# Topical Practice IGCSE PHYSICS Paper 4

Chapters 1-2

EDITION • Volum • STUDENT

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# **Chapter 1: Length, Time, Mass, Volume, and Density**

- A student is measuring some small glass spheres.
  - (a) The student has a 30 cm rule and two rectangular blocks of wood.

In the space below, draw a diagram to show clearly how you would arrange the apparatus to measure the diameter of **one** of the spheres.

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[2]

3

**(b)** The student then determines the average volume of a glass sphere by a displacement method. She pours some cold water into a measuring cylinder and records the volume *V* of the water, as shown in Fig. 4.1.

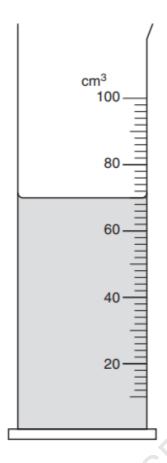


Fig. 4.1

- (i) On Fig. 4.1, show clearly the line of sight that you would use to obtain an accurate volume reading.[2]
- (ii) Using Fig. 4.1, record the volume *V* of water in the measuring cylinder.

(iii) The student carefully puts 15 of the glass spheres into the measuring cylinder. The new water level reading is 78 cm<sup>3</sup>.

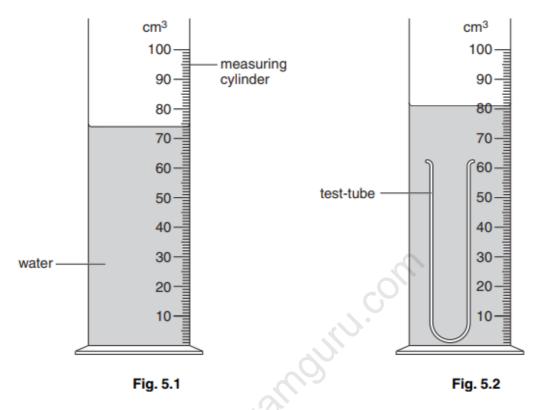
Calculate the volume  $V_1$  of **one** sphere.

$$V_1 = \dots [1]$$

[Total: 6]

2 The IGCSE class is determining the internal volume of a test-tube using two displacement methods.

The apparatus used is shown in Figs. 5.1, 5.2 and 5.3.



(a) (i) Fig. 5.1 shows water in a measuring cylinder. Record the volume  $V_1$  of the water.

$$V_1 =$$
 [1]

- (ii) On Fig. 5.1, show clearly the line of sight that you would use to obtain an accurate volume reading. [2]
- (b) (i) A student lowers a test-tube, closed end first, into the water in the measuring cylinder and pushes the tube down until it is filled with water. From Fig. 5.2, record the new water level V<sub>2</sub>.

(ii) Calculate the volume  $V_{\rm G}$  of the glass of the test-tube using the equation  $V_{\rm G} = (V_2 - V_1)$ .

(c) The student removes the test-tube from the measuring cylinder and empties the water back into the measuring cylinder. He then puts the test-tube, open end first, into the water in the measuring cylinder and carefully pushes it down with his finger until it is covered with water as shown in Fig. 5.3.

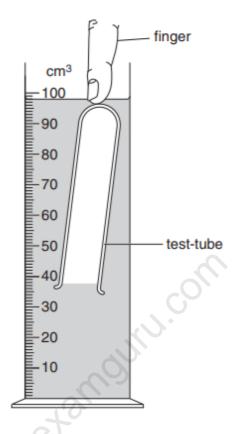


Fig. 5.3

(i) Record the new water level  $V_3$ .

(ii) Calculate the increase in water level  $(V_3 - V_1)$ .

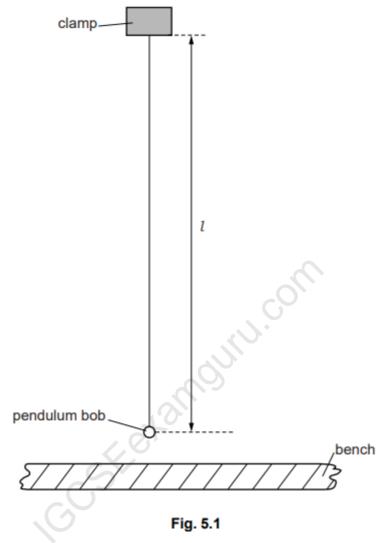
$$(V_3 - V_1) = \dots$$

(iii) Calculate the volume  $V_A$  of air in the test-tube using the equation  $V_A = (V_3 - V_1) - V_G$ .

(d)	The student removes the test-tube from the measuring cylinder and fills the test-tube with water from a beaker. He pours the water from the test-tube into an empty measuring cylinder and records the volume $V_{\rm W}$ of water:
	$V_{\rm W} =18  {\rm cm}^3$
	The student has attempted to determine the internal volume of the test-tube by two methods. His two values for the internal volume are $V_{\rm A}$ and $V_{\rm W}$ .
	Assuming that the experiments have been carried out correctly and carefully and that the measuring cylinder scale is accurate, suggest two reasons why the value $V_{\rm A}$ may be inaccurate and two reasons why the value $V_{\rm W}$ may be inaccurate.
	$V_{A}$ :
	reason 1
	reason 2
	$V_{W}$ :
	reason 1
	reason 2
	[3]
	[Total: 9]

3 The IGCSE class is investigating a pendulum.

The apparatus is shown in Fig. 5.1.



(a) On Fig. 5.1, measure the length *l* of the pendulum.

*l* = .....[1]

(b) The diagram is drawn 1/5<sup>th</sup> actual size.

Calculate the actual length L of the pendulum.

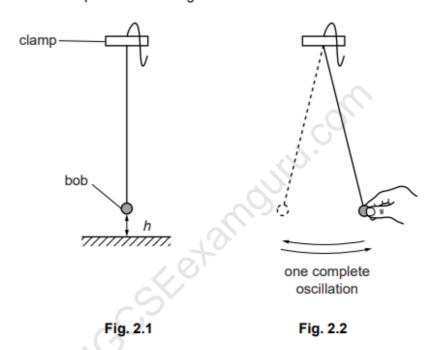
L = .....[2]

(c)	the	centre of		. Describe how yo	u would judge	n mark is vertically below that the 50.0 cm mark is a diagram.
						[1]
(d)						ically above the 52.0 cm I distance <i>d</i> = 2.0 cm.
	of the	he pendu				n for 12 complete swings d values. The values of d
				Table 5.1		
			d/	t/	T/	
			2.0	17.4		
			3.0	17.6		
			4.0	17.2		
			5.0	17.3		
			6.0	17.5		
	(i)					d. Enter the values in the og of the pendulum. [2]
	(ii)	Comple	te the column head	dings in the table.		[1]
(e)			vidence in the tabl lustify your answer			eriod T of increasing the
	des	cription .				
	just	ification .				
	•					
						[2]

(f)	Suggest why the student measures the time taken for twelve swings of the pendulum rather than for one swing.
	[1
	[Total: 10

4 The IGCSE class is investigating the oscillation of a pendulum.

The apparatus is set up as shown in Fig. 2.1.



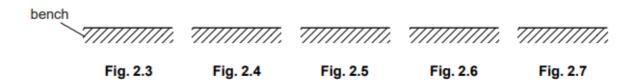
The height *h* of the pendulum bob above the bench is measured and recorded.

This is repeated, to obtain a total of five different values of *h*, by shortening the string of the pendulum but without changing the height of the clamp.

For each value of h, the pendulum bob is pulled to one side by a small distance, as shown in Fig. 2.2.

The pendulum is then released and the time *t* for 10 complete oscillations is measured and recorded.

(a)	Describe a prechas accurately	caution which the IGCS as possible. You may d	E students migh raw a diagram.	t have taken ir	n order to measure
				-011	[1
(b)	Figs. 2.3 to 2.7 abench for each	are scale diagrams short of the five experiments.	wing the height h	of the pendul	um bob above the



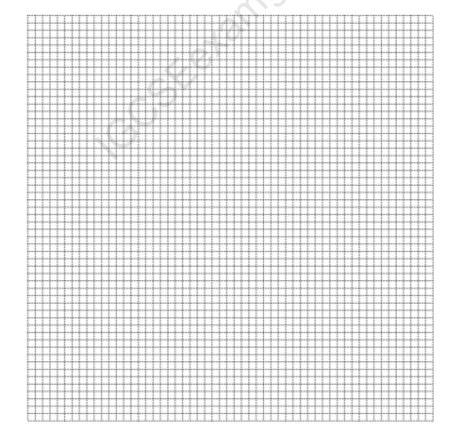
- Measure, and record in Table 2.1, the height h in each experiment.
- (ii) The diagrams are drawn to 1/5 scale.

Calculate, and record in Table 2.1, the actual heights *H* of the pendulum bob above the bench.

Table 2.1

	h/cm	H/cm	t/s	T/s	T <sup>2</sup> /s <sup>2</sup>
Fig. 2.3			14.01		
Fig. 2.4			12.39		
Fig. 2.5			10.85		
Fig. 2.6			8.93		
Fig. 2.7			6.30		

- (c) (i) For each value of height h, calculate the time T for one complete oscillation, using the equation  $T = \frac{t}{10}$ . Record these values in Table 2.1.
  - (ii) Calculate the values of  $T^2$  and record these in the table. [1]
- (d) Plot a graph of  $T^2/s^2$  (y-axis) against H/cm (x-axis).

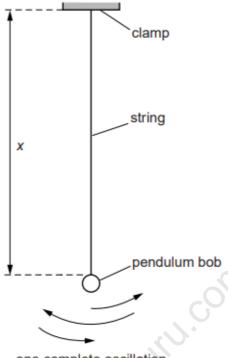


[4]

(e)	Determine the gradient <i>G</i> of the graph.
	Show clearly on the graph how you obtained the necessary information.
	G =[1]
(f)	One of the students wishes to carry out the experiment again to obtain results which are more reliable.
	Describe one change she might make to the method to achieve this.
	[1]
	[1] [Total: 10]
	Tall
	CKO,

5 A student carries out an experiment using a simple pendulum.

Fig. 4.1 shows the apparatus.



one complete oscillation

Fig. 4.1

The student records the time *t* taken for 20 complete oscillations of the pendulum for a range of different lengths *x* of the string. The readings are shown in Table 4.1.

Table 4.1

x/cm	t/s	T/s
90.0	38.5	
80.0	36.0	
70.0	33.4	
60.0	31.4	
50.0	28.2	
40.0	25.5	

(a) The period T of the pendulum is the time taken for one complete oscillation.

For each set of readings in the table, calculate the period *T* and enter the results in the table. [2]

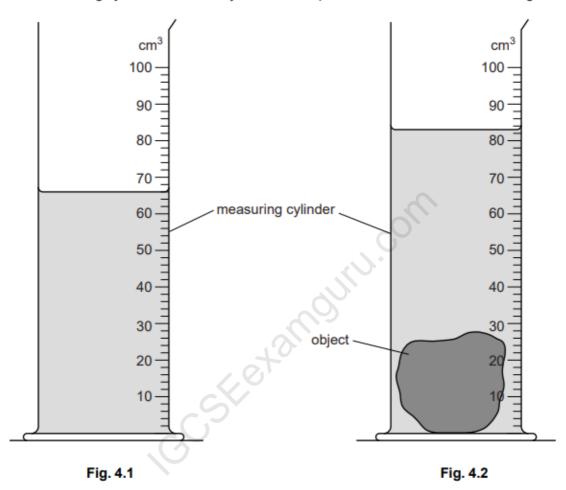
(b)	Suggest a reason for measuring the time for twenty oscillations rather than just one.
	[1]
(c)	In this experiment, the length x of the string is measured with a metre rule.
	Suggest one precaution that you would take when measuring the length in order to obtain an accurate reading.
	[1]
(d)	The student decides that a more useful result is possible if the length is measured to the centre of mass of the pendulum bob.
	The pendulum bob is a small metal ball. The student has a 30 cm ruler and two rectangular blocks of wood that are about 10 cm long.
	Suggest how the student can use this equipment to measure accurately the diameter of the pendulum bob. You may draw a diagram.
	CCSF.eXaimor
	[2]
	[Total: 6]

6 The IGCSE class has been asked to determine the density of an object.

One student is finding the volume of the object using a measuring cylinder containing water in which the object is to be placed.

The measuring cylinder containing only water is shown in Fig. 4.1.

The measuring cylinder after the object has been placed in the water is shown in Fig. 4.2.



(a) (i) Read and record the volume V<sub>1</sub> of the water in the measuring cylinder shown in Fig. 4.1.

v <sub>1</sub>	V₁ =					
----------------	------	--	--	--	--	--

(ii) Read and record the volume  $V_2$  of the water in the measuring cylinder shown in Fig. 4.2.

(b) The student then uses a balance to measure the mass m of the object, as shown in Fig. 4.3.

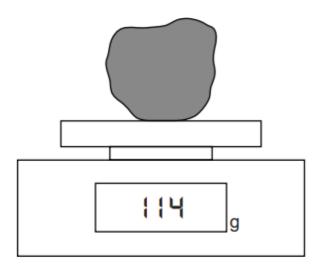


Fig. 4.3

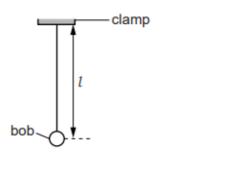
Calculate the density of the object using the equation

density = 
$$\frac{m}{(V_2 - V_1)}$$

	density =[	2]
(c)	Suggest a possible practical cause of inaccuracy in this method.	
		[1]
	[Total:	5]

7 The IGCSE class is investigating pendulums.

The apparatus is shown in Figs. 1.1 and 1.2.



one complete

Fig. 1.1

Fig. 1.2

oscillation

(a) (i) On Fig. 1.1, measure the length *l* of the pendulum.

(ii) The pendulum is drawn 1/10th of actual size.

Write the actual length of the pendulum in the first row of Table 1.1.

(b) A student displaces the pendulum bob slightly and releases it so that it swings.

Fig. 1.2 shows one complete oscillation of the pendulum bob.

The student uses a stopwatch to record the time t for 20 complete oscillations of the pendulum. The reading is recorded in the table.

(i) Calculate the period *T* of the pendulum. The period is the time for one complete oscillation.

Record the value of T in Table 1.1.

(ii) Complete the column headings in the table.

Table 1.1

<i>l</i> /cm	t/	T/
	22.4	
61.9	31.6	1.58

[3]

(c)	The student adjusts the length of the pendulum until its length $l$ = 61.9 cm. He repeats the procedure in <b>(b)</b> and calculates $T$ . The results are shown in Table 1.1.
	The student suggests that doubling the length $\it l$ of the pendulum should double the period $\it T$ .
	State whether the results support this suggestion and justify your answer by reference to the results.
	statement
	justification
	[2]
(d)	The student repeats the procedure in <b>(b)</b> four more times with different lengths of the pendulum.
	The student plots a graph of $l$ against $T^2$ .
	State two pieces of information from the graph that would indicate that $\it l$ is directly proportional to $\it T^2$ .
	1
	2
(e)	[2] The student uses another pendulum.
	This pendulum has a mass that is double the mass of the first pendulum. Its length is $61.9\mathrm{cm}$ . The period $T=1.61\mathrm{s}$ .
	Suggest a conclusion about the effect of doubling the mass of the pendulum.
	[1]
	[Total: 9]

8 An IGCSE student is measuring the capacity of a drinks cup by three methods.

The capacity of a cup is the maximum volume of liquid that it will hold in normal use. This maximum level is marked on the cup, as shown in Fig. 1.1.

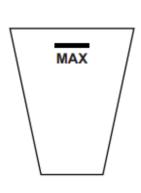


Fig. 1.1



Fig. 1.2

(a) Method 1

In Method 1, the capacity  $V_1$  is determined from the mass of water in the cup.

(i) The cup is filled to the marked level with water. It is then placed on the balance, as shown in Fig. 1.2.

Read and record its mass m.

(ii) Calculate a value for the capacity  $V_1$ , using your reading from (a)(i) and the equation  $V_1 = \frac{m}{\rho}$ , where  $\rho = 1.00\,\mathrm{g/cm^3}$ .

### (b) Method 2

In Method 2, the capacity  $V_2$  is measured directly from the volume of water in the cup.

The cup is filled to the marked level and the water is tipped into a measuring cylinder, as shown in Fig. 1.3.

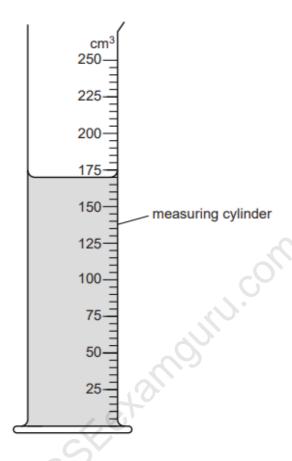


Fig. 1.3

Read and record the volume  $V_2$  of water in the measuring cylinder.

### (c) Method 3

In Method 3, the capacity  $V_3$  is calculated by considering the cup as a cylinder, using the average diameter of the cup and an approximate equation.

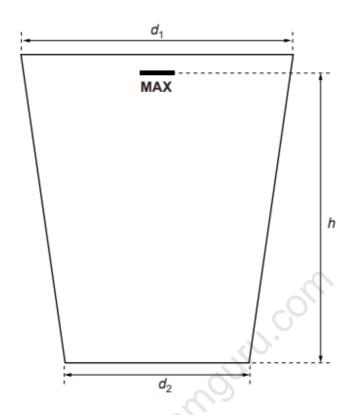


Fig. 1.4

(i) On Fig. 1.4, measure and record the diameter  $d_1$  of the top of the cup.

d<sub>1</sub> = .....cm

(ii) On Fig. 1.4, measure and record the diameter  $d_2$  of the base of the cup.

d<sub>2</sub> = ......cm

(iii) On Fig. 1.4, measure and record the height h from the base to the marked level MAX.

h = .....cm

(iv) Calculate the average diameter D using your readings from (c)(i) and (c)(ii), and the equation  $D = \frac{(d_1 + d_2)}{2}$ .

D =

	(v)	Calculate a value for the capacity $V_3$ , using your results from (c)(iii) and (c)(iv) and the equation $V_3 = \frac{\pi D^2 h}{4}$ .
		V <sub>3</sub> =[2]
(d)		ite a possible practical source of inaccuracy in <b>Method 2</b> and a possible practical urce of inaccuracy in <b>Method 3</b> .
	Me	thod 2
	Me	thod 3
		[2]
(e)		ite an additional measurement which could be taken to give a more accurate result in thod 1.
		[1]
		[Total: 10]

9 An IGCSE student is taking measurements of a pencil.

Fig. 1.1 shows the pencil, drawn full size.

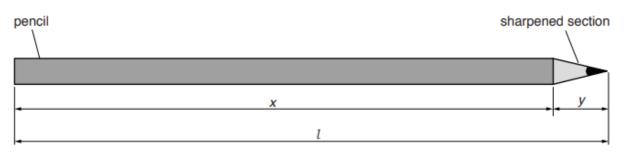


Fig. 1.1

(a)	(i)	On Fig. 1.1	. measure.	in cm.	the total	lenath	l of the	pencil.
<b>(~/</b>	۱٠,	O	, modeano,	,,	, and total	.o.igui	. 00	P-01110111.

*l* = ...... cm

(ii) Measure, in cm, the length x of the unsharpened section of the pencil.

(iii) Calculate the length y of the sharpened section of the pencil, using the equation y = (l - x).

<i>y</i> =	 cm
	[2]

**(b)** Describe how you would use a length of string and a rule to determine the circumference *c* of the unsharpened section of the pencil.

		[2]

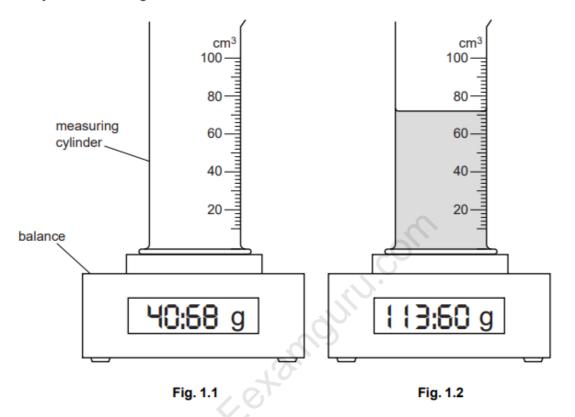
(c)	The	student's value for the circumference is $c = 2.4 \mathrm{cm}$ .
	(i)	Suggest a source of inaccuracy in determining the circumference of the pencil.
		[1]
	(ii)	Calculate the volume V of the unsharpened section of the pencil using the equation $V = \frac{c^2 x}{4\pi} \; .$
	iii)	V =
,	,	reasoning. $V_{\rm E}$ =

[Total: 8]

10 The IGCSE students are carrying out measurements in order to determine the density of water using two methods.

### (a) Method 1

Fig. 1.1 shows an empty measuring cylinder on a balance and Fig. 1.2 shows the measuring cylinder containing water.



(i) Read and record the mass m<sub>1</sub> of the empty measuring cylinder.

(ii) Read and record the mass  $m_2$  of the measuring cylinder and water.

(iii) Read and record the volume  $V_1$  of water, as shown in Fig. 1.2.

$$V_1 = \dots cm^3$$

(iv) Calculate a value  $\rho_1$  for the density of water using your readings from (a)(i), (ii) and (iii) and the equation  $\rho_1 = \frac{m_2 - m_1}{V_1}$ . Give an appropriate unit.

### (b) Method 2

In this method, a test-tube is floated in the water left in the measuring cylinder from Method 1 and the change in water level is measured.

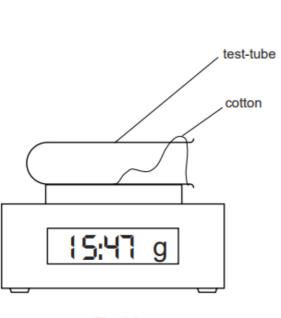


Fig. 1.3

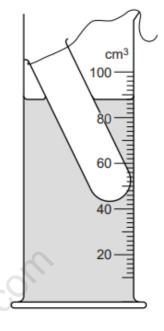


Fig. 1.4

(i) Read and record the mass  $m_3$  of the test-tube, as shown in Fig. 1.3.

m<sub>3</sub> = .....

(ii) The test-tube is carefully lowered, by means of a piece of cotton, into the measuring cylinder until it floats as shown in Fig. 1.4. Read and record the new water level V<sub>2</sub> in the measuring cylinder.

V<sub>2</sub> = .....

(iii) Using your results from (a)(iii) and (b)(ii), calculate  $V_3$ , the change in the water level, where  $V_3 = (V_2 - V_1)$ .

V<sub>3</sub> = .....

(iv) Calculate and record a value  $\rho_2$  for the density of water using the equation  $\rho_2 = \frac{m_3}{V_3}$ .

ρ<sub>2</sub> = ......[3]

(c)	Calculate an average value $\rho_{\rm AV}$ for the density of water using your results from (a)(iv) and (b)(iv).
	$ ho_{AV}$ =[1]
(d)	Suggest a precaution that should be taken in <b>Method 1</b> to ensure that the volume reading is as accurate as possible.
	[1]
(e)	Suggest a possible source of experimental inaccuracy in <b>Method 2</b> , other than with the volume reading.
	State and explain the effect that this would have on your value for $\rho_2$ .
	suggestion
	effect and explanation
	[2]
	[Total: 10]

11 An IGCSE student is taking measurements of a sample of modelling clay. She has moulded the sample of modelling clay into a cube, as shown in Fig. 1.1.

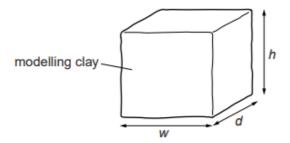


Fig. 1.1

(a) (i) On Fig. 1.2, measure the height h and width w of the piece of modelling clay.

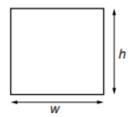


Fig. 1.2

h	=	••••	 •••	 				•••					•				•••		С	n	1

(ii) On Fig. 1.3, measure the depth d of the piece of modelling clay.

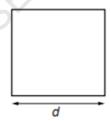


Fig. 1.3

(iii) Calculate the volume  $V_A$  of the modelling clay using the equation  $V_A = hwd$ .

(iv) The mass m of the piece of modelling clay is shown in Fig. 1.4.

Calculate the density  $\rho$  of the modelling clay using the equation  $\rho = \frac{m}{V_A}$ .



Fig. 1.4

(b) The student moulds the piece of modelling clay into a spherical shape.

Draw a diagram to show how you would use two rectangular blocks of wood and a rule to measure the diameter of the sphere of modelling clay.

(c) The student pours water into a measuring cylinder, as shown in Fig. 1.5.

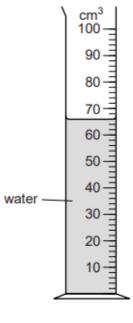


Fig. 1.5

(i) Record the volume  $V_1$  of water shown in Fig. 1.5.

(ii) On Fig. 1.5, show clearly the line of sight required to take the reading of  $V_1$ . [1]

(d) The student uses a piece of string to lower the sample of modelling clay into the measuring cylinder until it is completely covered with water. The new volume reading V<sub>2</sub> is 84 cm<sup>3</sup>.

Calculate the volume  $V_B$  of the modelling clay using the equation  $V_B = (V_2 - V_1)$ .

(e) The student suggests that the volume of the modelling clay should not change when the shape is changed.

Assuming that the experiment has been carried out with care, suggest two reasons why the values  $V_A$  and  $V_B$  may not be the same.

1	 	 	 



.....[2]

[Total: 9]

12 An IGCSE student is taking measurements of a drinks cup.

Carry out the following instructions, referring to Fig. 5.1.

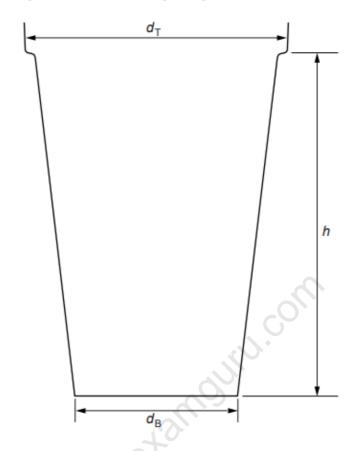


Fig. 5.1

(a) (i) On Fig. 5.1, measure the height h of the cup.

(ii) On Fig. 5.1, measure the diameter  $d_T$  of the top of the cup.

(iii) On Fig. 5.1, measure the diameter  $d_{\rm B}$  of the bottom of the cup.

(iv) Calculate the average diameter  $d_A$ , using the equation  $d_A = \frac{d_T + d_B}{2}$ .

(v) Calculate an approximate value for the volume V of the cup, using the equation  $V = \frac{\pi d_A^2 h}{4}$ .

V = .....[3]

(b) The student determines the average circumference of the cup, using a 50 cm length of string and a metre rule.

Fig. 5.2 shows how the student used the string to determine the average circumference.

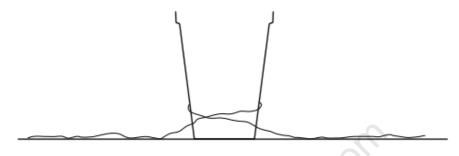


Fig. 5.2

Describe how you would use the string to obtain a more reliable value for the average circumference.

/ Q<sup>1</sup>

(c) The student fills a measuring cylinder to the 500 cm<sup>3</sup> mark. He pours water from the measuring cylinder into the cup until the cup is full. Fig. 5.3 shows the water remaining in the measuring cylinder.

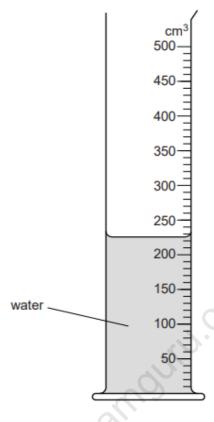


Fig. 5.3

(i) Record the volume of water  $V_{\rm R}$  remaining in the measuring cylinder.

١	/_	=	
	_		

(ii) Calculate the volume  $V_{\rm W}$  of the water in the cup.

(d) On Fig. 5.3, show clearly the line of sight required to take the reading of  $V_R$ . [1]

[Total: 8]

13 The class is investigating a pendulum.

Figs. 1.1 and 1.2 show the pendulum.

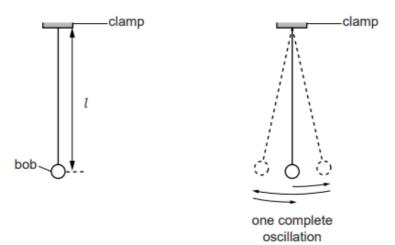


Fig. 1.1 Fig. 1.2

(a) A student adjusts the pendulum until its length  $l = 50.0 \,\mathrm{cm}$ .

State one precaution that you would take to measure the length  $\it l$  as accurately as possible. You may draw a diagram.

[1]

- **(b)** The student displaces the pendulum bob slightly and releases it so that it swings. She measures the time *t* for 20 complete oscillations of the pendulum (see Fig. 1.2).
  - (i) Record the time t, in s, shown on the stopwatch in Fig. 1.3.

(c)

(d)



Fig. 1.3

	Fig. 1.3				
	t=				s [1]
(ii)	Calculate the period <i>T</i> of the pendulum. The oscillation.	e period i	is the ti	me for on	e complete
	T =				[1]
(iii)	Explain why measuring the time for 20 oscillatio accurate value for <i>T</i> .				
	ne student adjusts the length of the pendulum unto ocedure and obtains a value for the period $T$ .	il its length	h <i>l</i> = 100	0.0 cm. She	repeats the
	T=	:		2.06s	
	nother student suggests that doubling the lengtheriod $T$ .	h l of the	pendul	um should	double the
	ate whether the results support this suggestion. sults.	Justify yo	our answ	er by refe	rence to the
stat	atement				
just	stification				
					[2]
					[4]
	continue the investigation of the relationship betweriod $T$ , it is necessary to use a range of values of		ength 1 o	f the pendu	ılum and the

[Total: 8]

List additional *l* values that you would plan to use in the laboratory.

14 The class is investigating two different types of pendulum.

Figs. 1.1 and 1.2 show the apparatus used.

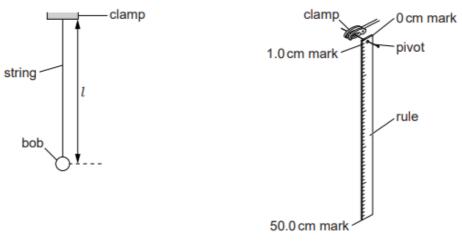


Fig. 1.1

Fig. 1.2

(a) (i) On Fig. 1.1, measure the length *l* of the pendulum.

1=	[1]	1
-	ъ.	

- (ii) Explain briefly how you would measure the length *l* of a pendulum, of the type shown in Fig. 1.1, as accurately as possible.
- (b) A student adjusts the length 1 of the pendulum shown in Fig. 1.1 to be exactly 50.0 cm. She displaces the pendulum bob slightly and releases it so that it swings. She measures the time t<sub>S</sub> for 20 complete oscillations of the pendulum.
  - (i) Record the time t<sub>S</sub> as shown in Fig. 1.3.



Fig. 1.3

(ii) Calculate the period  $T_{\rm S}$  of the pendulum. The period is the time for one complete oscillation.

	(iii)	Explain why measuring the time for 20 oscillations, rather than for 1 oscillation, gives a more accurate value for $T_{\rm S}$ .
		[1]
(c)	and	pendulum shown in Fig. 1.2 is a 50.0 cm rule. The student displaces this pendulum slightly releases it so that it swings. She measures the time $t_{\rm C}$ for 20 complete oscillations of the dulum.
		t <sub>C</sub> = 23.2s
	(i)	State a precaution that you would take to ensure that the measurement of time $t_{\mathbb{C}}$ is reliable.
	(ii)	Calculate the period $T_{\rm C}$ of the pendulum. The period is the time for one complete oscillation.
		τ <sub>c</sub> =[1]
		T <sub>G</sub> =
		[1]
(d)	A st	udent suggests that $T_{ m C}$ should be equal to $T_{ m S}$ .
	Stat	e whether the results support this suggestion. Justify your answer by reference to the lts.
	state	ement
	justi	fication
		[2]
(e)		the length $\it l$ of the first pendulum has been measured accurately at 50.0 cm and the length of the strip that forms the second pendulum is exactly 50.0 cm long.
	_	gest why it may not be correct to state that both pendulums have the same length 0.0 cm.
		[1]
		[Total: 9]

## **Chapter 2: Motion**

1 An IGCSE student is investigating the average speed of a toy car travelling down a slope.

She releases the toy car on the slope. She uses a stopwatch to measure the time taken for the car to travel down part of the slope. Fig. 5.1 shows the slope.

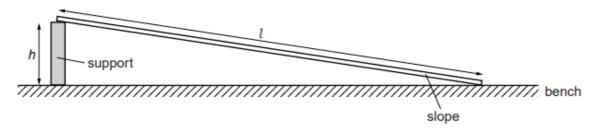


Fig. 5.1

(a)	(i)	Suggest a suitable length $\it l$ for the slope used in this school laboratory experiment.	
		1 =	
	(ii)	Suggest a suitable height <i>h</i> , above the laboratory bench, for one end of the slope.	
		$h \equiv$	
			[2]

(b) The student tries to determine the time that the toy car takes to travel a distance down the slope.

Make three suggestions about what she could do to ensure that the distance travelled and the time taken by the toy car are measured as reliably as possible.

1.		
	6	
2		
•••	[3	 31

[Total: 5]

2 The class is investigating the motion of a small steel ball when it is dropped on to a tray sand. Fig. 5.1 shows the apparatus.		
		steel ball
		sand
		Fig. 5.1
	(a)	A student is measuring the time it takes for the steel ball to fall through 2.00 m on to the sand. He uses a stopwatch.
		Suggest a cause of inaccuracy in the timing.
		[1]
	(b)	When the steel ball falls into the sand it creates a circular hole.
	(5)	Suggest how you would measure the diameter of the hole as reliably as possible. Name the measuring device that you would use. You may draw a diagram.
		CCS
	(c)	The student suggests that the diameter of the hole depends on the height from which the ball is dropped, because this affects the speed.
		Suggest two other variables on which the size of the hole may depend.
		1
		2

[Total: 5]