Topical Practice IGCSE PHYSICS Paper 4

Chapters 3-7

EDITION • Volum • STUDENT

CONTENTS

Chapter	Topic	Pages
3	 FORCES Hooke's Law, Limit of Proportionality, Extension-Load Graphs Effect on Motion and F = ma Circular Motion (Perpendicular Force) Friction and Air Resistance Turning Effect / Moments Conditions for Equilibrium Centre of Mass Scalars and Vectors 	3 - 37
4	 MOMENTUM Momentum Impulse Principle of Conservation of Momentum 	-
5	 ENERGY, WORK, POWER Energy (Includes: Types, Changes, Conservation, Transfer, Conversion, Sources, Advantages and Disadvantages) The Sun (Source of Energy and Nuclear Fusion) Efficiency Work Power 	38 - 44
6	PRESSURE o Force and Area, $p = F/A$ o Pressure Beneath Liquid Surface, $p = \rho gh$ o Barometers and Manometers	45 - 46
7	 KINETIC MOLECULAR MODEL OF MATTER States of Matter Molecular Structure, Forces, Distances, and Motion Random Motion and Brownian Motion Pressure as Change of Momentum Evaporation Effects of Temperature and Volume on Pressure, pV = constant 	_

Chapter 3: Forces

1 An IGCSE student is determining the mass of a metre rule using a balancing method.

Fig. 1.1 shows the apparatus.

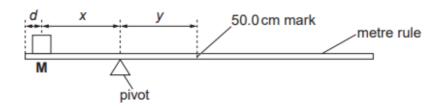


Fig. 1.1

Mass M is placed on the rule. The position of the pivot is adjusted until the rule balances.

(a) The student chooses a mass **M** which is similar to the mass of the metre rule. Suggest a suitable value for the mass.

suitable mass =[1]

(b) The mass is cylindrical and has a diameter slightly larger than the width of the metre rule.

Describe briefly how you would place the mass so that its centre of mass is exactly over the 90.0 cm mark on the metre rule. You should draw a diagram and mark the position of the centre of mass on the cylinder.

•••••		

(c) From your experience of carrying out balancing experiments of this type, suggest one difficulty that you are likely to come across that could make the final result inaccurate.

(d)	The student takes a reading of x and the corresponding reading of y. He then calculates
	the mass of the metre rule.

Suggest how y using this meth	d improve	the reli	ability o	f the val	ue of the	e mass o	of the met	tre rule,
								[1]

(e) Another student carries out a similar experiment to determine the mass of a 50 cm metal strip. She calculates the mass and writes down "mass = 234.872 g".

She checks the mass on an accurate balance. The value is 235g. She thinks she must have made a mistake in her experiment.

Write a brief comment on the accuracy of her experimental result.

[Total: 6]

2 The IGCSE class is investigating the effect of a load on a metre rule attached to a forcemeter.

The apparatus is shown in Fig. 1.1.

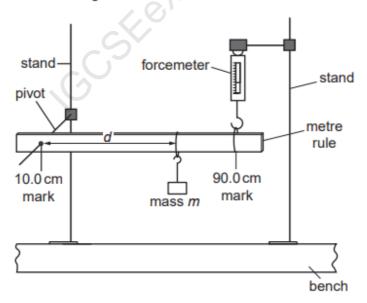


Fig. 1.1

The rule is pivoted near one end at the 10.0 cm mark. Near the other end, at the 90.0 cm mark, the rule is attached to a forcemeter. A mass is hanging from the rule at a distance d from the pivot.

(a) A student moves the mass to a distance d = 70.0 cm from the pivot. He adjusts the height of the forcemeter until the rule is again horizontal. He records the reading F on the forcemeter.

He repeats the procedure using *d* values of 60.0 cm, 50.0 cm, 40.0 cm, 30.0 cm, 20.0 cm and 10.0 cm. The forcemeter readings are shown in Table 1.1.

Table 1.1

d/	F/	
	2.9	
	2.5	
	2.2	
	1.8	
	1.5	
	1.2	
	0.8	C
s in the table.		•

- (i) Record the d values in the table.
- (ii) Complete the column headings in the table.

[2]

- (b) The student thinks that F is directly proportional to d.
 - (i) Suggest the graph that you could plot to test this idea. You are not asked to plot the graph.

	against

(ii) State the properties of the line that would indicate that F is directly proportional to d.

1.	
_	

[3]

(c) A spirit level is a piece of equipment that is placed on a surface to check whether the surface is horizontal.

Suggest why a spirit level balanced on the rule is not suitable for checking whether the rule is horizontal in this experiment.

(d)	Describe briefly how you would check that the rule is horizontal in this experiment. You may draw a diagram.
	[1]
	[Total: 7]
The	e IGCSE class is investigating the stretching of a spring.
Fig	1.1 shows the experimental set up.
	clamp ————————————————————————————————————
	spring

3

Fig. 1.1

(a) On Fig. 1.1, measure the vertical distance d_0 , in mm, between the bottom of the spring and the surface of the bench.

(b) The diagram is drawn $1/10^{th}$ actual size. Calculate the actual distance D_0 , in mm, between the bottom of the spring and the surface of the bench.

(c) A student hangs a 1.0 N load on the spring. He measures and records the distance D between the bottom of the spring and the surface of the bench, and the value of the load L.

He repeats the procedure using loads of 2.0 N, 3.0 N, 4.0 N and 5.0 N. The distance readings are shown in Table 1.1.

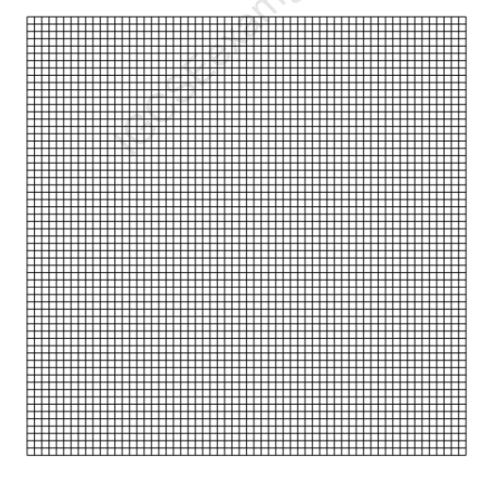
Calculate the extension e of the spring, for each set of readings, using the equation $e = (D_0 - D)$. Record the values of L and e in Table 1.1.

Table 1.1

L/N	D/mm	e/mm
	199	
	191	
	179	~
	171	60,
	160	

[2]

(d) Plot a graph of e/mm (y-axis) against L/N (x-axis).



[4]

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

(f) When making measurements, the student is careful to avoid a line-of-sight error.

Suggest one other precaution that the student should take when measuring the distance *D* between the bottom of the spring and the surface of the bench.

[Total: 11]

- 4 An IGCSE class is carrying out this experiment to determine the mass of a metal block.
 - Fig. 1.1 shows a spring drawn full size.

Fig. 1.2, also full size, shows the spring with a load of 100 g suspended from it.

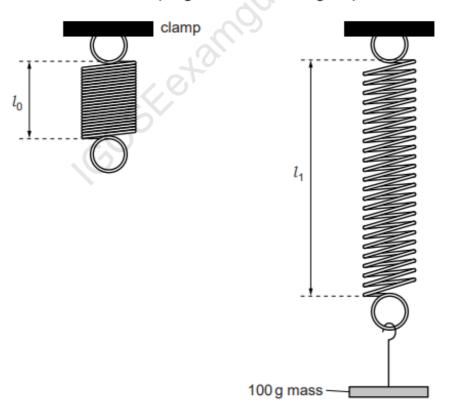


Fig. 1.1

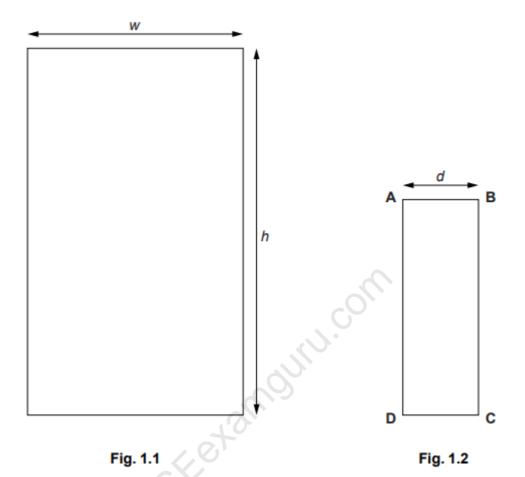
Fig. 1.2

(a) (I)	On Fig. 1.1, measure the length l_0 , in cm, of the spring without any load.
	$l_0 = \dots $
(ii)	On Fig. 1.2 measure the stretched length l_1 , in cm.
	l ₁ =cm
(iii)	Calculate the extension e_1 of the spring using the equation e_1 = $(l_1 - l_0)$.
(iv)	e_1 =[1] Determine a value for k using the equation $k = \frac{m}{e_1}$, where $m = 100 \text{g}$.
	k =
	metre rule hook
2	zero mark
bench [
	Fig. 1.3
As	tudent measures the length of the stretched spring and obtains the result
	l ₂ =
(i)	He then places a metal block X with its centre at the 40.0 cm mark on the rule.
	Explain briefly how the student can make sure that the block is in the correct position. You may wish to use a diagram.

	(ii)	The student measures the new length $\it l_{\rm 3}$ of the spring and records it as
		<i>t</i> ₃ =
		Determine the change in the extension ${\bf e}_2$ due to block ${\bf X}$, using the equation ${\bf e}_2$ = (l_3-l_2) .
		e ₂ =
	(iii)	Calculate the mass M of block \mathbf{X} using your answers to $\mathbf{(a)(iv)}$ and $\mathbf{(b)(ii)}$ and the
		equation $M = k \left(\frac{e_2}{0.40} \right)$.
		<i>M</i> =[2]
(c)	Sug	gest two practical causes of inaccuracy in this experiment.
	1	
	2	
		[2]
		[Total: 9]

5 The IGCSE class is investigating the stability of a block of wood.

Figs. 1.1 and 1.2 show the dimensions of the block.



(a) (i) On Figs. 1.1 and 1.2, measure the height h, width w and depth d of the block.

(ii) On Fig. 1.2, draw the line AC. [1]

(iii) Measure and record the angle α between lines **AD** and **AC**.

α =[1]

(b) A student places the block on the edge of the bench, as shown in Fig. 1.3.

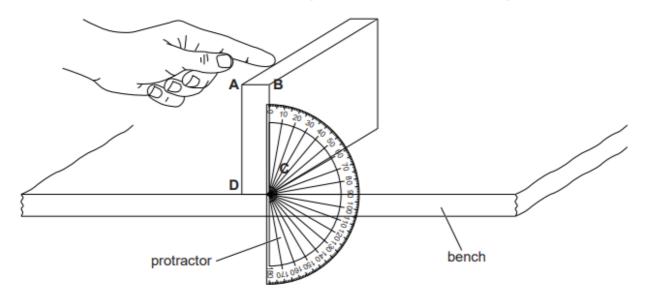


Fig. 1.3

He holds the protractor next to face **ABCD** of the block, as shown in Fig. 1.3. He gently pushes the top of the block (as indicated in Fig. 1.3) so that the block tips over.

He records the angle θ between side **BC** of the block and the vertical line on the protractor. The angle θ is when the block just tips over. He repeats this procedure a suitable number of times.

Suggest the number of measurements of θ that you think would be suitable for this experiment.

(c) The student calculates the average value θ_{av} of all his values for θ .

He suggests that θ_{av} should be equal to α . State whether the results support this suggestion. Justify your statement by reference to the results.

statement	 	
justification	 	
		[2]

[Total: 7]

6 The IGCSE class is determining the mass of a metre rule using two methods.

Method 1.

Fig. 1.1 shows the apparatus used.

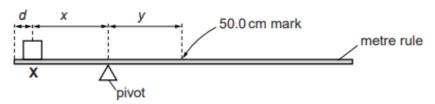


Fig. 1.1

A student places a $100 \,\mathrm{g}$ mass **X** on the rule so that its centre is at a distance $d = 5.0 \,\mathrm{cm}$ from the zero end of the rule, as shown in Fig. 1.1. He adjusts the position of the rule so that it is as near as possible to being balanced.

He measures the distance x from the centre of the mass \mathbf{X} to the pivot and the distance y from the pivot to the 50.0 cm mark on the rule.

He repeats the procedure using $d = 10.0 \,\mathrm{cm}$.

The readings are shown in Table 1.1.

Table 1.1

d/cm	x/cm	y/cm		
5.0	23.7	21.1		
10.0	21.0	18.5		

(a) (i) Using the values of x and y in the first row of the table, calculate the mass M of the rule using the equation

$$M = \frac{100x}{v}.$$

M =

(ii)	Repeat step (a)(i) using the values of x and y in the second row of the table.
	M =
	[2]
(iii)	Calculate the average value of M.
	average value of M =[1]
	101
	4.0
	average value of $M =$

Method 2.

(b) The student measures the mass M of the rule, using a spring balance as shown in Fig. 1.2.

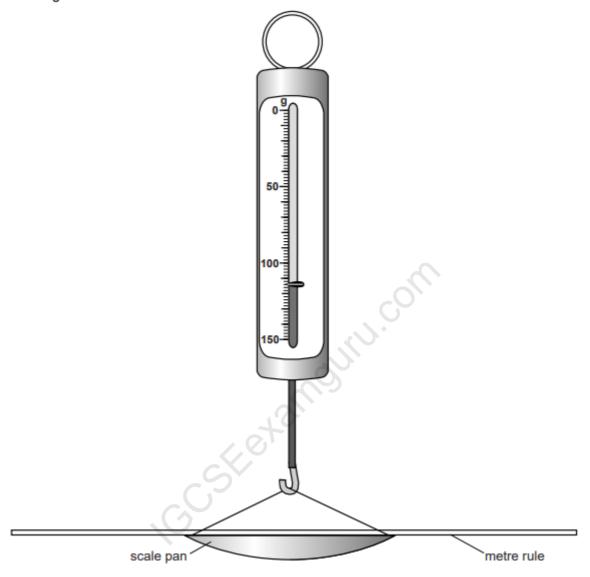


Fig. 1.2

Write down the reading shown in Fig. 1.2.

M =[1]

(c)	The student expects that the values of the mass \emph{M} obtained by the two methods will be exactly the same.			
	Suggest two practical reasons why, in spite of following the instructions with care, the values may differ. Assume that the balance used in Method 2 is accurate.			
	1			
	2			
	[2]			
(d)	Explain briefly how you would judge the position of the centre of the mass X when it is on the rule in Method 1. You may draw a diagram.			
	[1]			
	[Total: 7]			

7 The IGCSE class is determining the mass of a load **X** using a balancing method.

Fig. 5.1 shows the apparatus.

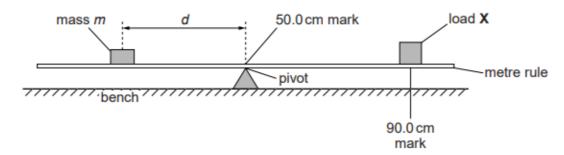


Fig. 5.1

The centre of the load **X** is fixed at the 90.0 cm mark on the rule.

A student uses a range of values of the mass *m* and determines the distance *d* from the pivot where the mass must be placed to balance the rule.

The readings are shown in Table 5.1.

Table 5.1

<i>m</i> /g	d/cm
40	30.2
50	23.9
60	20.0
70	17.1
80	15.1

(a) Calculate the distance x between the centre of the load X and the centre of the rule.

(c)	Using each set of readings and the value of x , the student calculates values for the mass of the load \mathbf{X} .
	He writes his results: 30.2g, 29.875g, 30g, 29.925g, 30.2g.
	Use these results to calculate an average value for the mass of ${\bf X}$ and give it to a suitable number of significant figures for this type of experiment.
	average value for the mass of X =[2]
(d)	This type of balancing experiment is difficult to carry out.
	Suggest one practical difficulty and one way to try to overcome the difficulty. You may draw a diagram, if you wish.
	practical difficulty
	way to overcome the difficulty
	way to overcome the difficulty
	[2]
	[Total: 6]

- 8 The IGCSE class is carrying out a moments experiment by balancing a metre rule on a small pivot.
 - (a) A student has a small pivot and a metre rule.

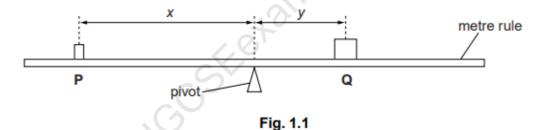
Explain briefly now the student finds the position of the centre of mass of the m	elle fule.
	[1]

(b) The student finds that the centre of mass is not in the middle of the rule but at the 50.2 cm mark.

Explain what the student could do to prevent this from affecting her results.

(c) The student places the metre rule on a pivot so that it balances.

She places a load $\bf P$ on one side of the metre rule at a distance x from the pivot. She places another load $\bf Q$ on the metre rule and adjusts the position of the load $\bf Q$ so that the rule balances, as shown in Fig. 1.1.



The load **Q** is a distance y from the pivot.

The readings are shown in Table 1.1.

Table 1.1

weight of P/N weight of Q/N		x/	y/	
2.0	5.0	39.0	15.5	

(i) Complete the column headings in the table.

[1]

	(ii)	Calculate the clockwise moment and the anticlockwise moment using the equation
		moment of a force = force × perpendicular distance to the pivot.
		clockwise moment =
		anticlockwise moment =[1]
(d)	In p	practice, it is difficult to adjust the loads to make the rule balance exactly.
		plain briefly how you would reduce the uncertainty in the position of Q required for
		ct balance.
		[1]
		[Total: 5]
		[Total: 5]

9 The IGCSE class is investigating the stretching of a spring.

Fig. 5.1 shows the apparatus.

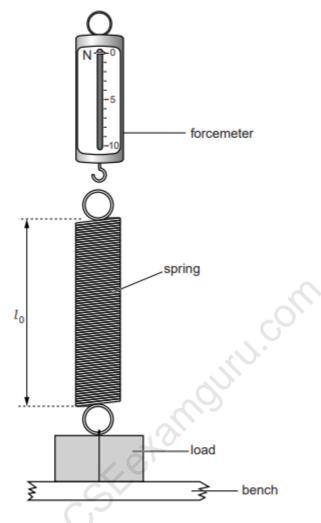


Fig. 5.1

(a) On Fig. 5.1, measure the unstretched length $l_{\rm 0}$ of the spring, in mm.

(b) A student hangs the spring on the forcemeter with the load attached to the bottom of the spring, as shown in Fig. 5.1. The load remains on the bench.

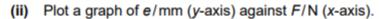
He gently raises the forcemeter until it reads $1.0\,\mathrm{N}$. He measures the new length l of the spring. He repeats the procedure using a range of forcemeter readings. The readings are recorded in Table 5.1.

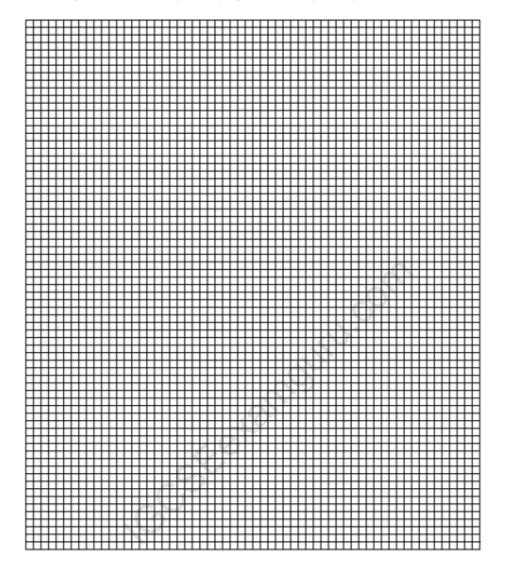
Table 5.1

F/N	l/mm	e/mm
1.0	67	
2.0	77	
3.0	91	
4.0	105	
5.0	115	

--

(i) Calculate the extension e of the spring, for each set of readings, using the equation $e = (l - l_0)$. Record the values of e in Table 5.1. [1]





[5]

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

[Total: 9]

10 The IGCSE class is investigating the motion of a mass hanging on a spring.

Fig. 1.1 shows the apparatus

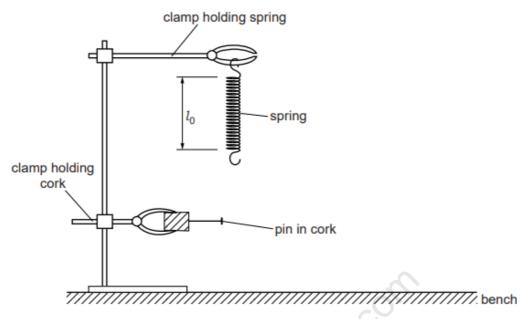


Fig. 1.1

(a)	On Fig	1 1	measure	the	lenath	1_	of the	unstretched	spring	in	mm

(b) The diagram is drawn one tenth of actual size. Write down the actual length L_0 of the unstretched spring, in mm.

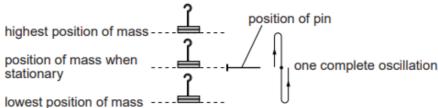
$$L_0 = \dots mm [1]$$

A student hangs a 300 g mass on the spring and measures the new length L of the spring.

(i) Calculate the extension e of the spring using the equation $e = (L - L_0)$.

(ii) Calculate a value for the spring constant k using the equation $k = \frac{F}{e}$, where F = 3.0 N. Include the appropriate unit.

(c) The student adjusts the position of the lower clamp so that the pin is level with the bottom of the mass when the mass is not moving. She pulls the mass down a short distance and releases it so that it oscillates up and down. Fig. 1.2 shows one complete oscillation.



		position of mass when stationary one complete oscillation
		lowest position of mass U
		Fig. 1.2
	She	e measures the time t taken for 20 complete oscillations.
		t =
	Cal	culate the time <i>T</i> taken for one complete oscillation.
		τ€[1]
(d)	She	replaces the 300g mass with a 500g mass. She repeats the timing as described in part
		t =34.48 s
	(i)	Calculate the time <i>T</i> taken for one complete oscillation.
	(-)	CKO I
		Τ=
	(ii)	The student suggests that the time taken for the oscillations of the spring should not be affected by the change in mass.
		State whether her results support this suggestion and justify your answer by reference to the results.
		statement
		justification
		[2]
		[2]

(e)	spring in this type of experiment. You may draw a diagram.
	[1]

11 The IGCSE class is investigating the downward deflection of a metre rule clamped at one end.

The apparatus has been set up as shown in Fig. 1.1. The 0.0 cm mark is at the free end of the rule.

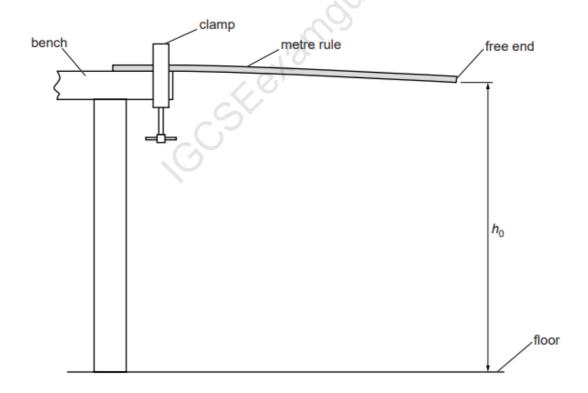


Fig. 1.1

(a) (i) On Fig. 1.1, measure h_0 .

[Total: 8]

Calculate and record the actual height H_0 of the free end of the metre rule above the floor.

(b) A student carefully places a mass on the rule at a distance d = 60.0 cm from the free end of the rule.

Explain how he could make sure that the centre of the mass was at this 60.0 cm mark. You may use a diagram.

	, O	
 		[1]

(c) Fig. 1.2 shows the mass in place on the rule.

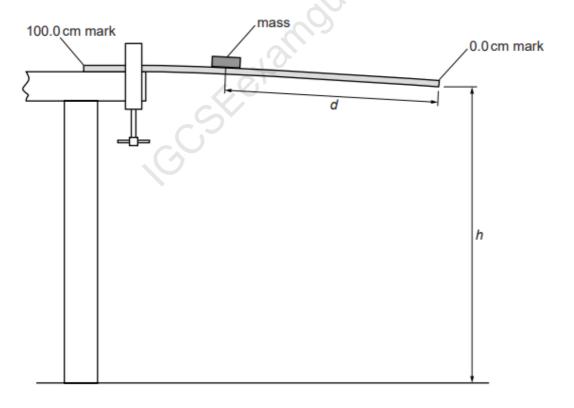


Fig. 1.2

(i) On Fig. 1.2, measure h.

(ii) Fig. 1.2 is also drawn to 1/10th scale.

Calculate, and record in Table 1.1, the actual height H of the free end of the rule above the floor.

Table 1.1

d/cm	H/cm	D/cm	(d × D)/cm ²
60.0			
50.0	82.5	1.5	
40.0	81.5	2.5	
30.0	80.3	3.7	
20.0	79.0	5.0	

[2]

- (d) The procedure is repeated for *d* values of 50.0 cm, 40.0 cm, 30.0 cm and 20.0 cm. The results are shown in the table.
 - (i) For d = 60.0 cm, calculate and record in the table the downward deflection D (change in height) produced by the mass. Use the results from (a)(ii) and from the table, and the equation $D = H_0 H$.
 - (ii) For each value of d, use the results from the table to calculate and record in the table the value of $(d \times D)$.

(e)		sudent suggests that the downward deflection D is inversely proportional to the distance d is, D is proportional to $1/d$).
		ng some appropriate figures from Table 1.1, explain why this cannot be the case.
		[1]
(f)	(i)	Although the metre rule is flat when placed on the bench, one student notices that the free end is slightly deflected downwards when clamped as shown in Fig. 1.1, even when the mass is not placed on it.

Explain why this deflection occurs.

(iii) S	Suggest how	to find the	value of this deflect	ction. You may draw	a diagram

	 	•••••	•••••
[2]	 		
[Total: 8]			
i iolai. oi			

12 The class is determining the weight of a metre rule using a balancing method.

The apparatus is shown in Fig. 1.1.

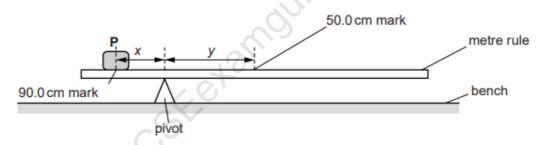


Fig. 1.1

- (a) A student places a load **P** at the 90.0 cm mark on a metre rule and then balances the rule on a pivot.
 - (i) On Fig. 1.1, measure the distance x from the 90.0 cm mark to the pivot.

(ii) On Fig. 1.1, measure the distance y from the pivot to the centre of the rule.

- (b) Fig. 1.1 is drawn one tenth of actual size.
 - (i) Calculate the actual distance X from the 90.0 cm mark to the pivot.

(ii) Calculate the actual distance Y from the pivot to the centre of the rule.

(iii) Determine a value W_1 for the weight of the metre rule using the equation $W_1 = \frac{PX}{Y}$, where $P = 2.0 \, \text{N}$. P is the weight of the load P.

$$W_1 = \dots [1]$$

(c) The student keeps the pivot at the same position and moves load P to the 95.0 cm mark. He places a load Q of weight Q = 1.0 N, on the metre rule. He adjusts its position so that the rule balances.

On Fig. 1.2 mark, with a letter Z, the approximate position of the load $\bf Q$. You do not need to carry out a detailed calculation.

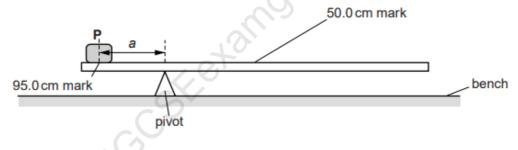


Fig. 1.2

[1]

(d)	The student uses the values of ${\bf P}$ and ${\bf Q}$ and their distances from the pivot to calculate a second value W_2 for the weight of the rule.
	$W_2 = \dots 1.12 N$
	The student expects W_1 and W_2 to be the same.
	State whether the results support his idea. Justify your answer by reference to the results.
	statement
	justification
	[2]
(e)	Suggest one practical reason why it is difficult to obtain exact results with this experiment.

[Total: 8]

13 The class is determining the mass of an object using two strings.

The apparatus is set up as shown in Fig. 1.1.

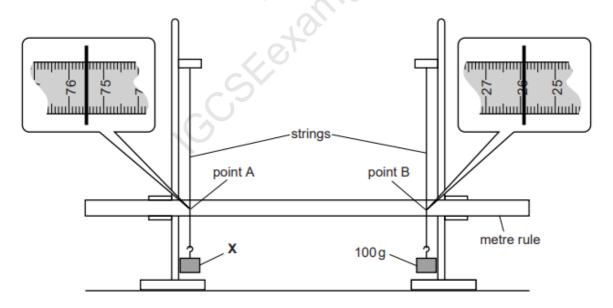


Fig. 1.1

(a) (i) Record the scale reading a_0 at point A, where the string crosses the rule, as indicated in the enlarged section of Fig. 1.1.

(ii) Record the scale reading b₀ at point B.

(b) A loop of string is placed around the vertical strings so that they are pulled closer together, as shown in Fig. 1.2. The loop is horizontal and is just above the rule.

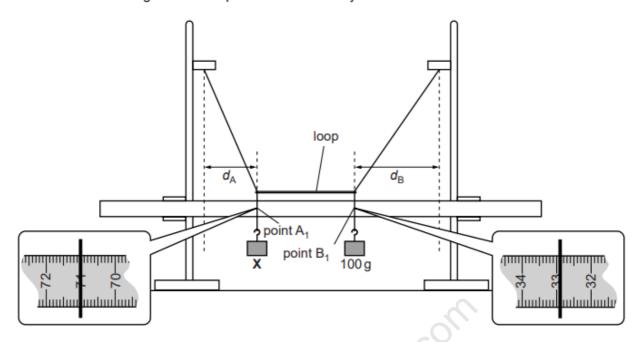


Fig. 1.2

(i)	Record the scale reading a ₄ at point A	as indicated in the enlarge	ed section of Fig. 1.2

(ii) Record the scale reading b, at point B,.

(iii) Calculate and record the distance d_A , shown in Fig. 1.2. Use your results from (a)(i) and (b)(i). d_A is the difference between a_0 and a_1 .

(iv) Calculate and record the distance $d_{\rm B}$. Use your results from (a)(ii) and (b)(ii). $d_{\rm B}$ is the difference between b_1 and b_0 .

(c) Calculate the mass M of object X, using your results from (b)(iii) and (b)(iv) and the equation $M = \frac{k d_B}{d_A}$ where $k = 100 \,\text{g}$.

(d)	Explain how you could ensure that the loop is hor	izontal in (b) . You may draw a diagram.
		[41
		[1]
(e)	A student suggests that d_A and d_B might be direct	
	Briefly describe how this experiment could be ext	ended to investigate the suggestion.
		[2]
		[Total: 9]
The	e class is investigating the masses of two loads, P	and Q .
Fig.	j. 1.1 shows the apparatus.	
	- 2	marker and a
	P	metre rule
		h h
	pivot	bènch
	Fig. 1.1	
(a)	A student places the metre rule on the pivot at the	50.0 cm mark.
	He places the load P on the metre rule. He the adjusts its position so that the metre rule is as near	
	(i) On Fig. 1.1, measure the distance x from the	centre of load P to the pivot.
		ζ=
	(ii) On Fig. 1.1, measure the distance y from the	pivot to the centre of load Q .
		/=
	•	[1]

(iii) Fig. 1.1 is drawn 1/10th full size.

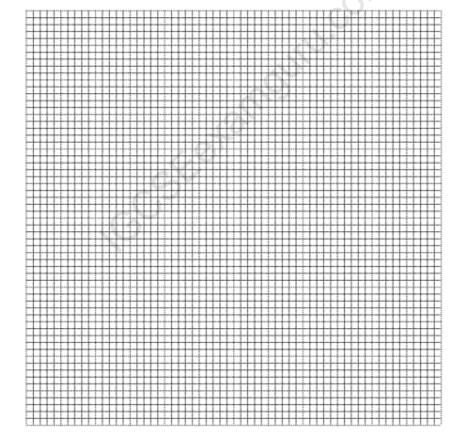
Calculate the actual distance a from the centre of load P to the pivot. Calculate the actual distance b from the pivot to the centre of load Q. Write the results in Table 1.1. [1]

Table 1.1

a/cm	b/cm
35.0	17.6
30.0	14.8
25.0	12.7
20.0	10.1

(b) The student repeats the procedure using different positions of **P**. His readings are shown in the table.

Plot a graph of b/cm (y-axis) against a/cm (x-axis).



[4]

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

(d) The gradient G is the ratio of the masses of the two loads P and Q.

Suggest a suitable value for the mass of $\bf P$ in this experiment. Use this, and your value for $\bf G$, to determine an estimate for the mass of $\bf Q$.

[Total: 10]

15 The class is investigating the behaviour of a spring, and then using the spring to determine the weight of an object.

The apparatus is shown in Fig. 2.1.

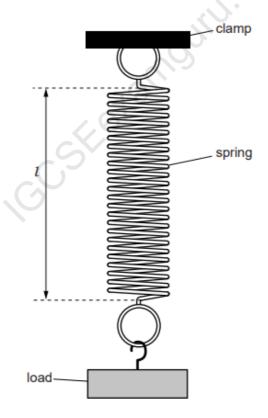


Fig. 2.1

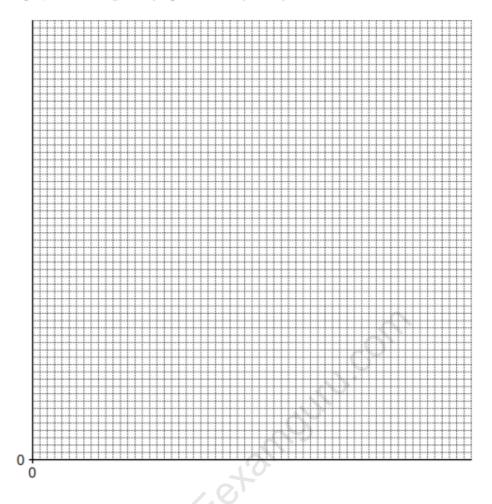
(a)	A load of weight $L=1.0\mathrm{N}$ is hung on the spring. The stretched length l of the spring, as indicated in Fig. 2.1, is recorded in Table 2.1.
	Suggest a precaution that you would take when measuring the length of the spring, to ensure a reliable reading. You may draw a diagram.

(b) Step (a) is repeated for values of L = 2.0 N, 3.0 N, 4.0 N and 5.0 N. The readings are shown in Table 2.1.

Table 2.1

L/N	1/cm
1.0	6.1
2.0	9.0
3.0	13.4
4.0	16.8
5.0	21.0

Plot a graph of l/cm (y-axis) against L/N (x-axis).



(c) Use your graph to determine the length \boldsymbol{l}_0 of the spring with no load attached.

 $l_0 = \dots [1]$

[4]

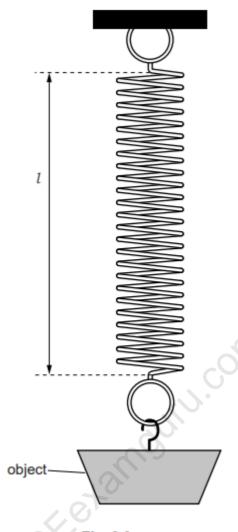


Fig. 2.2

- (d) The loads are removed and an object is suspended from the spring, as shown in Fig. 2.2.
 - (i) On Fig. 2.2, measure the stretched length *l* of the spring.

(ii) Use the graph, and your reading from (d)(i), to determine the weight W of the object. Show clearly on the graph how you obtained your answer.

(e) A student measures the weight of a different load using this same method. He gives the weight as 2.564 N.

Explain why this is not a suitable number of significant figures for this experiment.

[Total: 10]

Chapter 5: Energy, Work, and Power

1 Some IGCSE students are carrying out an experiment to investigate how a tennis ball bounces on various surfaces.

Fig. 5.1 shows how they are doing this. The ball is dropped from a known height and the height of the bounce is measured.

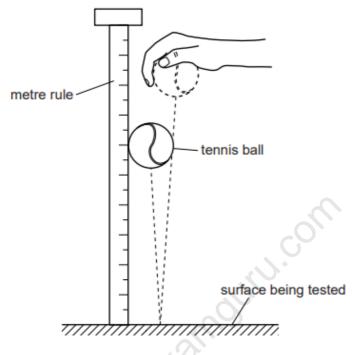


Fig. 5.1

(a) One student drops the ball several times from a height of 100 cm. Each time he measures the height to which the ball bounces. His measurements are shown in Table 5.1.

Table 5.1

test	1	2	3	4	5
height of bounce/cm	74	70	72	53	69

•	are not asked to cal	•	ounce could be a	cnieved from
				[2]
				[4]

(b)	Another student releases the ball from a height of 100 cm on to a stone floor. It bounces to a height of 75 cm.
	Calculate the efficiency of the bounce on the stone floor using the equation
	efficiency = $\frac{\text{height of bounce}}{\text{height of release}} \times 100\%$.
	efficiency =[1]
(c)	A third student releases the ball from a height of 85cm on to a concrete floor and it bounces to a height of 75cm.
	Without any further calculation, state whether the efficiency for the concrete floor is less than, greater than, or roughly the same as the efficiency for the stone floor. Explain your reasoning.
	statement
	explanation
	[2]
	[Total: 5]

2 An IGCSE student is investigating the motion of a ball down a slope.

She is using the apparatus shown in Fig. 4.1.

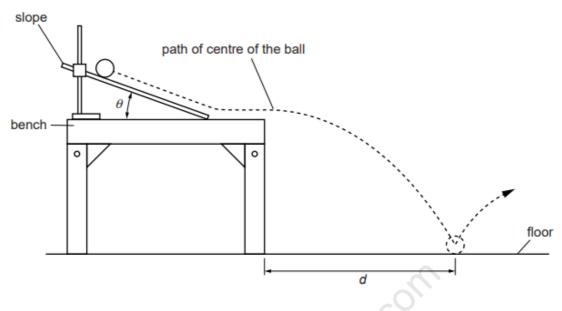


Fig. 4.1

She measures the angle θ of the slope, releases the ball from a marked point on the slope and watches where it hits the floor.

She then measures the distance d from the table to where the ball lands.

This is repeated for a number of angles, releasing the ball from the same point on the slope. Her results are shown in Table 4.1.

Table 4.1

θl°	d/cm
20	42
30	55
40	64
50	51
60	40

(a)	(i)	Describe the pattern in the values of d as θ is increased.
		[1]
	(ii)	From the pattern of results, predict what the \emph{d} values may be for slope angles of 10 $^{\circ}$ and 70 $^{\circ}$.
		10°
		70°[1]
(b)		student is being assessed and must carry out the experiment on her own. She says that difficult to release the ball carefully and then be able to see exactly where it lands.
		gest an improvement she might make to the experiment, so that she could obtain a more urate measurement of <i>d</i> .
		[1]
(c)	Sug	gest how she might make sure that the results of the experiment are reliable.
		<u>(,C)</u>
		[2]
		[Total: 5]

3 A student is investigating the behaviour of a solar panel.

She is using the apparatus shown in Fig. 5.1.

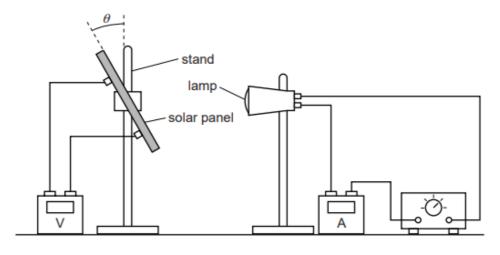
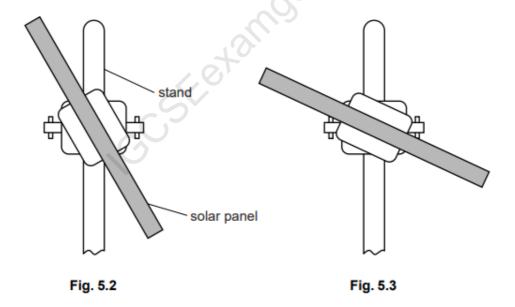


Fig. 5.1

She switches the lamp on. She changes the angle θ between the solar panel and the vertical and measures the voltage produced at each angle.

Figs. 5.2 and 5.3 show the solar panel at two different angles. The voltmeter readings for these angles are shown in Table 5.1.



(a) (i) Measure each value of the angle θ and record it in the table.

Table 5.1

	θl°	V/V
Fig. 5.2		3.62
Fig. 5.3		2.50

[1]

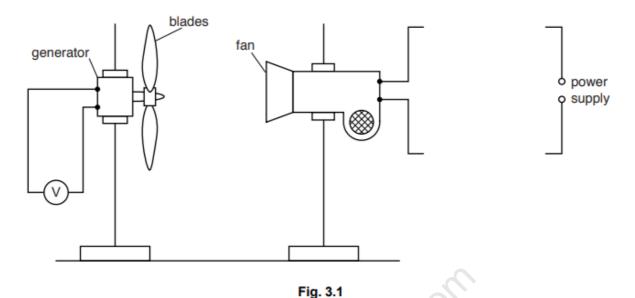
	(ii)	Explain what practical steps should be taken to obtain accurate measurements of θ in the experiment. You may draw a diagram to show the procedure.
		[1]
b)	The	student finds that a reading of 0.63V is obtained even when the lamp is switched off.
	Sug	gest a reason for this and explain what she could do to overcome this problem.
		son
		ıtion
		[2]
C)		gest two aspects of the apparatus that should be kept constant in order to make the ults of the experiment as reliable as possible.
	1	

[Total: 6]

[2]

4 Some students are carrying out experiments on a model wind turbine.

Some of their apparatus is shown in Fig. 3.1.



The turbine blades have been cut from cardboard. An electric fan is used to make the blades rotate. When they rotate, they turn a small generator.

- (a) One student is studying the effect of changing the electric current in the fan.
 - (i) Using standard symbols, complete the circuit in Fig. 3.1 to show a variable resistor and an ammeter connected for this purpose.
 - (ii) The student is carrying out the investigation over a number of days.

 Suggest a variable that he must keep constant in each of his tests.
- (b) Other students wish to test different aspects of the model wind turbine.

Suggest two variables, other than that already mentioned in (a)(ii), which they could change and which would affect the output of the generator.

1.		
2.		
•••	[2]	
	[4]	

[Total: 5]

Chapter 6: Pressure

The IGCSE class is investigating pressure.

A student places a rectangular block on a sheet of paper on the bench and draws the outline.

Fig. 5.1 shows the outline.

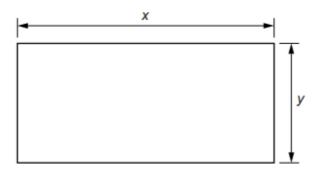


Fig. 5.1

(a) (i) On Fig. 5.1, measure the length x of the block.

(ii) On Fig. 5.1, measure the width y of the block.

(b) Fig. 5.2 shows the block being weighed using a forcemeter.

(i) Using Fig. 5.2, write down the weight W of the block.

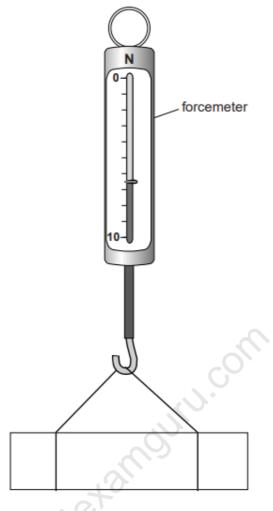


Fig. 5.2

(ii) Calculate the pressure P that the block exerts on the bench. Use the equation $P = \frac{W}{A}$ where A is the area of the block in contact with the bench (A = xy).

P =	 	
	[1]	

(c) The value calculated for P is slightly too small.

Suggest one practical source of inaccuracy that would account for this.

_____[1]

[Total: 5]