Topical Past Paper Questions

IGCSE Physics (0625) Paper 6

[Alternative to Practical]

Exam Series: February/March 2018 – February/March 2025

Format Type B:

Each question is followed by its answer scheme

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Introduction

Each Topical Past Paper Questions Workbook contains a comprehensive collection of hundreds of questions and corresponding answer schemes, presented in worksheet format. The questions are carefully arranged according to their respective chapters and topics, which align with the latest IGCSE or AS/A Level subject content. Here are the key features of these resources:

1. The workbook covers a wide range of topics, which are organized according to the latest syllabus content for Cambridge IGCSE or AS/A Level exams.
2. Each topic includes numerous questions, allowing students to practice and reinforce their understanding of key concepts and skills.
3. The questions are accompanied by detailed answer schemes, which provide clear explanations and guidance for students to improve their performance.
4. The workbook's format is user-friendly, with worksheets that are easy to read and navigate.
5. This workbook is an ideal resource for students who want to familiarize themselves with the types of questions that may appear in their exams and to develop their problem-solving and analytical skills.

Overall, Topical Past Paper Questions Workbooks are a valuable tool for students preparing for IGCSE or AS/A Level exams, providing them with the opportunity to practice and refine their knowledge and skills in a structured and comprehensive manner. To provide a clearer description of this book's specifications, here are some key details:

- Title: Cambridge IGCSE Physics (0625) Paper 6 Topical Past Papers
- Subtitle: Exam Practice Worksheets With Answer Scheme
- Examination board: Cambridge Assessment International Education (CAIE)
- Subject code: 0625
- Years covered: February/March 2018 – February/March 2025
- Paper: 6 (Alternative to Practical)
- Number of pages: 672
- Number of questions: 200

Contents

Chapter 1

Motion, forces and energy

1.1 Physical quantities and measurement techniques

1. 0625_w24_qp_61 Q: 1

A student investigates the period of a pendulum. Fig. 1.1 shows the set up.

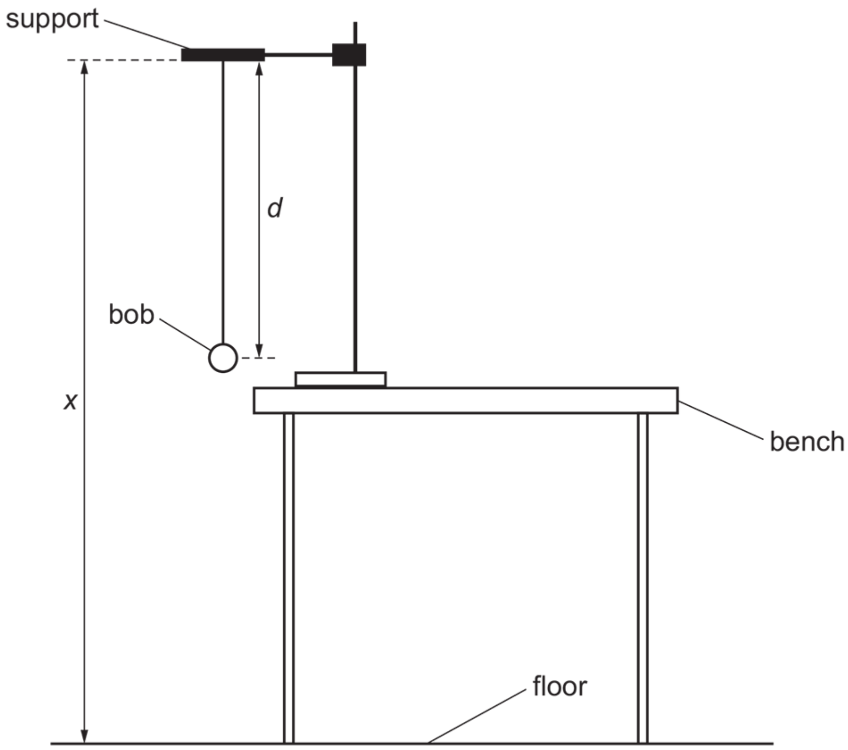

Fig. 1.1

(a) The student adjusts the length of the pendulum until the distance *d* measured from the bottom of the support to the centre of the bob is 90.0 cm.

He displaces the bob slightly and releases it so that it swings.

He measures, and records in Table 1.1, the time *t* for 10 complete oscillations.

Calculate, and record in Table 1.1, the period *T* of the pendulum. The period is the time for 1 complete oscillation.

Calculate a value for T^2 and record in Table 1.1. [2]

Table 1.1

d / cm	t /	T /	T^2 /
90.0	19.1		
45.0	13.5		

(b) The student repeats the procedure in **(a)** using a distance d = 45.0 cm.

Calculate, and record in Table 1.1, the period *T* of the pendulum.

Calculate a value for T^2 and record in Table 1.1. [1]

(c) Complete the column headings in Table 1.1. [2]

(d) Explain why timing 10 oscillations gives a more accurate result for the period *T* than timing 1 oscillation.

....

.... [1]

(e) Describe **one** technique that you use to improve accuracy when measuring the distance *d*.

You may draw a diagram to help your description.

....

.... [1]

(f) Describe **one** technique that you use to improve accuracy when measuring the time *t* for 10 oscillations.

....

....

.... [1]

(g) The pendulum support is 40 cm above the bench. Estimate the distance *x* between the bottom of the pendulum support and the floor.

x = ... cm [1]

(h) A student plans to plot a graph of T^2 against *d*. Suggest suitable values of *d* that the student can use to obtain measurements that are sufficient for this task.

....

.... [2]

[Total: 11]

Answer:

Question	Answer	Marks
(a)	(*For d = 90.0 cm*): T = 1.91	1
	T^2 = 3.65 (3.6481)	1
(b)	T and T^2 values present for 45cm, AND T^2 both quoted to 3 OR both quoted to 4 significant figures	1
(c)	t and T in s	1
	T^2 in s^2	1
(d)	(Timing) errors (due to reaction time) less significant / (same) error is spread over a longer time.	1
(e)	Use of set square or similar horizontal aid OR metre rule close to bob / pendulum	1
(f)	Use of fiducial point / counting from when pendulum passes the vertical / start counting from zero.	1
(g)	100 (cm) < x < 140 (cm)	1
(h)	At least 3 additional values	1
	No value greater than distance x *as* stated in (g)	1

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2. 0625_m23_qp_62 Q: 4

A student investigates the motion of a ball through the air.

Plan an experiment which will enable him to investigate how the range of the ball depends on the angle at which it is launched.

The range is the horizontal distance that the ball travels after leaving the end of the channel shown in Fig. 4.1 and before hitting the ground.

The apparatus available includes:

- a flexible channel, as shown in Fig. 4.1, which can be bent at different angles
- a selection of balls, each of different diameter and mass.

In your plan, you should:

- list any additional apparatus needed
- explain briefly how to do the experiment – you may add to Fig. 4.1 if it helps your explanation
- state the key variables to keep constant
- draw a table with column headings, to show how to display the readings (you are **not** required to enter any readings in the table)
- explain how to use the results to reach a conclusion.

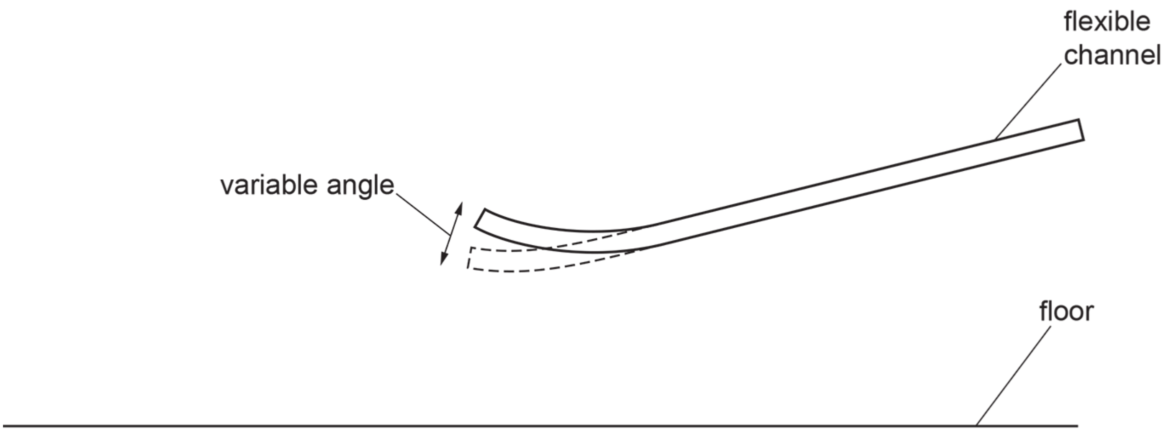

Fig. 4.1

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.... [7]

Answer:

Question	Answer	Marks
	MP1 **apparatus:** metre ruler, protractor	**1**
	MP2 **method:** set initial launch angle roll ball measure range	**1**
	MP3 repeat for different angle	**1**
	MP4 **control variable** (one from)**:** diameter of ball, mass of ball. angle / height of (upper end of) channel	**1**
	MP5 **table**: with columns for independent variable <u>and</u> dependent variable (at least) <u>and</u> both with units	**1**
	MP6 **analysis:** compare readings in a table to see if change in independent variable produces change in dependent variable, plot (line) graph (with axes specified)	**1**
	MP7 **additional point** (one from)**:** at least 5 sets of data taken, repeat each measurement <u>and</u> take average, means of accurate indication of point at which ball hits floor, clear indication of where to measure range from	**1**

3. 0625_w23_qp_62 Q: 1

A student investigates the period of a pendulum.

Fig. 1.1 shows the set-up.

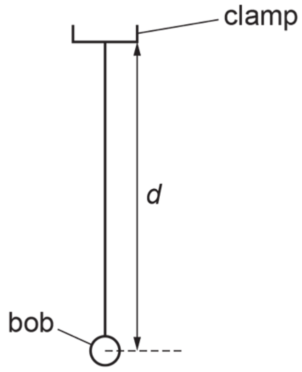


Fig. 1.1

(a) The distance d is measured from the bottom of the clamp to the centre of the bob.

The student adjusts the length of the pendulum until d = 50.0 cm.

He displaces the bob slightly and releases it so that it swings.

He uses a stop-watch to measure the time t for 10 complete oscillations.

Fig. 1.2

(i) Fig. 1.2 shows the reading on the stop-watch.

Record, in Table 1.1, the time t for 10 complete oscillations. [1]

(ii) Calculate and record in Table 1.1, the period T of the pendulum. The period is the time for one complete oscillation. [1]

(iii) Calculate T^2 and record your value in Table 1.1. [1]

(iv) Write the units in the column headings. [2]

Table 1.1

d /	t /	T /	T^2 /
50.0			
100.0	20.20	2.02	4.08

(b) The student repeats the procedure in **(a)** using d = 100.0 cm. The readings and results are shown in Table 1.1.

Another student suggests that T^2 is directly proportional to d.

Explain briefly how to test the suggestion using the results in Table 1.1.

....

....

....

.... [2]

(c) The procedure can be repeated to plot a graph.

Suggest additional values of d that are suitable for the experiment.

....

.... [1]

(d) Explain how you would measure the distance d as accurately as possible. Draw a diagram to help your explanation.

....

.... [2]

(e) Explain why timing 10 oscillations gives a more accurate result for the period T than timing one oscillation.

....

.... [1]

[Total: 11]

Answer:

Question	Answer	Marks
(a)(i)	$t = 14.21$	**1**
(a)(ii)	$T = 1.42(1)$	**1**
(a)(iii)	$T^2 = 2.02$	**1**
(a)(iv)	cm, s, s	**1**
	s^2	**1**
(b)	calculate T^2 / d (or reciprocal of this)	**1**
	judge if (close enough to be considered) equal **OR** compare the T^2 and d values judge if the second value is (close enough to) double the first value **OR** plot a graph of T^2 against d (if directly proportional) it will be a <u>straight</u> line <u>passing through the origin</u>	**1**
(c)	at least three values <u>between</u> 10 (cm) and 100 (cm)	**1**
(d)	diagram to show (correct use of) a horizontal aid (e.g., a set-square / ruler)	**1**
	matching wording **OR** measure the diameter of the bob with two blocks and a ruler / micrometer divide by 2 to find the radius and add this on to the length of the string **OR** measure to the top and the bottom of the bob find the average	**1**
(e)	reduces the <u>effect</u> of (reaction) timing errors / reduces the percentage error / uncertainty / the (reaction time) error is spread over 20 oscillations	**1**

4. 0625_w22_qp_61 Q: 1

A student investigates the period of a pendulum. Fig. 1.1 and Fig. 1.2 show the set-up.

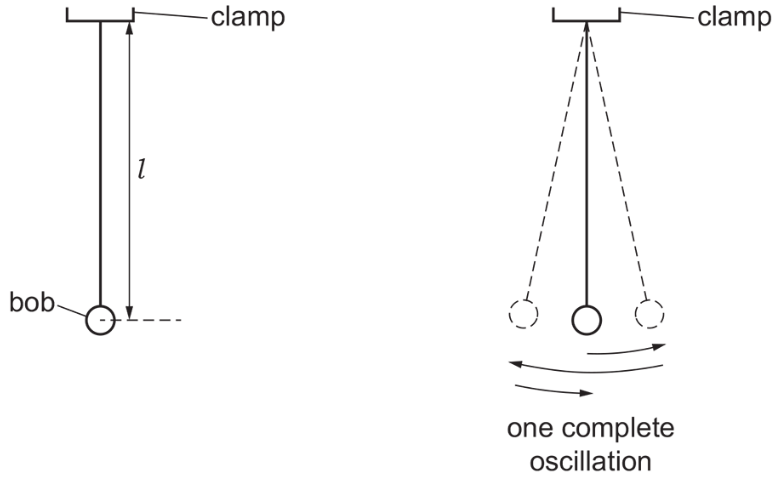


Fig. 1.1 **Fig. 1.2**

(a) Explain briefly how to measure to the centre of the pendulum bob as accurately as possible.

....

.... [1]

(b) The student adjusts the length of the pendulum until the distance l, measured from the bottom of the clamp supporting the pendulum to the centre of the pendulum bob, is 50.0 cm.

He displaces the bob slightly and releases it so that it swings. Fig. 1.2 shows one complete oscillation of the pendulum.

He measures and records the time t for 20 complete oscillations.

(i) Calculate, and record in Table 1.1, the period T of the pendulum. The period is the time for one complete oscillation. [1]

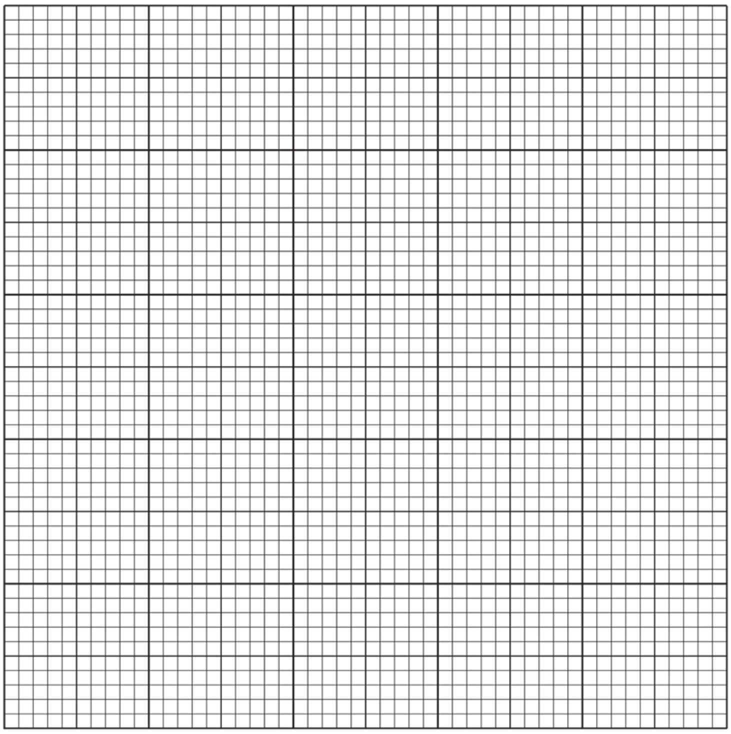
(ii) Calculate, and record in Table 1.1, the value of T^2. [1]

Table 1.1

l / cm	t / s	T / s	T^2 / s^2
50.0	28.2		
60.0	31.2	1.56	2.43
70.0	33.6	1.68	2.82
80.0	35.8	1.79	3.20
90.0	38.2	1.91	3.65

He repeats the procedure using l values of 60.0 cm, 70.0 cm, 80.0 cm and 90.0 cm. The readings and results are shown in Table 1.1.

(c) Plot a graph of T^2/s^2 (y-axis) against l/cm (x-axis). Start the T^2/s^2 axis at a convenient value close to the minimum value of T^2/s^2.



[4]

(d) Determine the gradient G of the graph. Show clearly on the graph how you obtained the necessary information.

G = ... [3]

(e) Explain briefly why timing 20 oscillations gives a more accurate result for the period T than timing 1 oscillation.

....

.... [1]

[Total: 11]

Answer:

Question	Answer	Marks
(a)	Clear use of horizontal aid OR bob touching rule	**1**
(b)(i)	T = 1.41	**1**
(b)(ii)	T^2 = 1.99 (to 2 decimal places only, correctly rounded)	**1**
(c)	Axes of graph correctly labelled with quantity and unit and right way round	**1**
	Suitable scales	**1**
	All plots correct to ½ small square	**1**
	Good line judgement, thin, continuous line	**1**
(d)	Triangle method clear on graph	**1**
	Triangle at least half the length of the line between extreme plots used	**1**
	G value in range 0.038 – 0.044	**1**
(e)	Reaction time / human error a smaller part of time measured	**1**

5. 0625_w22_qp_61 Q: 4

A student investigates the horizontal distance travelled by a metal ball after it rolls off the end of a plastic track. Fig. 4.1 shows the set-up.

The ball rolls down a plastic track. The left-hand side of the track is fixed. The right-hand side can be adjusted so that the ball comes off the track at different angles.

The student measures the horizontal distance that the ball travels from the right-hand end of the track to the point that it hits the floor.

Plan an experiment to investigate how the horizontal distance travelled by the metal ball depends on the angle that the right-hand end of the track makes with the bench.

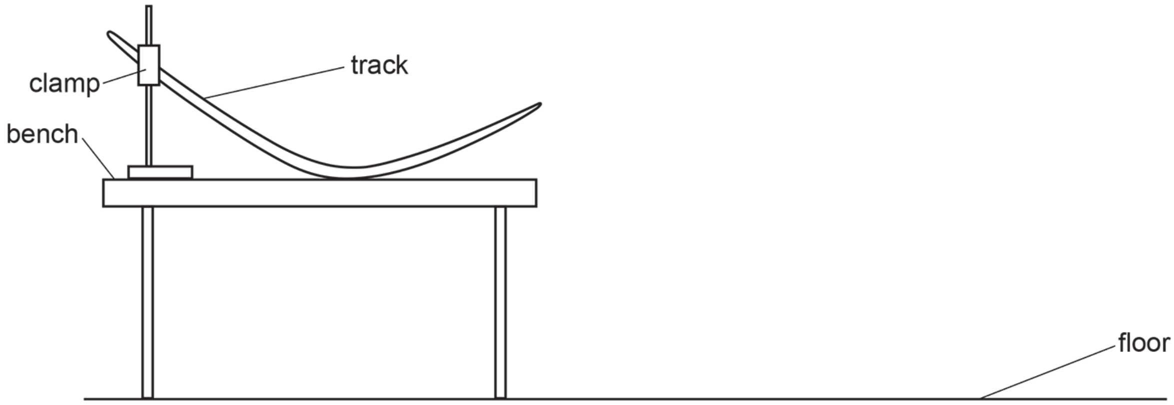


Fig. 4.1

The following apparatus is available to the student:

- track with stand, boss and clamp
- selection of metal balls.

Other apparatus normally available in a school laboratory can also be used.

In your plan, you should:

- list any additional apparatus required
- explain briefly how you would do the investigation, including the measurements you would take
- state the key variables to be kept constant
- draw a suitable table, with column headings, to show how you would display your readings (you are **not** required to enter any readings in the table)
- explain how you would use the results to reach a conclusion.

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.... [7]

Answer:

Question	Answer	Marks
	MP1 (Metre) rule / tape measure	**1**
	MP2 Release ball to roll down track, measure how far it travels.	**1**
	MP3 Repeat for at least 2 more <u>different angles</u> of right-hand side of track	**1**
	MP4 Clear identification of the correct distance to be measured (e.g. from table leg or other point identified on floor to point of impact with track) OR clear explanation of how to identify point of impact (e.g. using a sand tray)	**1**
	MP5 Constant variable identified Release height for ball Or same ball every time / same weight / mass / size of ball	**1**
	MP6 Table <u>consistent with their method</u> (if method correct with columns for distance travelled and angle of track, with units)	**1**
	MP7 Analysis <u>based on their table</u> Graph of angle against distance travelled, or compare angle with distance travelled (or the equivalents for their method)	**1**

6. 0625_w22_qp_63 Q: 1

A student investigates the dimensions of a boiling tube.
She uses the apparatus shown in Fig. 1.1.

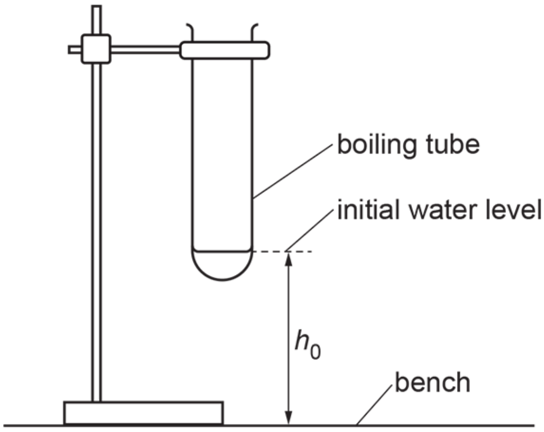


Fig. 1.1

(a) The student pours a small amount of water into the boiling tube and measures the height h_0 from the bench to the initial water level.

h_0 = ...2.6.......................... cm

Suggest **one** precaution that is taken when measuring the height of the water level to ensure the reading is accurate.
You may draw a diagram if it helps your explanation.

....

.... [1]

(b) The student uses a measuring cylinder graduated in cm^3 to add a volume of water $V = 5.0\,cm^3$ to the boiling tube.
Part of the boiling tube, after the water has been added, is shown full size in Fig. 1.2.

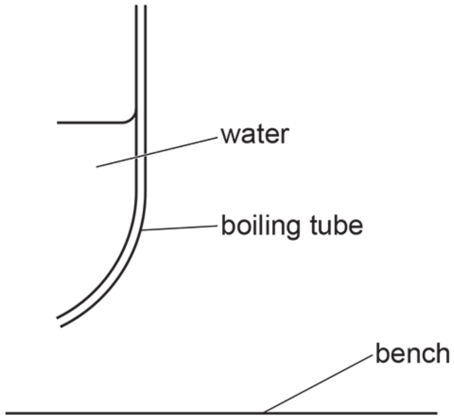


Fig. 1.2

Measure, and record in the first row of Table 1.1, the new height h of the water level from the bench. [1]

Table 1.1

V/cm^3	h/cm	H/cm
5.0		
10.0	5.5	2.9
15.0	6.7	4.1
20.0	8.3	5.7
25.0	9.6	7.0

(c) For the value of $V = 5.0\,cm^3$, calculate, and record in Table 1.1, the increase in height H of the water in the boiling tube. Use the value of h_0 from **(a)**, your value of h in Table 1.1 and the equation $H = (h - h_0)$. [1]

(d) Plot a graph of V/cm^3 (y-axis) against H/cm (x-axis).

[4]

(e) **(i)** Determine the gradient of the graph. Show clearly on the graph how you obtained the necessary information.

gradient = ... [1]

(ii) Calculate D, the inside diameter of the boiling tube.

Use the equation $D = \sqrt{\frac{4G}{\pi}}$, where G is numerically equivalent to the gradient in **(e)(i)**.

D = ... cm [1]

(f) Suggest why it was important for the student to add a small volume of water at the start of the experiment.

....

.... [1]

(g) Another student uses this experiment, with the same apparatus, to measure *D* for a small test-tube of diameter approximately 1.2 cm. He adds water in volumes of 1.0 cm^3 at a time. State and explain **one** reason why this is **not** an accurate method to use for this test-tube.

....

.... [1]

[Total: 11]

Answer:

Question	Answer	Marks
(a)	precaution for reading water level e.g.: view scale perpendicularly rule close to boiling tube use of set square	**1**
(b)	*h* = 4.0	**1**
(c)	*H* = 1.4 / ecf from **(b)**	**1**
(d)	axes labelled with quantity and unit	**1**
	appropriate scales (occupying at least ½ grid)	**1**
	plots all correct to ½ small square <u>and</u> precise plots	**1**
	well-judged line <u>and</u> thin line	**1**
(e)(i)	*G* present and triangle method shown on graph grid	**1**
(e)(ii)	*D* in range 1.9 cm to 2.4 cm	**1**
(f)	inside diameter near base not uniform / owtte	**1**
(g)	valid critical comment e.g.: water volumes small – large uncertainty in measuring cylinder test-tube diameter small – large uncertainty in answer / owtte height changes small so unreliable	**1**

7. 0625_s21_qp_61 Q: 1

A student investigates the period of a pendulum. Fig. 1.1 and Fig. 1.2 show the arrangement.

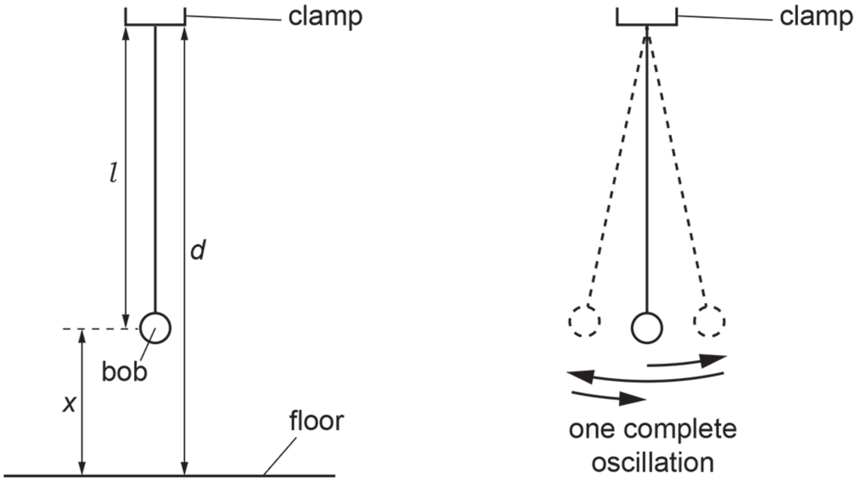


Fig. 1.1 **Fig. 1.2**

(a) The student measures the distance *d* between the bottom of the clamp and the floor.

d = ...120.0 cm......

This distance *d* remains constant throughout the experiment.

He adjusts the length l of the pendulum to 70.0 cm.

Calculate the distance *x* between the centre of the pendulum bob and the floor. Record the value of *x* in the first row of Table 1.1. [1]

(b) The student displaces the bob slightly and releases it so that it swings. Fig. 1.2 shows one complete oscillation of the pendulum.

He measures, and records in the first row of Table 1.1, the time *t* for 10 complete oscillations.

(i) Calculate, and record in the first row of Table 1.1, the period *T* of the pendulum. The period is the time for one complete oscillation. [1]

(ii) Calculate, and record in the first row of Table 1.1, T^2. [2]

(iii) Complete the column headings in Table 1.1. [1]

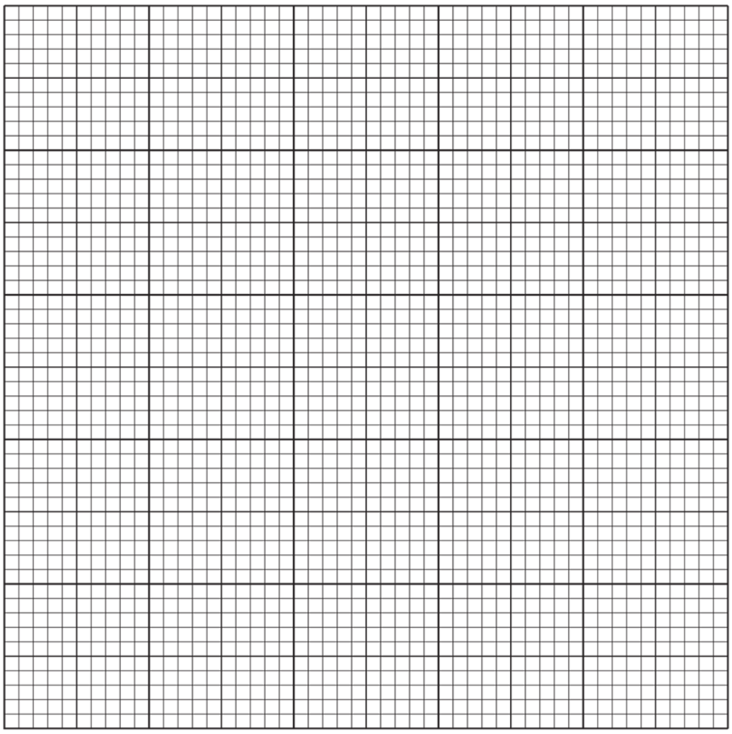
Table 1.1

x /	t /	T /	T^2 /
	16.7		
45.0	17.3	1.73	2.99
40.0	17.9	1.79	3.20
35.0	18.4	1.84	3.39
30.0	19.0	1.90	3.61

(c) He repeats the procedure using x = 45.0 cm, 40.0 cm, 35.0 cm and 30.0 cm.

He records the readings in Table 1.1.

Plot a graph of T^2 (y-axis) against x (x-axis). You do **not** need to start your axes at the origin (0,0).



[4]

(d) State whether the graph line shows that T^2 is proportional to x. Give a reason for your answer.

statement ....

reason ....
[1]

(e) Explain why timing 10 oscillations gives a more accurate result for the period T than timing one oscillation.

....

.... [1]

[Total: 11]

Answer:

Question	Answer	Marks
(a)	x = 50.0 (cm)	**1**
(b)(i)	T = 1.67	**1**
(b)(ii)	T^2 = 2.79 (or 2.789 or 2.7889)	**1**
	T^2 given to 3 significant figures	**1**
(b)(iii)	cm, s, s, s^2	**1**
(c)	Graph: Axes correctly labelled with quantity and unit and right way round	**1**
	Suitable scales	**1**
	All the plots from their table correct to better than ½ small square	**1**
	Good line judgement, thin, continuous line	**1**
(d)	No. Not through origin	**1**
(e)	(Timing) errors less significant / have a smaller <u>percentage</u> uncertainty / the error is spread over 10 periods / is divided by 10	**1**

8. 0625_s20_qp_62 Q: 1

A student investigates the period of a pendulum. Fig. 1.1 and Fig. 1.2 show the apparatus she uses.

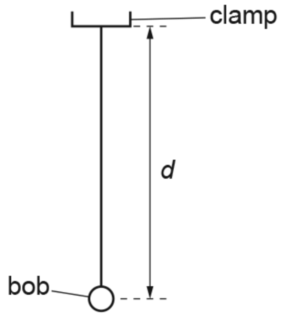


Fig. 1.1

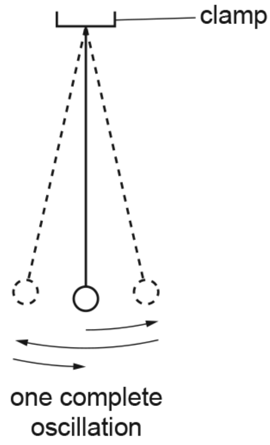


Fig. 1.2

(a) Explain briefly, with the help of a diagram, how you would use a metre rule and set square to measure the length *d* of a pendulum as accurately as possible.

Diagram:

....

....

.... [3]

(b) The student adjusts the pendulum so that d = 50.0 cm. She displaces the bob slightly and releases it so that it swings. Fig. 1.2 shows one complete oscillation of the pendulum. She measures the time t_1 for 20 complete oscillations.

(i) Record the time t_1 shown in Fig. 1.3.

Fig. 1.3

t_1 = ... [1]

(ii) Calculate the period T_1 of the pendulum. The period is the time for one complete oscillation.

T_1 = ... [1]

(c) The student adjusts the pendulum until the distance d is 100.0 cm.

She repeats the procedure and records the time t_2 for 20 oscillations and the period T_2.

t_2 = 39.80 s

T_2 = 1.99 s

She measures the mass m_A of the pendulum bob. The reading on the balance is shown in Fig. 1.4.

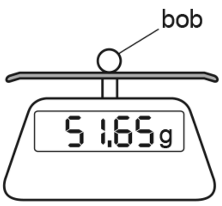


Fig. 1.4

Record mass m_A of the pendulum bob to the nearest gram.

m_A = ... g [1]

The student repeats the procedure using a pendulum bob of mass m_B.

m_B = 109 g

She obtains these results:

distance d = 50.0 cm

period T_3 = 1.39 s

distance d = 100.0 cm

period T_4 = 2.02 s

(d) **(i)** Using the results T_1, T_2, T_3 and T_4, for the period of each of the pendulums, tick (✓) the response that matches your results within the limits of experimental accuracy.

☐ the period T is affected by d only

☐ the period T is affected by both d and m

☐ the period T is affected by m only

☐ the period T is not affected by d or m

[1]

(ii) Justify your answer to **(d)(i)** by reference to the results.

....

.... [1]

(e) The student now investigates the effect of the size of the oscillations on the period of the pendulum.

(i) Suggest briefly how you would measure the size of an oscillation. You may draw a diagram.

....

.... [2]

(ii) State **one** variable that you would keep constant during this part of the investigation.

.... [1]

[Total: 11]

Answer:

(a)	clear diagram showing use of set square and rule with horizontal line of set square across to vertical rule from approximate centre of bob	**1**
	rule positioned to enable measurement of *d* from bottom of clamp	**1**
	wording to include perpendicular viewing of the rule	**1**
(b)(i)	t_1 = 28.12 (s)	**1**
(b)(ii)	T_1 = 1.406 (s)	**1**
(c)	m_A = 52	**1**
(d)(i)	first box only ticked (error carried forward possible)	**1**
(d)(ii)	justified by correct reference to results	**1**
(e)(i)	rule or protractor used	**1**
	method explained / diagram drawn	**1**
(e)(ii)	length	**1**