Centre Number	Class Index Number	Name	Class
S3016			

RAFFLES INSTITUTION
2021 Preliminary Examination

PHYSICS
Higher 2

9749/04
20 August 2021

Paper 4 Practical

2 hours 30 minutes

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your index number, name and class in the spaces provided at the top of this page.
Write in dark blue or black pen on both sides of the paper.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.
The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.

Give details of the practical shift and laboratory in the boxes provided.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

Shift
Laboratory

For Examiner's Use	
1	/ 16
2	/ 7
3	/ 21
4	/ 11
Total	/ 55

This document consists of **17** printed pages and **3** blank pages.

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1 This experiment considers the oscillatory motion of a cylinder on a curved section of a card.

(a) You have been provided with a sheet of card which has been attached to a piece of cardboard. The mid-point of the card has been marked by a straight line. You should not remove the card from the cardboard during the experiment.

(b) **(i)** Set up the apparatus as shown in Fig. 1.1.

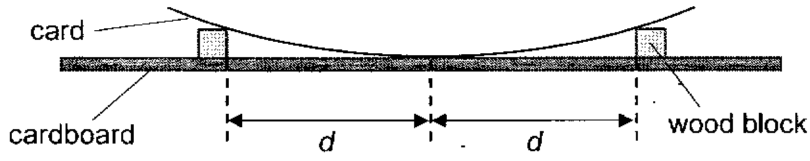

Fig. 1.1

Use the blocks of wood to raise both sides of the card so that the section of card between the blocks is curved. Each block should be a distance *d* from the centre of the card. Adjust the blocks until *d* is approximately 10 cm.

(ii) Measure and record *d*.

d = ... [1]

(iii) Estimate the percentage uncertainty in this value of *d*.

percentage uncertainty = ... [1]

(c) **(i)** Place the cylinder on the card close to one of the blocks. Release the cylinder so that it performs oscillations as shown in Fig. 1.2.

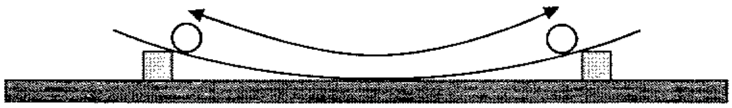

Fig. 1.2

(ii) Measure and record the period *T* of these oscillations.

T = ... [1]

(d) Vary the distance *d* by moving both of the blocks.
Values of *d* should not be less than 7.0 cm.
Repeat **(b)(i)**, **(b)(ii)**, **(c)(i)** and **(c)(ii)**.

Present your results clearly.

[5]

(e) It is suggested that *T* and *d* are related by the expression

$$T = A\,d^n$$

where *A* and *n* are constants.

Plot a suitable graph to determine the values of *A* and *n*.

A = ...

n = ... [7]

(f) A student suggests that *T* is directly proportional to *d*.

State whether the results of your experiment supports the student's suggested relationship.
Justify your conclusions by referring to your value in **(b)(iii)**.

....

....

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....

....

.... [1]

2 In this experiment, you will investigate the resistance of a wire in an electrical circuit.

(a) Measure the length L of resistance wire X.

L = ...

(b) Set up the electrical circuit as shown in Fig. 2.1.

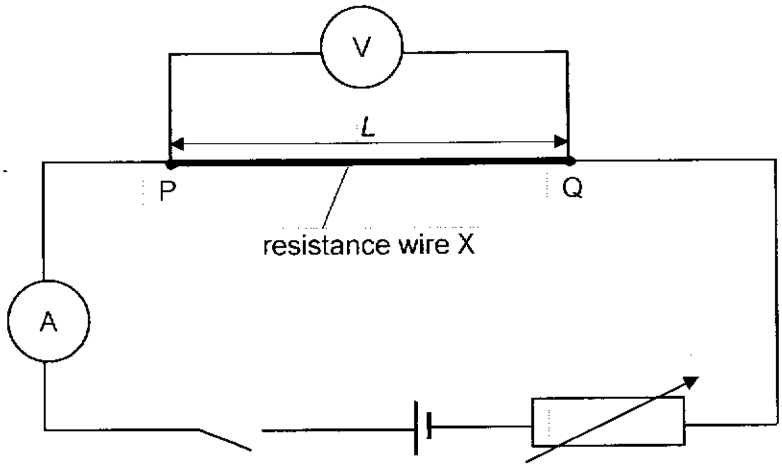

Fig. 2.1

Close the switch and adjust the variable resistor such that the current is about 100 mA.

Measure and record the value of the potential difference V_1 and current I_1 and hence determine the resistance R_1 of wire X.

V_1 = ...

I_1 = ... [1]

R_1 = ... [1]

Open the switch.

Note that the resistance wire may be hot if the circuit is left closed for a period of time.

(c) Remove wire *X* from the crocodile clips at P and Q and fold it into two equal segments as shown in Fig. 2.2.

Using the crocodile clips at P and Q, clip the ends of wire X as shown in Fig. 2.3 and connect the circuit as shown in Fig. 2.4.

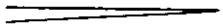

Fig. 2.2

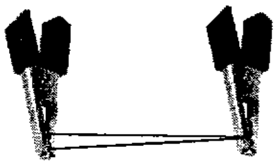

Fig. 2.3

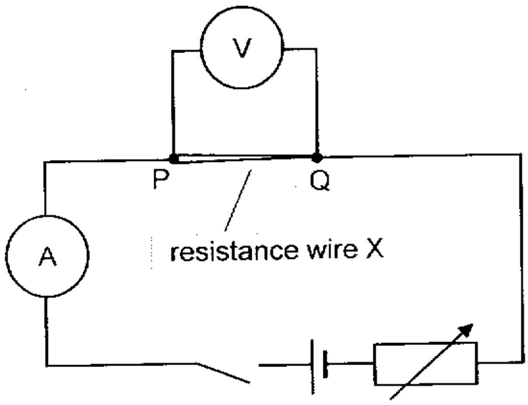

Fig. 2.4

Close the switch.

Measure and record the value of the potential difference V and current I and hence determine the resistance R of wire X in this configuration.

V = ...

I = ... [1]

R = ... [1]

Open the switch.

(d) It is suggested that

$$R = R_1 N^m$$

where m is an integer and N is the number of segments of the wire.

In part **(c)**, $N = 2$.

Calculate m using the results in **(b)** and **(c)**.

m = ... [1]

(e) If you were to repeat this experiment by folding wire X into different number of segments, describe the graph that you would plot to determine m.

....

....

....

.... [2]

[7 marks]

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3 In this experiment, you will investigate how the terminal velocity of a paper helicopter falling in air depends on the length of its rotor blades.

(a) Use the pair of scissors provided to cut out the paper helicopter template **3A** along the **solid lines**. Use the dotted lines to guide you in folding the template into the helicopter as shown in Fig. 3.1. Attach the paper clip provided to the bottom of the paper helicopter to lower its centre of gravity.

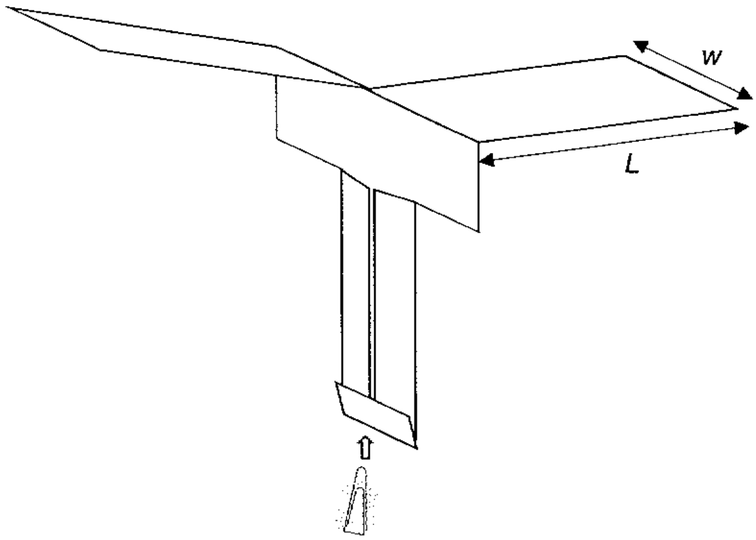

Fig. 3.1

(b) Measure and record the width of the rotor blade *w*.

w = ... [1]

(c) (i) Mount a metre rule vertically on the floor using a retort stand, boss and clamp.

(ii) Release the paper helicopter from at least 50 cm above the top of the metre rule as shown in Fig. 3.2.

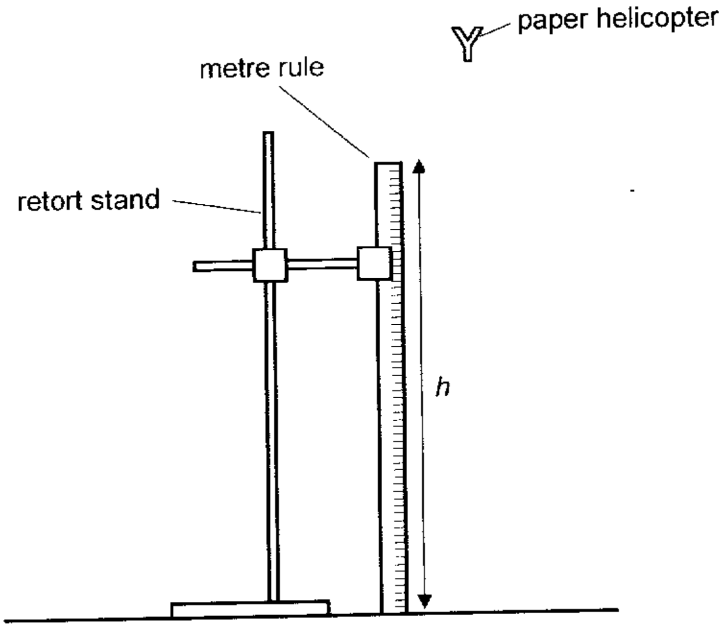

Fig. 3.2

(iii) Make and record measurements to determine the time *t* for the paper helicopter to fall through a distance h = 1.000 m.

t = ... [2]

(iv) Estimate the percentage uncertainty in your value of *t*.

percentage uncertainty of t = ... [1]

(v) You may assume that the paper helicopter has reached terminal velocity by the time it reaches the top of the metre ruler. Calculate the terminal velocity v of the paper helicopter.

v = ... [1]

(d) (i) Suggest a significant source of error in this experiment.

....

....

.... [1]

(ii) Suggest an improvement that could be made to the experiment to reduce the error identified in **(d)(i)**.

You may suggest the use of other apparatus or a different procedure.

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.... [1]

(e) (i) Repeat **(a)** using template **3B** to fold a second paper helicopter.

(ii) Repeat **(b)**, **(c)(ii)**, **(c)(iii)** and **(c)(v)** and record your results below.

w = ...

t = ...

v = ... [3]

(f) It is suggested that v is inversely proportional to w.

State and explain whether your results from **(b)**, **(c)(v)** and **(e)(ii)** support this suggestion. Justify your conclusion by referring to your answer in **(c)(iv)**.

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.... [2]

(g) In an investigation, the length L of the helicopter blades was varied.

The following results for L and t were recorded.

L / cm	5.0	6.5	8.0	9.5	11.0
t / s	0.46	0.70	1.00	1.27	1.60

(i) Plot t against L on the grid provided and draw the straight line of best fit.

[2]

(ii) Use your graph to determine the value of t when the helicopter has no blades.

t = ______________________ [2]

(iii) Comment on the value of t obtained in **(g)(ii)**.

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____ [2]

(h) The stability of the descending motion of the paper helicopter depends greatly on the position of its centre of gravity.

Plan an investigation to determine the position of the centre of gravity of the paper helicopter.

You may suggest the use of any additional apparatus commonly found in a school physics laboratory.

Your answer should include a diagram and your experimental procedure.

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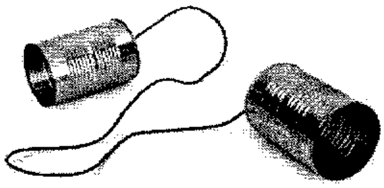
.... [3]

Total : [21 marks]

4 A tin can telephone is a type of acoustic (non-electrical) speech-transmitting device made up of two tin-cans; paper cups or similarly shaped items attached to either end of a taut string or wire. It is a particular case of mechanical telephony, where sound is converted into vibrations along a liquid or solid medium. These vibrations are transmitted along the medium and then reconverted back to sound. In the case of the tin-can telephone the medium is a string.

When the string is pulled taut and someone speaks into one of the cans, its base acts as a diaphragm, converting the sound waves into mechanical vibrations which vary the tension of the string. These variations in tension set up longitudinal waves in the string which travel to the second can, causing its base to vibrate in a similar manner as the first can, thus recreating the sound, which is heard by the second person.



For a string of length L with tension T, the intensity I of the sound produced at the second tin is given by

$$I = kL^aT^b$$

where k, a and b are constants.

Design an experiment to determine the values of a and b.

You would be provided with two tin cans with a small hole at the base of each can, some string and a sound level meter. You may also use any other equipment usually found in a physics laboratory.

Draw a diagram to show the arrangement of your apparatus. You should pay particular attention to

(a) the equipment you would use
(b) the procedure to be followed
(c) how the length, tension and intensity of sound are measured
(d) the control of the variables
(e) any precautions that should be taken to improve the accuracy and safety of the experiment.

Diagram

[11]

[Total: 11]

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2021 Raffles Institution Preliminary Examinations – H2 Physics
Paper 4 – Suggested Solutions

1 This experiment considers the oscillatory motion of a cylinder on a curved section of a card.

(a) You have been provided with a sheet of card which has been attached to the bench. The mid-point of the card has been marked by a straight line. You should not remove the card from the bench during the experiment.

(b) (i) Set up the apparatus as shown in Fig. 1.1.

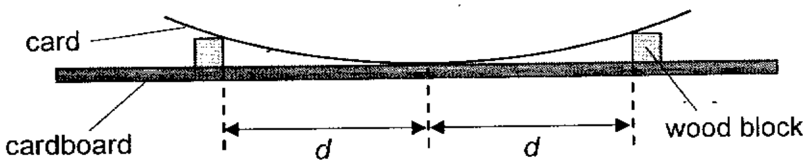


Fig. 1.1

Use the blocks of wood to raise both sides of the card so that the section of card between the blocks is curved. Each block should be a distance d away from the centre of the card. Adjust the blocks until d is approximately 10 cm.

(ii) Measure and record d.

$\frac{10.0+10.0}{2}=10.0$ cm

d = 10.0 cm [1]

(iii) Estimate the percentage uncertainty in this value of d.

$\frac{0.2}{10.0}\times 100\% = 2.0$ %

percentage uncertainty = 2.0 % [1]

(c) (i) Place the cylinder on the card close to one of the blocks. Release the cylinder so that it performs oscillations as shown in Fig. 1.2.

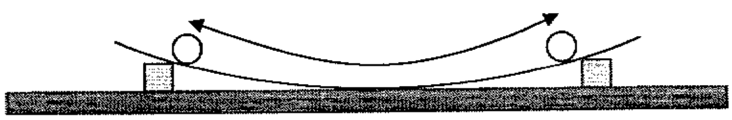


Fig. 1.2

(ii) Measure and record the period T of these oscillations.

$\frac{21.56+21.66}{2}=21.61$ s

$T=\frac{21.61}{20}=1.081$ s

T = 1.081 s [1]

(d) Vary the distance d by moving both of the blocks.
Values of d should not be less than 7.0 cm.
Repeat **(b)(i)**, **(c)(i)** and **(c)(ii)**.

Present your results clearly.

number of oscillations N	d / m	Time for N oscillations / s			T / s	lg (T / s)	lg (d / m)
		t_1	t_2	average			
30	0.070	23.14	23.16	23.15	0.7717	–0.1126	–1.155
25	0.080	21.82	21.94	21.88	0.8752	–0.0579	–1.097
20	0.090	19.10	19.33	19.22	0.9608	–0.0174	–1.046
20	0.100	21.56	21.66	21.61	1.081	0.0338	–1.000
20	0.110	23.41	23.19	23.30	1.165	0.0663	–0.959
20	0.120	25.24	25.05	25.15	1.257	0.0993	–0.921

[5]

(e) It is suggested that T and d are related by the expression

$$T = A\,d^n$$

where A and n are constants.

Plot a suitable graph to determine the values of A and n.

$\lg T = n \lg d + \lg A$
Plot graph of $\lg T$ against $\lg d$, where the gradient is n and y-intercept is $\lg A$.

Using points (–0.9300, 0.092) and (–1.1500, –0.108)

$\Rightarrow$ gradient $= \dfrac{0.092-(-0.108)}{-0.9300-(-1.1500)} = 0.909$

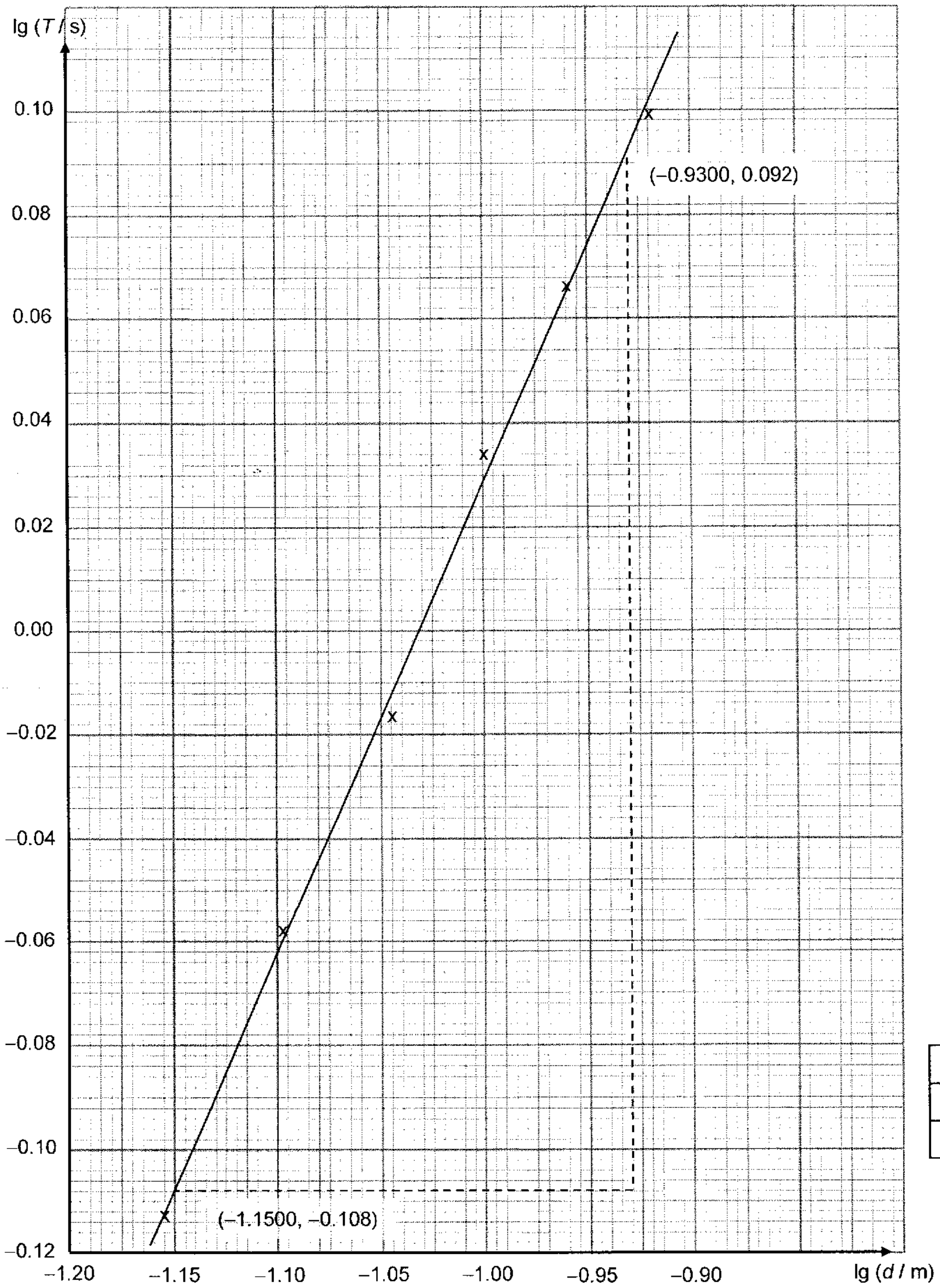
Using (–0.9300, 0.092) and gradient = 0.909,
$\Rightarrow 0.092 = 0.909\,(-0.9300) + \text{y-intercept}$
$\Rightarrow$ y-intercept = 0.937

n = gradient = 0.909

$\lg A$ = y-intercept = 0.937
$\Rightarrow A = 8.65\ \text{s m}^{0.909}$

A = 8.65 s $\text{m}^{-0.909}$

n = 0.909 [7]


lg (T / s)
0.10
0.08
0.06
0.04
0.02
0.00
−0.02
−0.04
−0.06
−0.08
−0.10
−0.12
(−0.9300, 0.092)
(−1.1500, −0.108)
−1.20
−1.15
−1.10
−1.05
−1.00
−0.95
−0.90
lg (d / m)

(iii) A student suggests that *T* is directly proportional to *d*.

State whether the results of your experiment supports the student's suggested relationship.
Justify your conclusions by referring to your value in **(b)(iii)**.

For *T* to be directly proportional to *d*, the value of *n* should be 1.

$$\frac{1-0.909}{1}\times 100\% = 9.1\%$$

Since this is larger than the percentage uncertainty calculated in **(b)(iii)**,

the results do not support the relationship.

[1]

2 In this experiment, you will investigate the resistance of a wire in an electrical circuit.

(a) Measure the length L of resistance wire X.

1 d.p. in cm. 3 d.p. in m.

L = 50.0 cm

(b) Set up the electrical circuit as shown in Fig. 2.1.

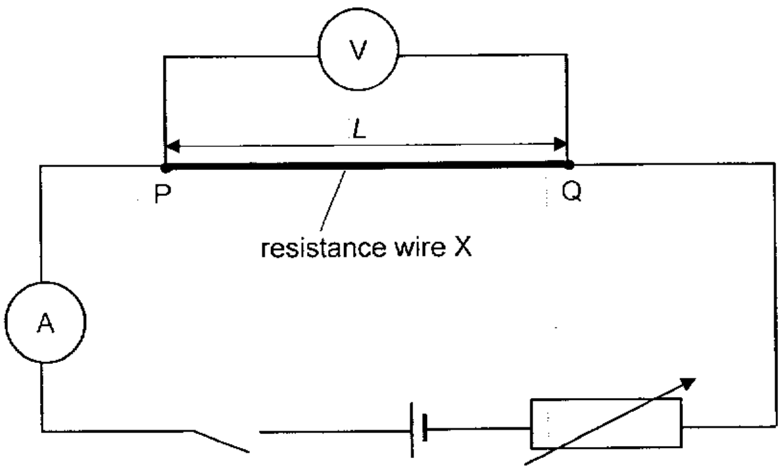


Fig. 2.1

Close the switch and adjust the variable resistor such that the current is about 100 mA.

Measure and record the value of the potential difference V_1 and current I_1 and hence determine the resistance R_1 of wire X.

$$R_1 = \frac{V_1}{I_1} = \frac{0.615}{0.1006} = 6.11\Omega$$

V_1 = 0.615 V

I_1 = 100.6 mA [1]

R_1 = 6.11 Ω [1]

Open the switch.

Note that the resistance wire may be hot if the circuit is left closed for a period of time.

(c) Remove wire *X* from the crocodile clips at P and Q and fold it into two equal segments as shown in Fig. 2.2.

Using the crocodile clips at P and Q, clip the ends of wire X as shown in Fig. 2.3 and connect the circuit as shown in Fig. 2.4.

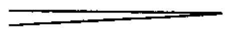


Fig. 2.2

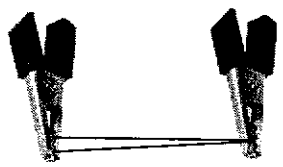


Fig. 2.3

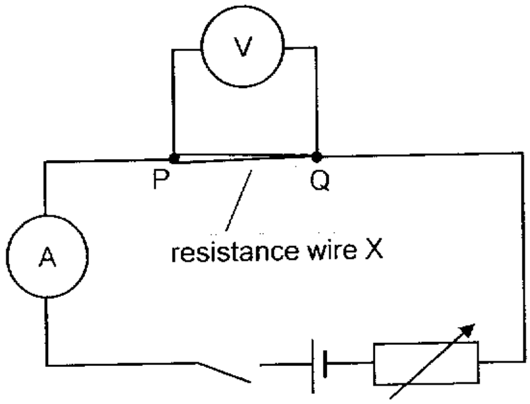


Fig. 2.4

Close the switch.
Measure and record the value of the potential difference *V* and current *I* and hence determine the resistance *R* of wire X in this configuration.

$$R = \frac{V}{I} = \frac{0.182}{0.1348} = 1.35\ \Omega$$

V = 0.182 V

I = 134.8 mA [1]

R = 1.35 Ω [1]

Open the switch.

(d) It is suggested that

$$R = R_1 N^m$$

where m is an integer and N is the number of segments of the wire.
$N = 2$ in **(c)**.
Calculate m using the results in **(b)** and **(c)**.

$R = R_1 N^m$

$1.350 = 6.11(2^m)$

$\lg\frac{1.350}{6.11} = m\lg 2$

$m = -2$

m = –2 [1]

(e) If you were to repeat this experiment by folding wire X into different number of segments, describe the graph that you would plot to determine m.

Take 6 readings by folding wire into the required number of segments.
$R = R_1 N^m \Rightarrow \lg R = \lg R_1 + m \lg N$
Plot $\lg R$ against $\lg N$ [1]
m will be given by gradient [1] [2]

[7 marks]

3 In this experiment, you will investigate how the terminal velocity of a paper helicopter falling in air depends on the length of its rotor blades.

(a) Use the pair of scissors provided to cut out the paper helicopter template **3A** along the **solid lines**. Use the dotted lines to guide you in folding the template into the helicopter as shown in Fig. 3.1. Attach the paper clip provided to the bottom of the paper helicopter to lower its centre of gravity.

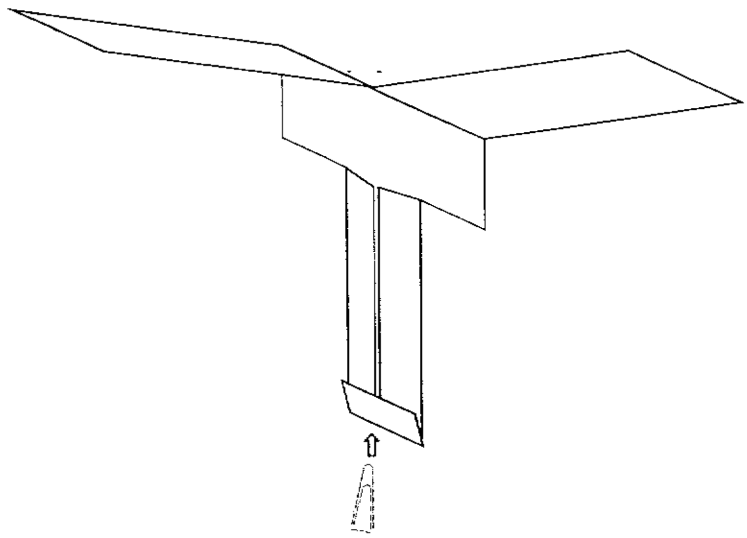


Fig. 3.1

(b) Measure and record the width of the rotor blade w.

w_1 = 3.0 cm

w_2 = 3.1 cm

$$w_{ave} = \frac{3.0 + 3.1}{2} = 3.1 \text{ cm}$$

w = 3.1 cm [1]

(c) **(i)** Mount a metre rule vertically on the floor using a retort stand, boss and clamp.

(ii) Release the paper helicopter from at least 50 cm above the top of the metre rule.

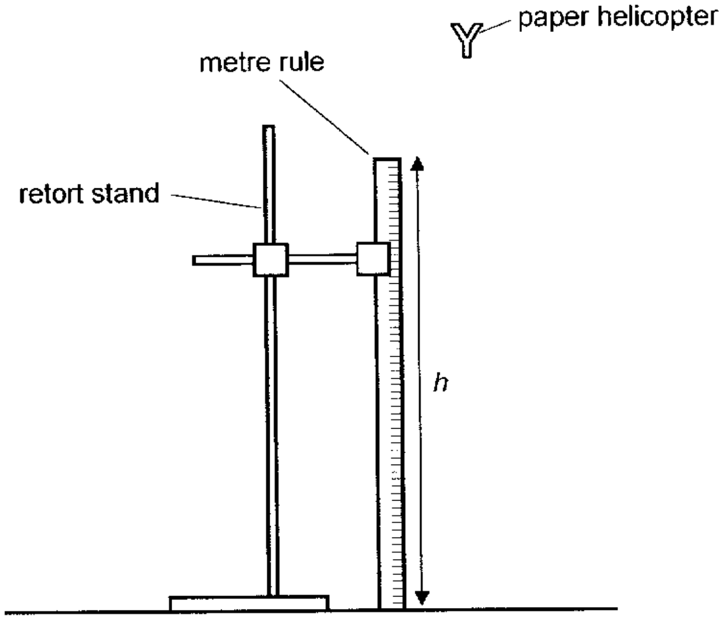


Fig. 3.2

(iii) Make and record measurements to determine the time t for the paper helicopter to fall through a distance h = 1.000 m.

t_1 = 1.05 s
t_2 = 1.16 s
t_3 = 1.30 s

$$t_{ave} = \frac{1.05 + 1.16 + 1.30}{3} = 1.17 \text{ s}$$

t = 1.17 s [2]

(iv) Estimate the percentage uncertainty in your value of t.

$$\Delta t \approx \frac{1.30 - 1.05}{2} \approx 0.1 \text{ s}$$

$$\% \text{ uncertainty of } t = \frac{0.1}{1.17} \times 100 = 8.5\%$$

percentage uncertainty of t = 8.5% [1]

(v) You may assume that the paper helicopter has reached terminal velocity by the time it reaches the top of the metre ruler. Calculate the terminal velocity v of the paper helicopter.

$$v = \frac{h}{t} = \frac{1.00}{1.17} = 0.85 \text{ m s}^{-1}$$

v = 0.85 m s^{-1} [1]

(d) **(i)** Suggest a significant source of error in this experiment.

Time of fall too short, making the % uncertainty of t very large. (or words to that effect)

Or Difficult to start and stop timing at the precise position (moving too fast / parallax error), making the value of both t and h unreliable [1]

(ii) Suggest an improvement that could be made to the experiment to reduce the error identified in **(d)(i)**.

You may suggest the use of other apparatus or a different procedure.

1. Allow helicopter to fall through greater height to increase duration of fall.
2. Use helicopters of longer/wider blades so that force due to air resistance is greater, increase duration of fall.
3. Use light gates and electronic timer to detect the fall of the helicopter to have more precision in timing of the fall.
4. High speed video recording to track the motion to get more precise timing of fall. [1]

(e) **(i)** Use the template **3B** to fold a second paper helicopter.

(ii) Repeat **(b)**, **(c)(ii)**, **(c)(iii)** and **(c)(v)** and record your results below.

w_1 = 2.0 cm

w_2 = 2.0 cm

$$w_{ave} = \frac{2.0 + 2.0}{2} = 2.0 \text{ cm}$$

t_1 = 0.88 s

t_2 = 0.69 s

t_2 = 0.68 s

$$t_{ave} = \frac{0.88 + 0.69 + 0.68}{3} = 0.75 \text{ s}$$

$$v = \frac{h}{t} = \frac{1.000}{0.75} = 1.33 \text{ m s}^{-1}$$

w = 2.0 cm

t = 0.75 s

v = 1.33 m s^{-1} [3]

(f) It is suggested that v is inversely proportional to w.

State and explain whether your results from **(b)**, **(c)(v)** and **(e)(ii)** support this suggestion. Justify your conclusion by referring to your answer in **(c)(iv)**.

If v is inversely proportional to w, then $v = \frac{k}{w}$ where k is a constant.

When w = 3.1 cm, v = 0.85 m s^{-1}. Hence, $k_1 = 3.1 \times 0.85 = 2.64$

When w = 2.0 cm, v = 1.33 m s^{-1}. Hence, $k_2 = 2.0 \times 1.33 = 2.66$

$$k_{ave} = \frac{k_1 + k_2}{2} = 2.65$$

% difference of k from the average value $= \frac{k_2 - k_{ave}}{k_{ave}} \times 100\%$

$$= \frac{0.01}{2.65} \times 100\%$$

$$= 0.38\%$$

Since the percentage difference of k from the average value is 0.38% which is smaller than the percentage uncertainty of t obtained in **(c)(iv)**, my results support the suggested relationship between v and w.

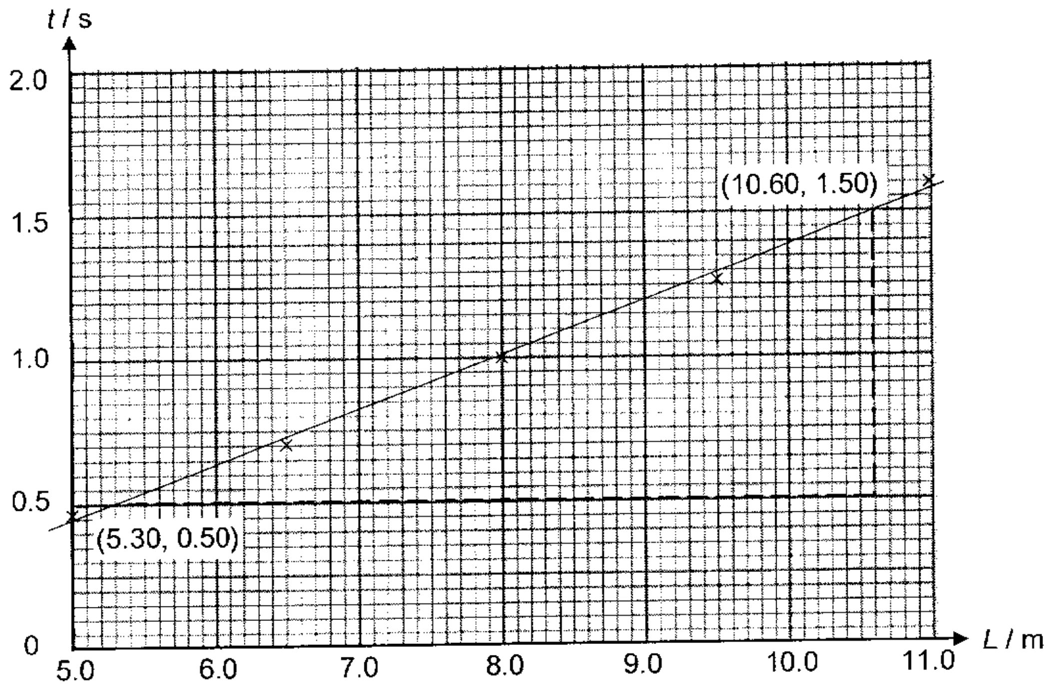
[2]

(g) In an investigation, the length L of the helicopter blades was varied.

The following results for L and t were recorded.

L / cm	5.0	6.5	8.0	9.5	11.0
t / s	0.46	0.70	1.00	1.27	1.60

(i) Plot t against L on the grid and draw the straight line of best fit.



[2]

(ii) Use your graph to determine the value of *t* when the helicopter has no blades.

$$\text{gradient} = \frac{1.50 - 0.50}{10.60 - 5.30} = \frac{1.00}{5.30} = 0.189$$

If the helicopter has no blades, $L = 0$

$$\frac{t - 1.50}{0 - 10.60} = 0.189$$

$t = -0.50$ s

t = – 0.50 s [2]

(iii) Comment on the value of *t* obtained in **(g)(ii)**.

It is impossible to have a negative value of *t*.

As the blades become shorter and shorter, their effect in slowing down the descent of the helicopter becomes insignificant. Hence, the gradient of the graph of *t* vs *L* will become smaller and smaller. The value of *t* at $L = 0$ will hence remain positive.

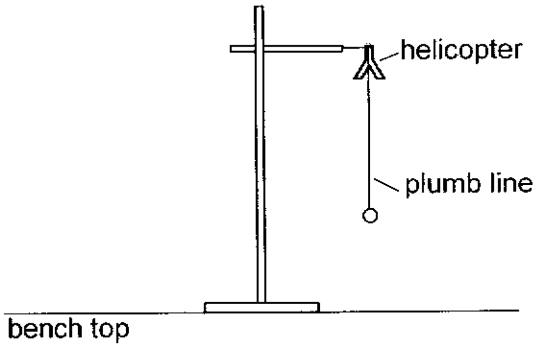
[2]

(h) The stability of the descending motion of the paper helicopter depends greatly on the position of its centre of gravity.

Plan an investigation to determine the position of the centre of gravity of the paper helicopter.

You may suggest the use of any additional apparatus commonly found in a school physics laboratory.

Your answer should include a diagram and your experimental procedure.



1. Clamp an optical pin using a retort stand as shown above. Puncture a small hole through the paper helicopter and suspend it through the optical pin.
2. Hang a plumb line from the optical pin just in front of the paper helicopter.
3. Mark two points on the helicopter that coincide with the plumb line.
4. Remove the paper helicopter from the pin and repeat steps 1-3 for two additional holes.
5. For each pair of markings on the paper helicopter, draw a straight line to join them together. The point of intersection of the three lines is the position of the centre of gravity.

[3]

Total : [21 marks]

Question 4 (Planning Question)

1. Problem Definition

Experiment 1

Independent variable: Length L of string

Dependent variable: Intensity I of the sound produced at the second can

Control variables: Tension T in the string, frequency and intensity of the incident sound in the first can

Experiment 2

Independent variable: Tension T in the string

Dependent variable: Intensity I of the sound produced at the second can

Control variables: Length L of string, frequency and intensity of the incident sound in the first can

2. Experimental Set-up

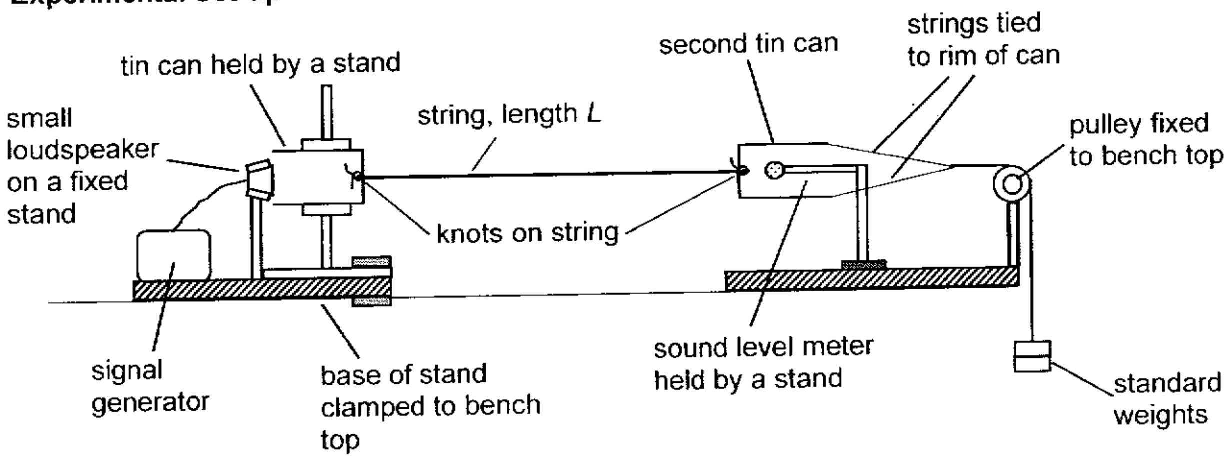


Fig. 1

3. Procedure

1. Set up the apparatus as shown in Fig. 1

2. Measure and record the length L of the string between the bases of the two tin cans using a metre rule.

3. By adding pieces of standard weights onto the mass hanger, the tension T in the string can be varied.
Measure and record the total mass M of the weights hung from the pulley using an electronic balance. The tension T in the string can be calculated using $T = Mg$.

4. Turn on the signal generator that is connected to the small loudspeaker. Select a frequency that is in the audible range.
Adjust the amplitude of the output voltage until a sound of moderate loudness is obtained.

5. Record the reading I' on the sound level meter. Correct the intensity of the sound produced in the second can for ambient sound (intensity I_b) by using the equation $I = I' - I_b$.

6. Experiment 1: variation of I with L, keeping T constant
Repeat steps 2 to 5 to obtain a total of 6 sets of readings of I and L by using strings of different lengths but keeping the tension T constant.

T is kept constant by hanging the same mass M from the pulley.

7. Experiment 2: variation of I with T, keeping L constant
Repeat steps 2 to 5 to obtain a total of 6 sets of readings of I and T by varying the masses hung from the pulley but keeping L constant.

L is kept constant by using the same string with the two knots spaced at a fixed distance apart.

4. Analysis

$I = kL^aT^b$

To determine a from Experiment 1:
$\lg I = a \lg L + \lg(kT^b)$ where T is constant.
Plot a graph of $\lg I$ against $\lg L$, where the gradient = a and the vertical-intercept = $\lg (k\,T^b)$.

To determine b from Experiment 2:
$\lg I = b \lg T + \lg(kL^a)$ where L is constant.
Plot a graph of $\lg I$ against $\lg T$, where the gradient = b and the vertical-intercept = $\lg (k\,L^a)$.

5. Safety Precautions

1. Clamp the stand holding the first tin can securely to the bench top to prevent the apparatus from toppling.

6. Additional Details

1. Perform the experiment in a sound-proof room.

2 The frequency and intensity of the sound emitted by the loudspeaker should be kept fixed throughout the experiment.

3 The distance of the loudspeaker from the base of the first can should be kept fixed throughout the experiment.

4. When the loudspeaker is turned on, record the reading on the sound level meter when no tension is applied to measure the intensity I_b of the ambient sound.

5 The distance of the sound level meter from the base of the second can should be kept fixed throughout the experiment.

6. The intensity of the sound produced in the second tin should not be too close to the ambient sound level, otherwise the uncertainties in the measured intensities will be too high and the results will be inaccurate.

Question 4 (Planning Question) Mark Scheme

1. **Detailed Diagram** **[max 1]**

   1. Clearly labelled, workable set-up of the tin cans, pulley and weights system, signal generator and loudspeaker, sound level meter. [1]
   2. Diagram includes support for set-up (e.g. table top, clamps, stands)

2. **Procedure** **[max 4]**

   1. Describe the steps to determine the length L of the string, stating the appropriate measuring instrument (includes making the knots). [1]
   2. Describe the steps to determine the tension T, stating the appropriate apparatus and equation to be used. [1]
   3. Describe the steps to set the intensity of the incident sound. [1]
   4. Describe the steps to measure the intensity I of the sound produced in the second tin can. [1]

3. **Control of Variables** **[max 2]**

   1. To determine a, repeat for at least 6 sets by varying L and keeping T constant. [1]
   2. To determine b, repeat for at least 6 sets by varying T and keeping L constant. [1]

4. **Analysis** **[max 2]**

   1. Plot a graph of lg I against lg L, stating gradient = a. [1]
   2. Plot a graph of lg I against lg T, stating gradient = b. [1]

5. **Safety Precautions** **[max 1]**

   1. Method to ensure setup and experiment is safe (e.g. clamp the stands). [1]

   Do not allow "ensure sound is not too loud".

6. **Additional Details** **[max 1]**
   Refer to the points given in the above list.

[Total: 11 marks]