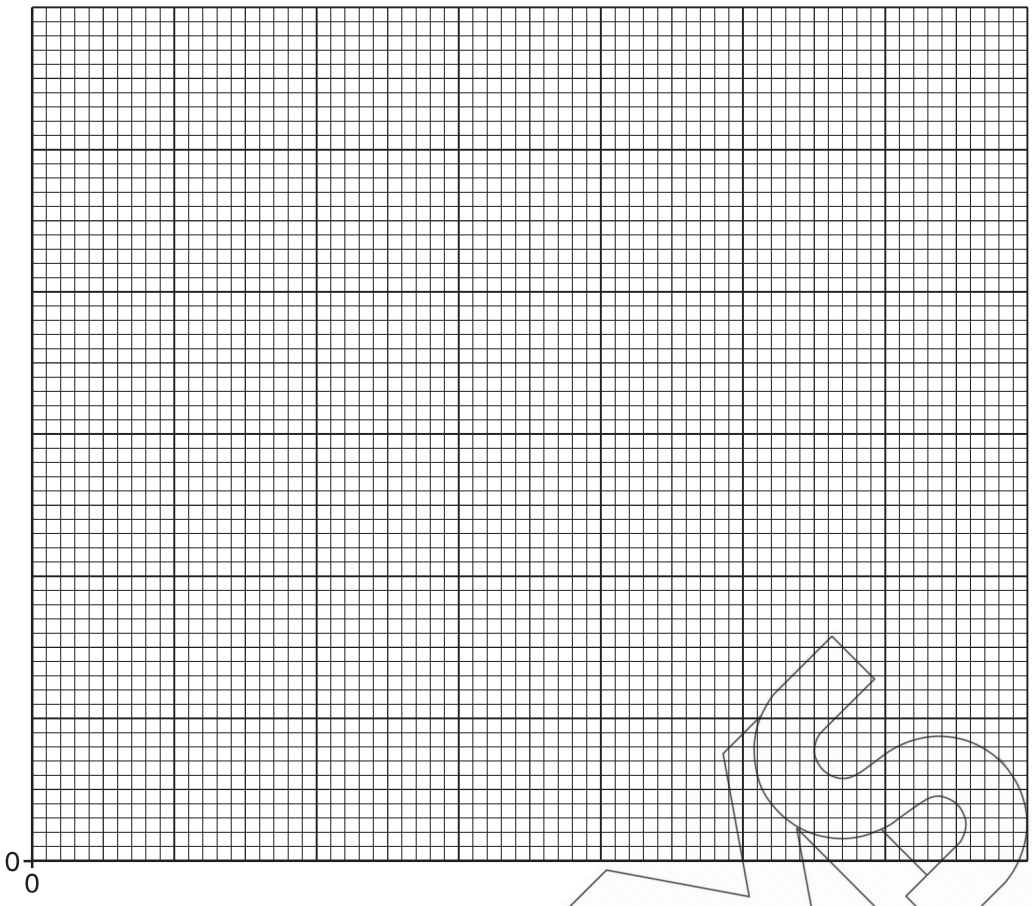

Fig. 1.3

(d) Before taking any readings, the student attached the pendulums A and B close together on the metre rule.

(i) Give one reason why it is helpful to have the strings close together.

.....

.....[1]

(ii) Suggest one problem this may cause.

.....

.....[1]

(e) **(i)** The length L_A of pendulum A is 85.0 cm. The length L_B of pendulum B is 75.0 cm. Use your graph in Fig. 1.3 to obtain a value for N.

N = ...[1]

(ii) Theory shows that

$$N = \frac{\sqrt{L_B}}{\sqrt{L_A} - \sqrt{L_B}}$$

Calculate the value for N when L_A is 85.0 cm and L_B is 75.0 cm.
Give your answer to two significant figures.

N = ...[2]

(iii) Comment on whether your two values for N are in agreement.

.....

.....[1]

Q2/41/O/N/14

3 A group of students measure the heights of the seats of five similar laboratory stools. The stools are shown in Fig. 2.1.

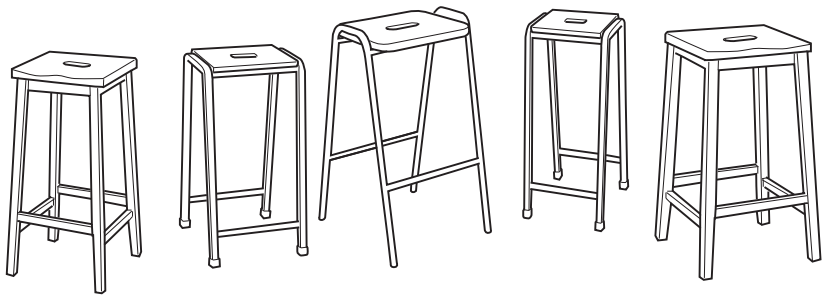

Fig. 2.1

(a) State the name of a suitable instrument for measuring the heights.

.....[1]

(b) **(i)** Explain what is meant by *parallax error*.

.....

.....[1]

(ii) Describe how the student can avoid parallax error when measuring the height of a stool.

.....

.....

.....[1]

(c) The students obtain the following results. The heights are measured in centimetres.

62.2 37.6 61.9 62.5 62.1

(i) One of the results is very different from the other four.

Suggest how the student used the measuring instrument incorrectly to obtain this result.

.....

.....[1]

(ii) Calculate the average value of the height of a stool.
Give your answer to 3 significant figures.

average height = ...[2]

Q4/42/O/N/14

4 A student is given a cylindrical 250 cm^3 beaker.
He is asked to find the outside diameter of the beaker.
The other apparatus available is shown below.

Apparatus List	
two half-metre rules	*marker pen*
30 cm ruler	*pencil*
2 m thin string	*scissors*
2 m thick string	*Blu-Tack*
plain paper	*Sellotape*
blocks of wood	*lined paper*

(a) Describe in detail how the student can obtain an accurate value for the outside diameter of the beaker.

In your account you should

- state the equipment used,
- explain how the equipment is used,
- state any readings taken,
- explain how the value for the diameter is obtained,
- describe how to make the measurement accurate.

.....

.....

.....

.....

.....

.....[5]

(b) Suggest one reason why it is more difficult to measure the internal diameter of the beaker.

.....

.....[1]

Q3/41/M/J/14

1 (a) (i) 0.5 to 1(.0) cm^3 [B1]

(ii) B [M0]
most sensitive / volume marble small / has 0.2 cm^3 divisions / volume less than 10 cm^3 [A1]
would not fit into A [A1]

(iii) two readings and subtract [B1]

(b) (i) less fragile / will not break / cheaper [B1]

(i) flat meniscus [B1]

[6]

Q1/41/O/N/14

2 (a) any **one** from:
measures two ends of ruler from the bench (same height) B1 **[1]**
use of spirit level
align with horizontal object e.g. windowsill
allow answers on diagram e.g. ruler and set-square to measure height at two places
check the strings are perpendicular to the metre rule with a set square

(b) (i) at least one horizontal line drawn between A and B and *x* accurately labelled B1

(ii) measure from bench / support to same point on each bob / ensure the pendulum is not moving / explain how parallax error is avoided. B1 **[2]**

(c) axes labelled quantity and unit B1
scales linear B1
points plotted accurately B1
best fit curve drawn B1 **[4]**

(d) (i) observe both together / observe simultaneously B1

(ii) any **one** from:
strings tangle B1 **[2]**
bobs collide

(e) (i) 15 ± 1 ecf from graph B1

(ii) 15.484 C1
15 A1

(iii) If both values are the same – Yes, they are the same.
If values are similar (±10%) – Yes + close enough / within experimental error B1 **[4]**
If values differ (by more than 10%) – No + difference outside experimental error / they are too far apart

[Total: 13]

Q2/41/O/N/14

3	**(a)**	metre rule	B1	**[1]**
	(b) **(i)**	error in taking measurement due to position of observer	B1	
	(ii)	view from level with top of stool	B1	**[2]**
	(c) **(i)**	metre rule upside down	B1	
	(ii)	62.175 or 62.18 or 62.17 or 62.22 seen	C1	
		62.2 cm cao	A1	**[3]**
				[Total: 6]

Q4/42/O/N/14

4	**(a)**	maximum 3 marks for drawing round bottom of beaker		
		equipment used stated	B1	
		how equipment used explained	B1	
		readings taken stated	B1	
		how diameter is obtained explained	B1	
		one accuracy detail	B1	**[5]**
	(b)	any **one** from: cannot fit ruler inside beaker cannot use string inside beaker cannot draw (internal) circle inside beaker	B1	**[1]**
				[Total: 6]