CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

PHYSICS **0625/05**

Paper 5 Practical Test

May/June 2003

1 hour 15 minutes

Additional Materials: As specified in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Follow the instructions on the front cover of the Answer Booklet.
Write your answers in the spaces provided in the Answer Booklet.

Answer **all** questions.
You are expected to record all your observations as soon as these observations are made.
An account of the method of carrying out the experiments is **not** required.
At the end of the examination, hand in only the Answer Booklet.

This document consists of **7** printed pages, **1** blank page and an inserted Answer Booklet.

SP (AT/KN) S47468/2

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

[Turn over

1 *In this experiment, you are to investigate the heating of thermometer bulbs under different conditions.*

Record all of your observations on pages 2 and 3 of your Answer Booklet.

You are provided with two thermometers labelled A and B. Thermometer B has a thin layer of cotton wool around the bulb. Do not remove this cotton wool. The thermometers are arranged with their bulbs at equal distances from a lamp. Do not move the lamp or the thermometers.

Carry out the following instructions referring to Fig. 1.1.

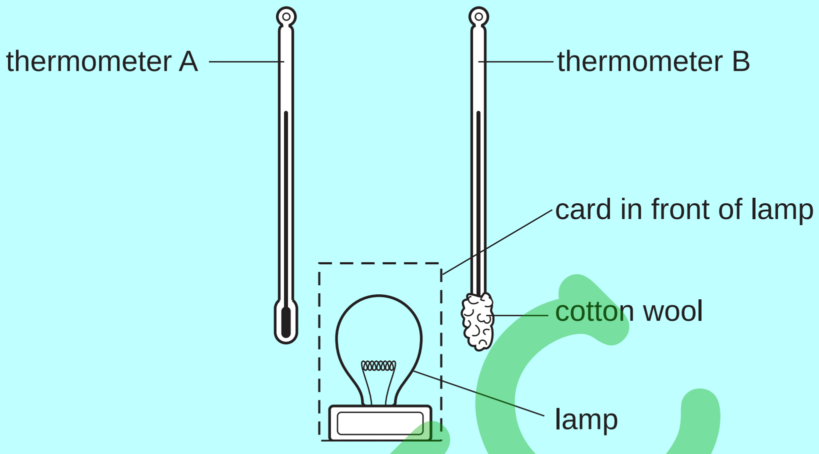

Fig. 1.1

During the experiment, you will read temperature values from thermometers. You may find it more comfortable to use the card provided to shield your eyes from the direct light from the lamp. Do not place the card between the lamp and a thermometer.

(a) Take the room temperature readings on both thermometers and record them at time 0 s in the table.

(b) Switch on the lamp and start the stopwatch.

(i) Record in the table T_A, the temperature reading on thermometer A after 30 s.

(ii) After a further 30 s (i.e. at time $t = 60$ s) record T_B, the temperature reading on thermometer B.

(iii) Continue taking temperature readings from the thermometers in turn at 30 s intervals, as indicated in the table, up to 300 s.

(iv) Switch off the lamp.

(c) Complete the column headings in the table.

(d) **(i)** Using the readings obtained for thermometer A, plot a graph of temperature / °C (*y*-axis) against time / s (*x*-axis). Label the line 'A'.

(ii) Using the same axes, plot a graph using the readings obtained for thermometer B. Label the line 'B'.

(e) State which thermometer bulb heated up more quickly. Justify your answer by reference to your graph.

2 *In this experiment, you are to make two sets of measurements as accurately as you can in order to determine the volume of a beaker.*

Record all of your observations and answers on pages 4 and 5 of the Answer Booklet.

You are provided with a beaker, a rule, a length of string and two blocks of wood.

Carry out the following instructions.

Method 1

(a) Use the two blocks of wood and the rule to measure the external diameter d of the middle part of the beaker.

(b) Draw a labelled diagram to show how you used the blocks of wood and the rule to find, as accurately as possible, a value for the diameter.

(c) Calculate the external radius r of the beaker.

(d) Measure the height h of the beaker.

(e) Calculate the external volume V of the beaker using the equation

$$V = \pi r^2 h.$$

Method 2

(f) Use the string and the rule to measure, as accurately as possible, the circumference c of the middle part of the beaker.

(g) Calculate a second value of the external volume V of the beaker using the equation

$$V = \frac{c^2 h}{4\pi}.$$

(h) Calculate A, the average of your two values for V.

(i) Estimate the maximum volume of water v that the beaker could hold.

(j) Calculate the approximate volume G of the glass used to make the beaker, using the equation

$$G = A - v.$$

3 *In this experiment, you are to compare the combined resistance of lamps arranged in series or in parallel.*

Record all of your observations and readings on page 6 of your Answer Booklet.

Carry out the following instructions, referring to Fig. 3.1 and Fig. 3.2.

The circuit shown in Fig. 3.1 has been set up for you.

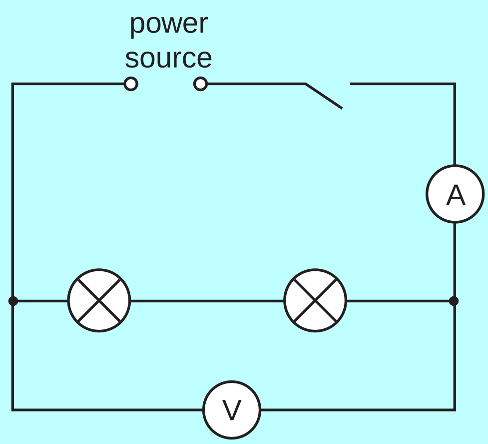

Fig. 3.1

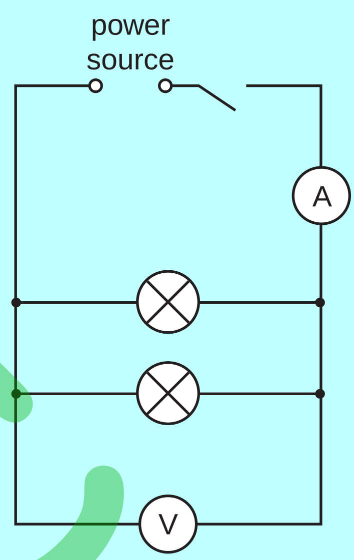

Fig. 3.2

(a) Switch on. Measure and record in the table the current I in the circuit and the p.d. V across the two lamps. Switch off.

(b) Calculate the combined resistance R of the two lamps using the equation

$$R = \frac{V}{I}.$$

Record this value of R in the table.

(c) Complete the column headings in the table.

(d) Disconnect the lamps and the voltmeter. Set up the circuit shown in Fig. 3.2.

(e) Switch on. Measure and record in the table the current I in the circuit and the p.d. V across the two lamps. Switch off.

(f) Calculate the combined resistance R of the two lamps using the equation

$$R = \frac{V}{I}.$$

Record this value of R in the table.

(g) Using the values of resistance obtained in parts **(b)** and **(f)**, calculate the ratio

$$\frac{\text{resistance of lamps in series}}{\text{resistance of lamps in parallel}}.$$

(h) Fig. 3.3 shows a cell connected to two motors. Copy and complete the circuit diagram to show

- a voltmeter connected to measure the p.d. across the motors,
- an ammeter connected to measure the total current in the circuit,
- a variable resistor connected to vary the current in one of the motors.

You are not asked to set up this circuit.

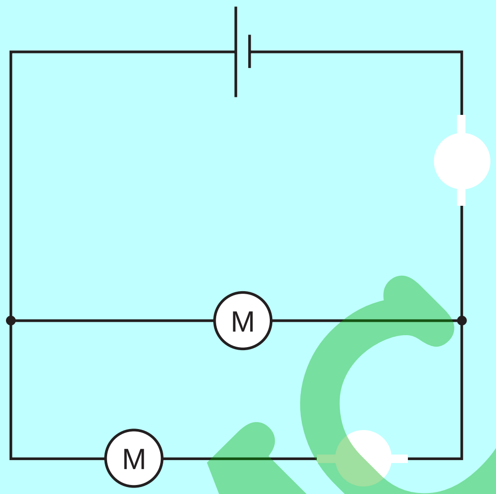

Fig. 3.3

4 *In this experiment, you are to investigate the reflection of light by a plane mirror.*

Record all of your observations and answers on page 7 of the Answer Booklet.

Carry out the following instructions referring to Fig. 4.1. Use the diagram printed on page 7 of your Answer Booklet as a ray trace sheet.

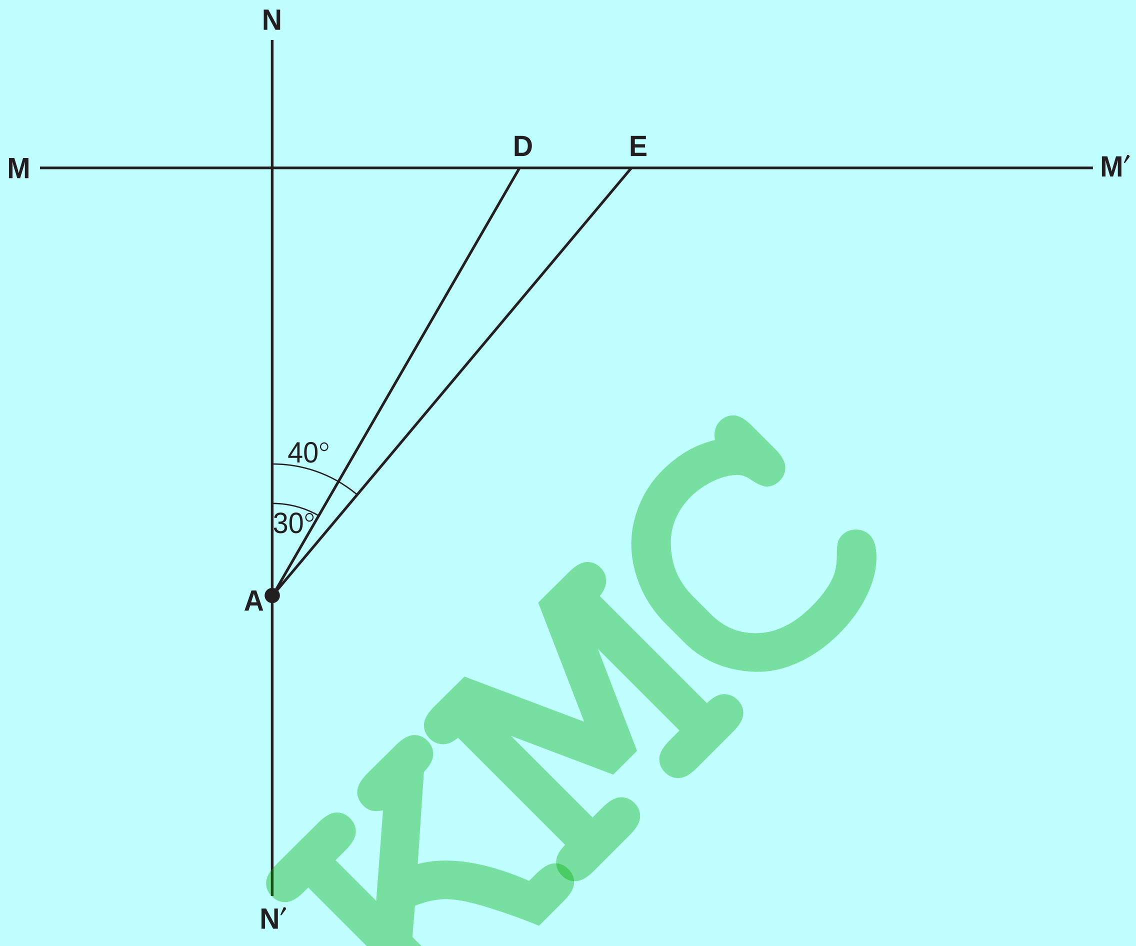

Fig. 4.1

(a) On the ray trace sheet, draw a line from point **A** to the line **MM′**. The line is to be at an angle of 30° from the line **NN′**. Label with the letter **D** the point at which the line you have drawn meets line **MM′**.

(b) Draw another line from point **A** to the line **MM′**. This line is to be at an angle of 40° from the line **NN′**. Label with the letter **E** the point at which the line you have drawn meets line **MM′**.

(c) Place the mirror so that its reflecting surface lies along the line **MM′**. Place a pin at point **A**. Place another pin **B** close to the mirror and along the line **AD**.

(d) View the images of pins **A** and **B** in the mirror. Place two pins **F** and **G** between your eye and the mirror so that **F**, **G** and the images of **A** and **B** appear exactly one behind the other.

(e) Mark the positions of pins **B**, **F** and **G** on the ray trace sheet. Remove the pins and the mirror. Using a rule draw a line joining **G** and **F**, and continue the line to meet the line **MM′**.

(f) Repeat the steps **(c)** to **(e)** using the same position of pin **A** but placing pin **B** on line **AE**.

(g) Draw a line from line **AD** to line **AE** that is parallel to and 2.0 cm from **MM′**. Record the length x of the line.

(h) Draw a line between the two reflected ray lines that is parallel to and 4.0 cm from **MM′**. Record the length y of the line.

(i) Calculate the ratio $\frac{x}{y}$.

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At the end of the examination, hand in only the Answer Booklet.

This document consists of **6** printed pages, **2** blank pages and an inserted Answer Booklet.

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UNIVERSITY *of* CAMBRIDGE International Examinations

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1 *In this experiment, you are to investigate the heating of a thermometer bulb.*

Record all of your observations on page 2 of your Answer Booklet.

Carry out the following instructions, referring to Fig. 1.1.

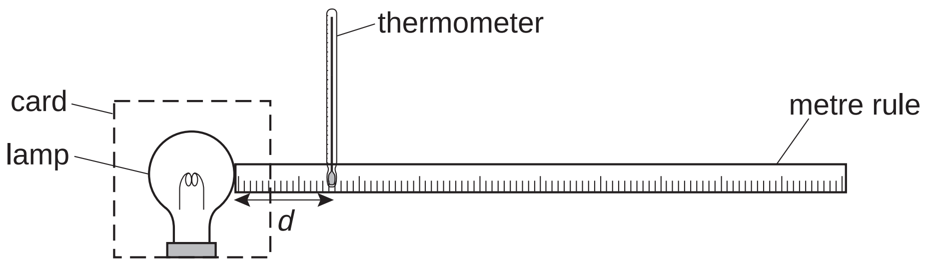

Fig. 1.1

During the experiment, you will read temperature values from the thermometer. You may find it more comfortable to use the card provided to shield your eyes from the direct rays of the lamp. Do **not** place the card between the lamp and the thermometer.

You are provided with a lamp and a scale marked in 1 mm divisions. Do **not** move the lamp or the scale.

(a) Switch on the lamp. Leave the lamp switched on until you have completed all the readings.

(b) Place the thermometer so that its bulb is a distance d = 100 mm from the surface of the lamp, as shown by the scale provided. Wait for about 30 s. In the table, record the distance d between the thermometer bulb and the surface of the lamp and the temperature θ shown on the thermometer.

(c) Move the thermometer so that its bulb is a distance d = 80 mm from the surface of the lamp. Wait for about 30 s. In the table, record the distance d and the temperature θ.

(d) Repeat the steps described in **(c)**, but using values of d of 60 mm, 40 mm, 20 mm and 10 mm.

(e) Complete the column headings in the table.

(f) Use the data in the table to plot a graph of temperature (y-axis) against distance (x-axis).

(g) Use your graph to estimate room temperature. Explain briefly how you obtained your estimate.

2 *In this experiment, you are to compare the combined resistance of lamps in different circuit arrangements.*

Record all of your observations and readings on page 4 of your Answer Booklet.

The circuit shown in Fig. 2.1 has been set up for you.

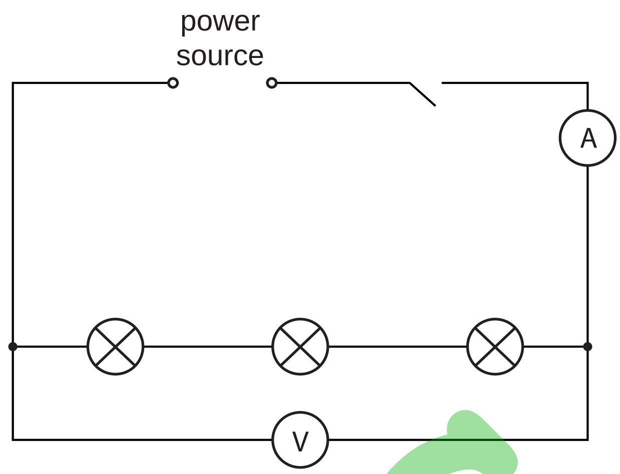

Fig. 2.1

(a) Switch on. Measure and record in the table the current I in the circuit and the p.d. V across the three lamps. Switch off.

(b) Calculate the combined resistance R of the three lamps using the equation

$$R = \frac{V}{I}.$$

Record this value of R in the table.

(c) Complete the column headings for each of the I, V and R columns of the table.

(d) Disconnect the lamps and the voltmeter and set up the circuit shown in Fig. 2.2.

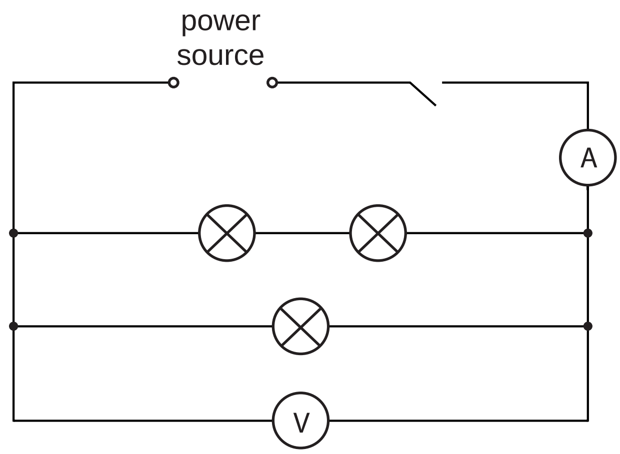

Fig. 2.2

(e) Switch on. Measure and record in the table the current I in the circuit and the p.d. V across the three lamps. Switch off.

(f) Calculate the combined resistance R of the three lamps using the equation

$$R = \frac{V}{I}.$$

Record this value of R in the table.

(g) Disconnect the lamps and the voltmeter and set up the circuit shown in Fig. 2.3.

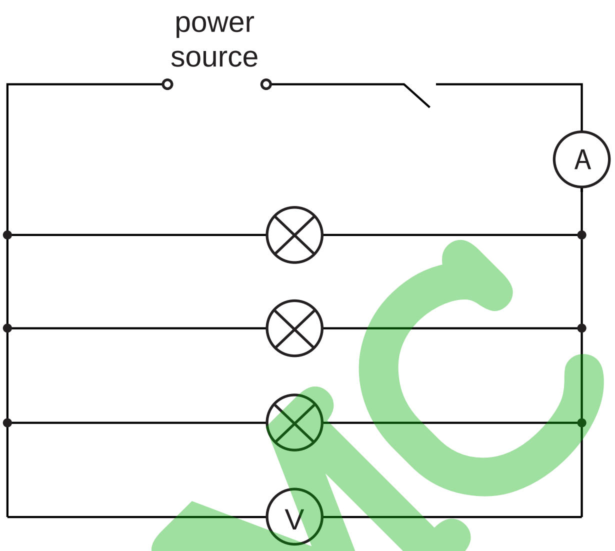

Fig. 2.3

(h) Switch on. Measure and record in the table the current I in the circuit and the p.d. V across the three lamps. Switch off.

(i) Calculate the combined resistance R of the three lamps using the equation

$$R = \frac{V}{I}.$$

Record this value of R in the table.

(j) Draw a circuit showing the same components as in Fig. 2.3 but with two lamps in parallel with each other and another lamp in series with the first two. Also include the ammeter to measure the total current in the circuit and the voltmeter to measure the p.d. across the complete combination of lamps.

You are not asked to set up this circuit.

3 *In this experiment, you are to investigate the period of oscillation of a rule attached to a spring.*

Record all of your observations on page 5 of your Answer Booklet.

Carry out the following instructions, referring to Fig. 3.1.

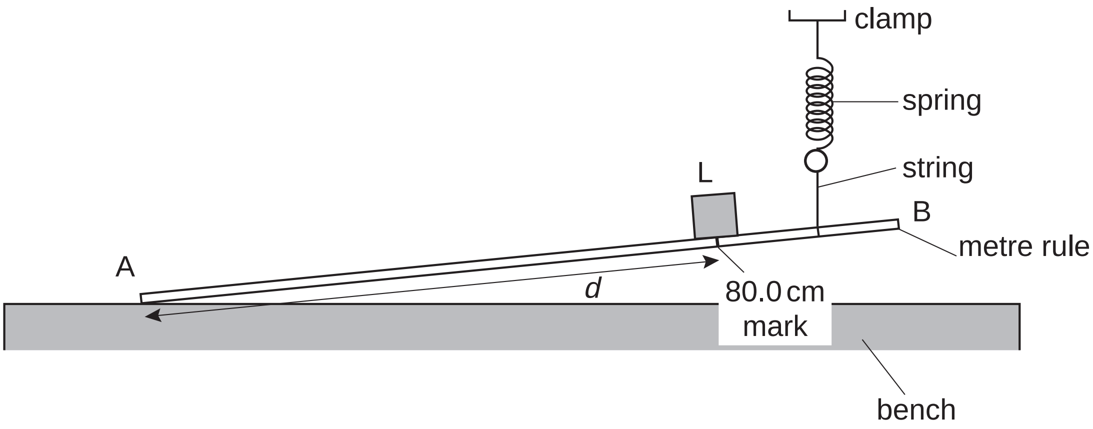

Fig. 3.1

The rule has one end lightly taped to the bench so that it does not slip. The other end is attached to a spring. Do **not** change the position of the spring.

(a) Place the load L on the rule so that its centre is over the 80.0 cm mark. Record the distance *d* from the centre of the load to the end A of the rule.

(b) Displace the end B of the rule a small distance downwards and release it so that it oscillates. Record the time *t* taken for 10 complete oscillations of the rule.

(c) Calculate the period *T* of the oscillations. *T* is the time for one complete oscillation.

(d) Calculate the value of $\dfrac{T}{d}$.

(e) Repeat steps **(a)** – **(d)** using values for *d* of 70.0 cm, 60.0 cm, 50.0 cm, 40.0 cm and 30.0 cm.

(f) Complete the column headings in the table.

(g) Draw a labelled diagram to show how you judged the centre of the load to be exactly over the 80.0 cm mark on the rule.

(h) A student suggests that *T* should be directly proportional to *d*. State with a reason whether your results support this suggestion.

4 *In this experiment, you are to investigate the magnification of an image produced by a converging lens.*

Record all of your observations on page 6 of your Answer Booklet.

Carry out the following instructions, referring to Fig. 4.1.

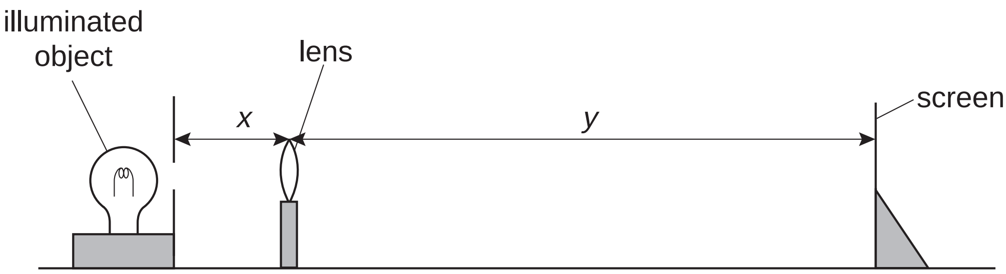

Fig. 4.1

(a) Place the lens at a distance x = 25.0 cm from the illuminated object. Place the screen close to the lens, then move it away from the lens until a sharply-focused image is formed on the screen. Measure and record the distance y between the lens and the screen.

(b) Calculate the value of the ratio y/x.

(c) Measure the height h of the focused image.

(d) Calculate the magnification m using the equation $m = h/k$ where k = 1.5 cm.

(e) Repeat steps **(a)** – **(d)** using values of x of 30.0 cm and 35.0 cm.

(f) Look at the values of y/x and m that you have obtained. Within the limits of experimental error, what do you conclude about the relationship between y/x and m?

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PHYSICS **0625/05**

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SPA MML 8430 4/04 S81480/4

UNIVERSITY of CAMBRIDGE International Examinations

1 *In this experiment you are to investigate the change in temperature of hot water as cold water is added.*

Record all your observations on pages 2 and 3 of your Answer Booklet.

Carry out the following instructions, referring to Fig. 1.1.

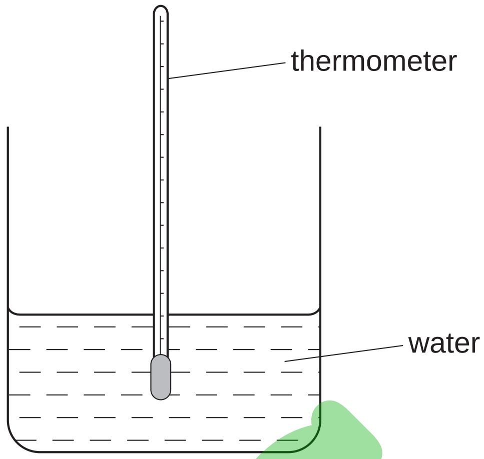

Fig. 1.1

(a) You are provided with 100 cm^3 of hot water (labelled **A**) and a supply of cold water. The cold water is approximately at room temperature.

(i) Measure and record the temperature of the cold water.

(ii) Measure and record in the first row of the table the temperature θ of the hot water.

(iii) Pour 20 cm^3 of the cold water into the measuring cylinder. Transfer this water to the beaker containing the hot water. Measure and record the temperature θ of the mixture of hot and cold water. Record the total volume V of cold water that you have added.

(iv) Repeat step **(iii)** four times until you have added a total of 100 cm^3 of cold water.

(v) Complete the column headings in the table.

(vi) Use the data in the table to plot a graph of θ (y-axis) against V (x-axis). Draw the best-fit curve.

(b) A student carrying out this experiment obtained the graph shown in Fig. 1.2.

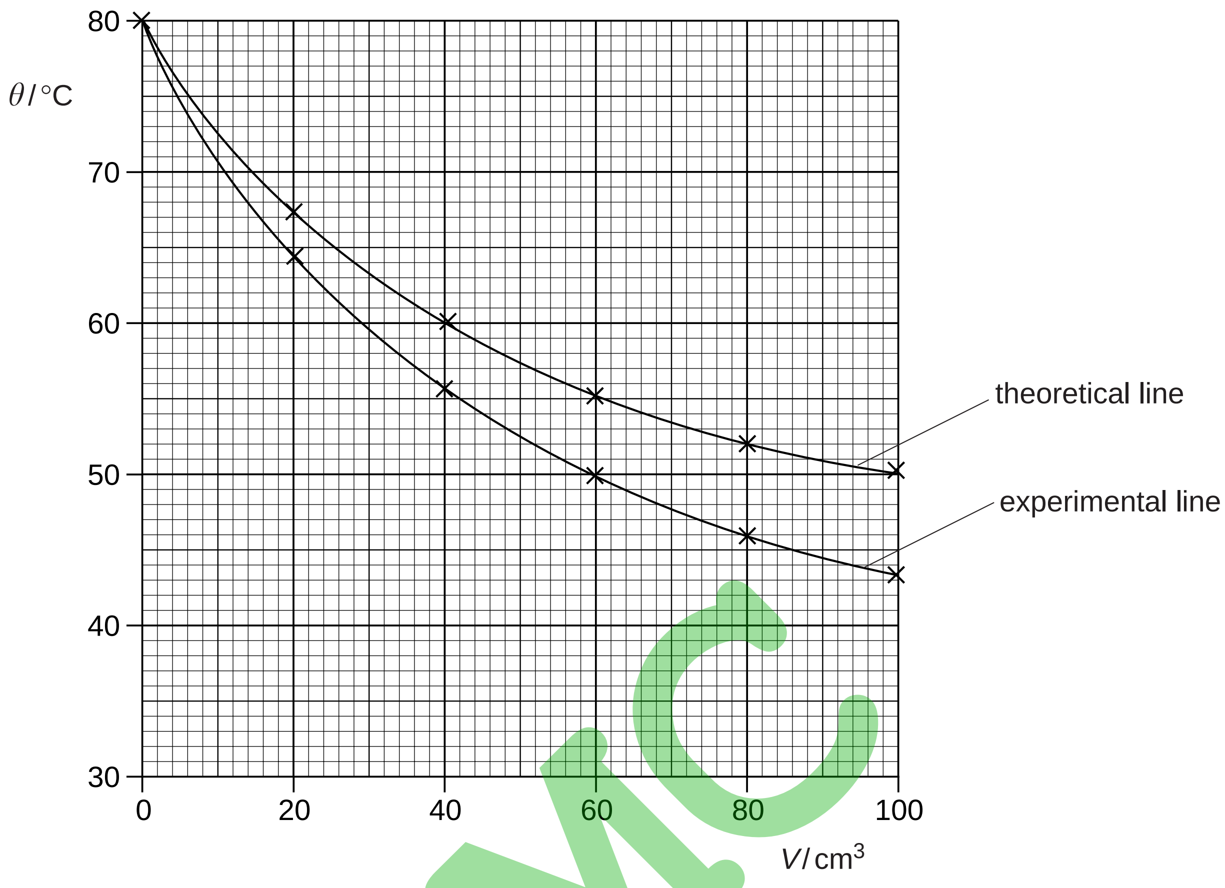

Fig. 1.2

The theoretical line shows the results expected by the student after calculating the values of θ. The student assumed that all the heat lost by the hot water was gained by the cold water when the cold water was poured into the beaker. The other line shows the student's experimental results.

The student had carried out the experiment with care. Suggest a practical reason why the experimental graph line differs from the theoretical line.

2 *In this experiment you are to investigate the resistance of resistance wire in different circuit arrangements.*

Record all your observations and readings on page 4 of your Answer Booklet.

The circuit shown in Fig. 2.1 has been set up for you.

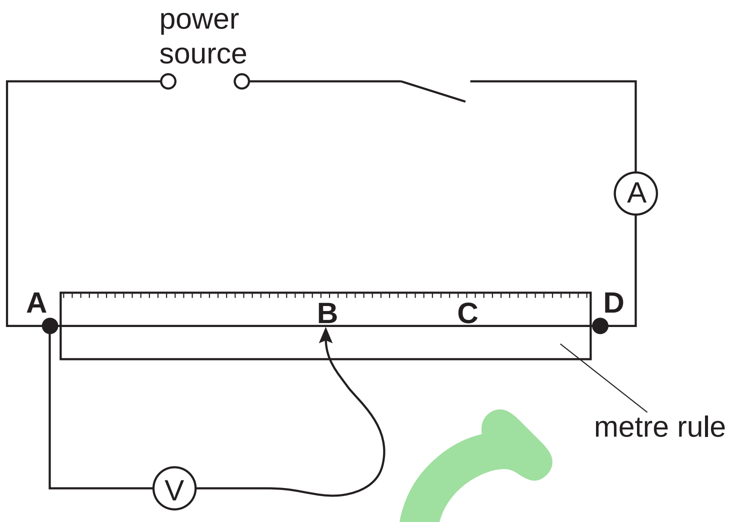

Fig. 2.1

(a) Switch on. Measure and record in the table the current I in the circuit and the p.d. V across the section of resistance wire **AB**. Switch off.

(b) Record the length l of the resistance wire **AB**.

(c) Calculate the resistance R of the section of wire **AB** using the equation

$$R = \frac{V}{I}.$$

Record this value of R in the table.

(d) Complete the column headings for each of the l, I, V and R columns of the table.

(e) Repeat steps **(a)** – **(c)** with the voltmeter connected across section **AC** of the resistance wire.

(f) Repeat steps **(a)** – **(c)** with the voltmeter connected across section **AD** of the resistance wire.

(g) Use your results to predict the resistance of a 1.50 m length of the same wire. Show your working.

3 *In this experiment you are to investigate the period of oscillation of a mass attached between two springs.*

Record all your observations on page 5 of your Answer Booklet.

Carry out the following instructions, referring to Fig. 3.1. The apparatus has been set up for you.

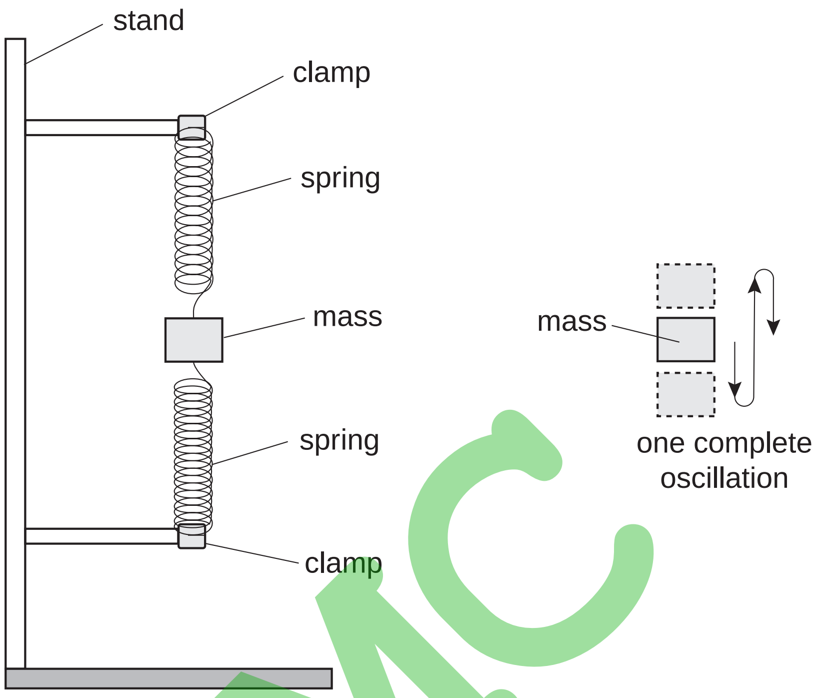

Fig. 3.1

You are provided with a mass m of 400 g attached between two springs.

(a) Displace the mass a **small** distance downwards and release it so that it oscillates. Record the time t_1 taken for 10 complete oscillations of the mass. Also record the time t_2 taken for another 10 complete oscillations of the mass.

(b) Calculate t, the average value of t_1 and t_2.

(c) Calculate the period T of the oscillations. T is the time for one complete oscillation.

(d) Calculate the value of $\dfrac{T}{m}$.

(e) Repeat steps **(a)** – **(d)** using values for m of 300 g and 200 g.

(f) Complete the final column heading in the table.

(g) A student suggests that T should be directly proportional to m. State with a reason whether or not your results support this suggestion.

(h) In the experiment you have just done, the mass oscillates rapidly so that it is difficult to take the times accurately. The instructions in the question included methods of improving the accuracy of the value obtained for the period T. Describe briefly one of these methods and any calculation involved to obtain the T value.

4 *In this experiment you will investigate the refraction of light through a transparent block.*

Record all your observations and answers on page 7 of your Answer Booklet. You are supplied with three ray trace sheets.

Carry out the following instructions, referring to Figs. 4.1, 4.2 and 4.3.

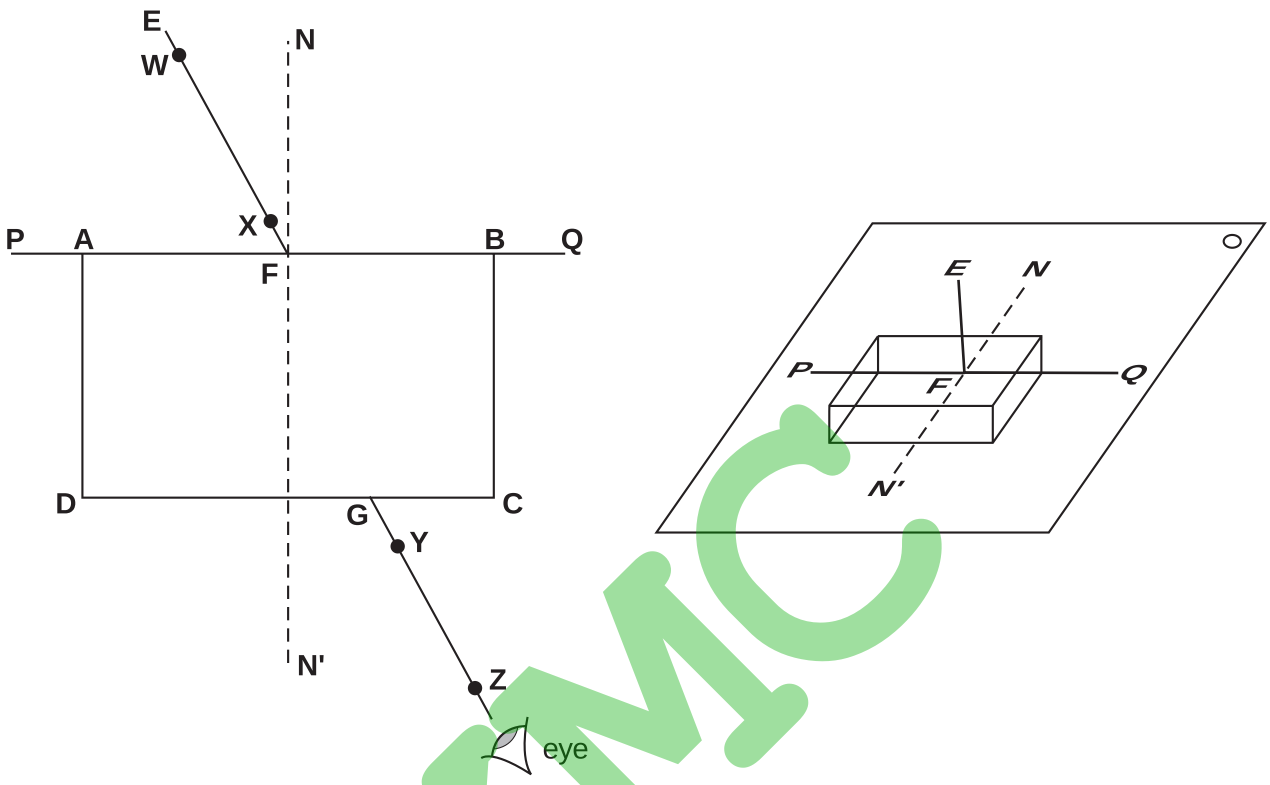

Fig. 4.1

(a) Place the transparent block with its largest face down on one of the ray trace sheets as shown in Fig. 4.1. One of the longest sides is to be along line **PQ**.

(b) Draw round the block and label the corners **A**, **B**, **C** and **D**. Remove the block.

(c) Place the ray trace sheet on the pin board and push a pin **X** into the paper on line **EF** close to line **AB**. Push another pin **W** into line **EF** some distance away from line **AB**.

(d) Replace the block on the ray trace sheet.

(e) View the images of pins **W** and **X** through the block. Place two pins **Y** and **Z** between your eye and the block so that **Y**, **Z** and the images of **W** and **X** appear exactly one behind the other.

(f) Label the positions of pins **W**, **X**, **Y** and **Z** on the ray trace sheet. Remove the pins and the block. Using a rule, draw a line joining **Z** and **Y** and continue the line to meet the line **CD** at a point, which you should label **G**.

(g) Draw a line to join the points **F** and **G**.

(h) Measure and record the angle of refraction *r* between line **FG** and the normal **NN'**.

(i) Place the block on the second ray trace sheet so that one of its longest sides is along line **PQ** but with the largest face vertical (as shown in Fig. 4.2). Label the corners **A**, **B**, **C** and **D**.

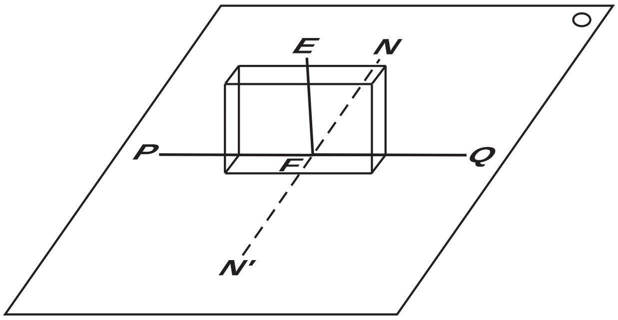

Fig. 4.2

(j) Repeat steps **(b)** – **(h)**.

(k) Place the block on the third ray trace sheet with the largest face down so that one of its shorter sides is along the line **PQ**. One corner should be about 1 cm to the left of point **F**, as shown in Fig. 4.3. Label the corners **A**, **B, C** and **D**.

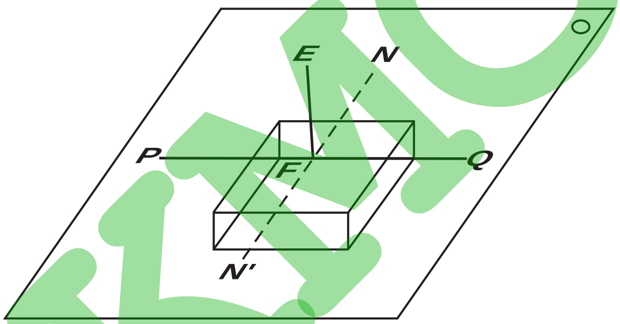

Fig. 4.3

(l) Repeat steps **(b)** – **(h)**.

(m) Within the limits of experimental error, what do you conclude about the effect on the angle of refraction *r* of increasing the length of the ray within the block?

Tie your ray trace sheets into your Answer Booklet.

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Centre Number	Candidate Number	Name

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

PHYSICS **0625/05**

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May/June 2005

1 hour 15 minutes

ANSWER BOOKLET

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen in the spaces provided on this Answer Booklet.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
All of your answers should be written in this Answer Booklet: scrap paper must **not** be used.

Answer **all** questions.
Graph paper is provided in this Answer Booklet. Additional sheets of graph paper should be used only if it is necessary to do so.
At the end of the examination, fasten any additional answer paper used securely to this Answer Booklet.

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

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2	
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Total	

This document consists of **7** printed pages and **1** blank page.

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[Turn over

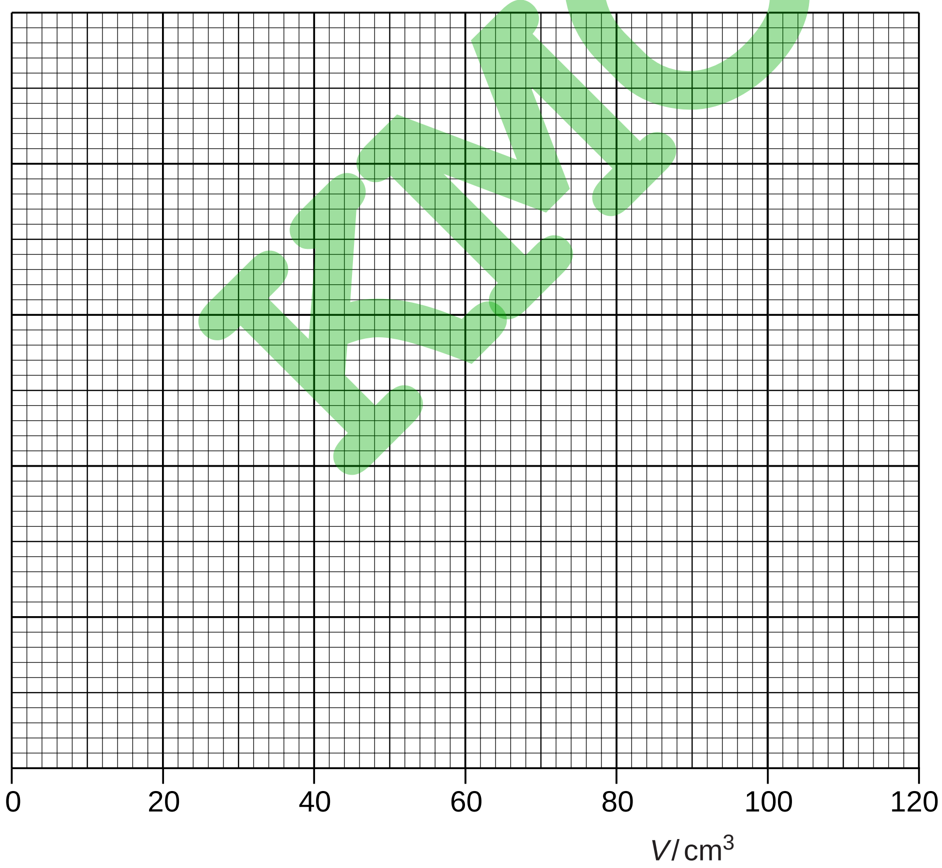
1 (a) (i) Record of temperature of the cold water .... [1]

(ii) – (v)

θ /	V /
	0

[3]

(vi)



[5]

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(b) A practical reason why the student's experimental line differed from the theoretical line

....

....

.... [1]

For Examiner's Use

2 **(a) – (f)**

voltmeter connected across	l /	I /	V /	R /
AB				
AC				
AD				

[8]

(g) Working

Predicted resistance .... [2]

For Examiner's Use

3 **(a) – (f)**

m/ g	t_1/ s	t_2/ s	t/ s	T/ s	$\frac{T}{m}$ /
400					
300					
200					

[6]

(g) Statement ....

Reason ....

....

.... [2]

(h) Description ....

....

.... [2]

For Examiner's Use

Tie your ray trace sheets in here. [5]

For Examiner's Use

4 **(h)** value of *r* ....

(j) value of *r* ....

(l) value of *r* ....

[4]

(m) Within the limits of experimental error, ...

....

.... [1]

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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

PHYSICS **0625/05**

Paper 5 Practical Test

May/June 2006

1 hour 15 minutes

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

If you have been given an Answer Booklet, follow the instructions on the front cover of the Booklet.
Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
You are expected to record all your observations as soon as these observations are made.
An account of the method of carrying out the experiments is **not** required.
At the end of the examination, hand in only the Answer Booklet.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **7** printed pages, **1** blank page and **1** inserted Answer Booklet.

MML 10773 4/05 T03989/2

UNIVERSITY *of* CAMBRIDGE
International Examinations

[Turn over

1 *In this experiment you are to determine the density of a sample of card.*

Record all your observations on page 2 of your Answer Booklet.

You are provided with ten pieces of card. Carry out the following instructions, referring to Fig. 1.1.

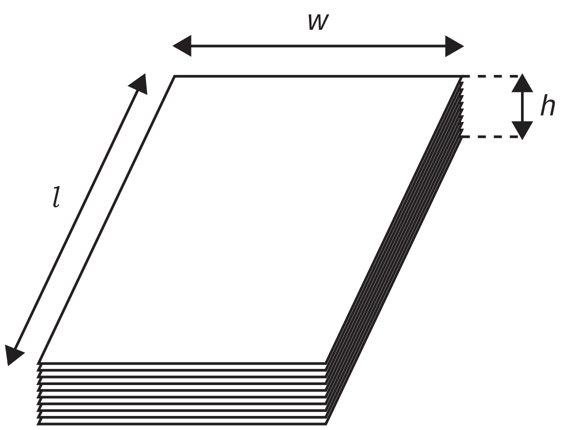

Fig. 1.1

(a) **(i)** Measure and record in grams the mass M of the stack of ten pieces of card.

(ii) Calculate the average mass m of one piece of card.

(b) **(i)** Measure and record the height h (in mm) of the stack of cards.

(ii) Calculate the average thickness t of one piece of card.

(c) **(i)** Measure and record the length l (in mm) and width w (in mm) of one piece of card.

(ii) Calculate the volume V of one piece of card using the equation

$$V = ltw.$$

(d) Calculate the density d of the card using the equation

$$d = \frac{m}{V}.$$

(e) A sample of corrugated card of the same length and width as the card you have used consists of two thin sheets of card with an air gap in between. The sheets of card are separated by paper as shown in the cross-section in Fig. 1.2. The thickness y of the air gap as shown in Fig. 1.2 is between 2 mm and 3 mm.

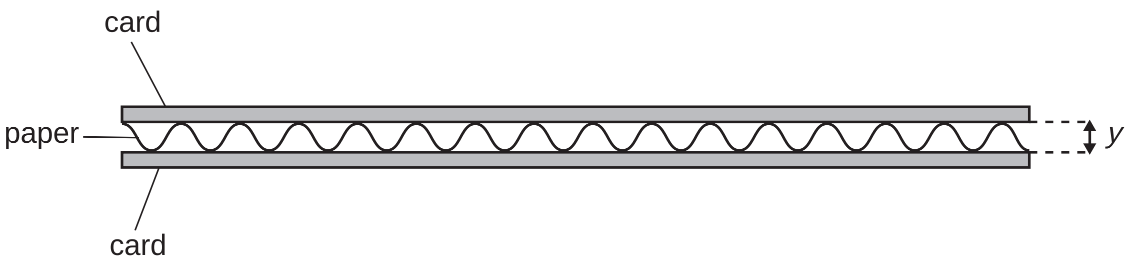

Fig. 1.2

Estimate the volume V_a of air trapped within the corrugated card shown in Fig. 1.2.

2 *In this experiment you are to investigate the resistance of lamps in different circuit arrangements.*

Record all your observations and readings on page 3 of your Answer Booklet.

A circuit has been set up for you. You are also provided with an additional lamp and some additional connecting leads.

(a) Draw a circuit diagram of the circuit that has been set up for you. Use standard circuit symbols.

(b) **(i)** Switch on. Measure and record the current I_1 in the circuit and the p.d. V_1 across the lamp. Switch off.

(ii) Calculate the resistance R_1 of the lamp using the equation

$$R_1 = \frac{V_1}{I_1}.$$

(c) Connect a second lamp in parallel with the first lamp.

(i) Switch on. Measure and record the total current I_2 in the circuit and the p.d. V_2 across the lamps. Switch off.

(ii) Calculate the resistance R_2 of the two lamps in parallel using the equation

$$R_2 = \frac{V_2}{I_2}.$$

3 *In this experiment you are to determine the weight of a metre rule.*

Record all your observations on pages 4 and 5 of your Answer Booklet. Carry out the following instructions, referring to Fig. 3.1. The apparatus has been set up for you.

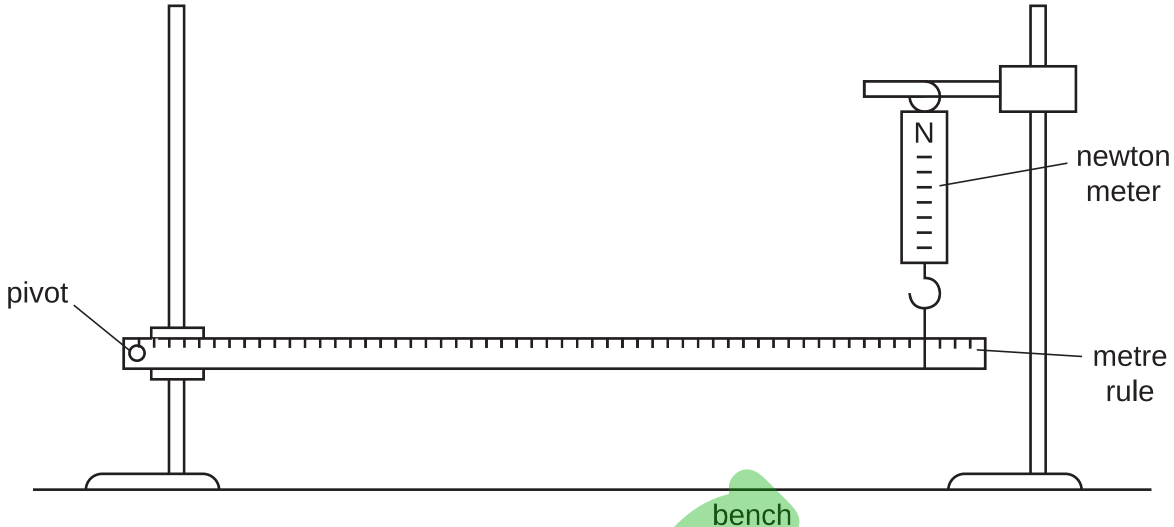

Fig. 3.1

You are provided with a metre rule supported at one end by a pivot through the 1.0 cm mark. The other end is supported by a newton meter hanging from a clamp.

(a) Adjust the position of the clamp supporting the newton meter so that the rule is supported at the 0.900 m mark and is horizontal. Describe how you checked that the metre rule was horizontal. You may draw a diagram if you wish.

(b) Record the force F shown on the newton meter. Also record the distance d (in m) from the pivot to the 0.900 m mark.

(c) Calculate and record the value of $\dfrac{1}{d}$.

(d) Adjust the position of the clamp supporting the newton meter so that the rule is supported at the 0.850 m mark and is horizontal. Check that the metre rule is horizontal.

(e) Record the force F shown on the newton meter and the distance d from the pivot to the 0.850 m mark. Calculate and record the value of $\dfrac{1}{d}$.

(f) Repeat steps **(d)** and **(e)** with the newton meter at the 0.800 m, 0.750 m and 0.700 m marks.

(g) Plot a graph of F / N (y-axis) against $\dfrac{1}{d} \Big/ \dfrac{1}{\text{m}}$ (x-axis).

(h) Determine the gradient G of the graph.

(i) Calculate the weight of the metre rule using the equation

$$W = \frac{G}{k},$$

where $k = 0.490$ m.

4 *In this experiment you are to investigate the refraction of light through a transparent block.*

Record all your observations and answers on page 6 of the Answer Booklet. Carry out the following instructions referring to Fig. 4.1.

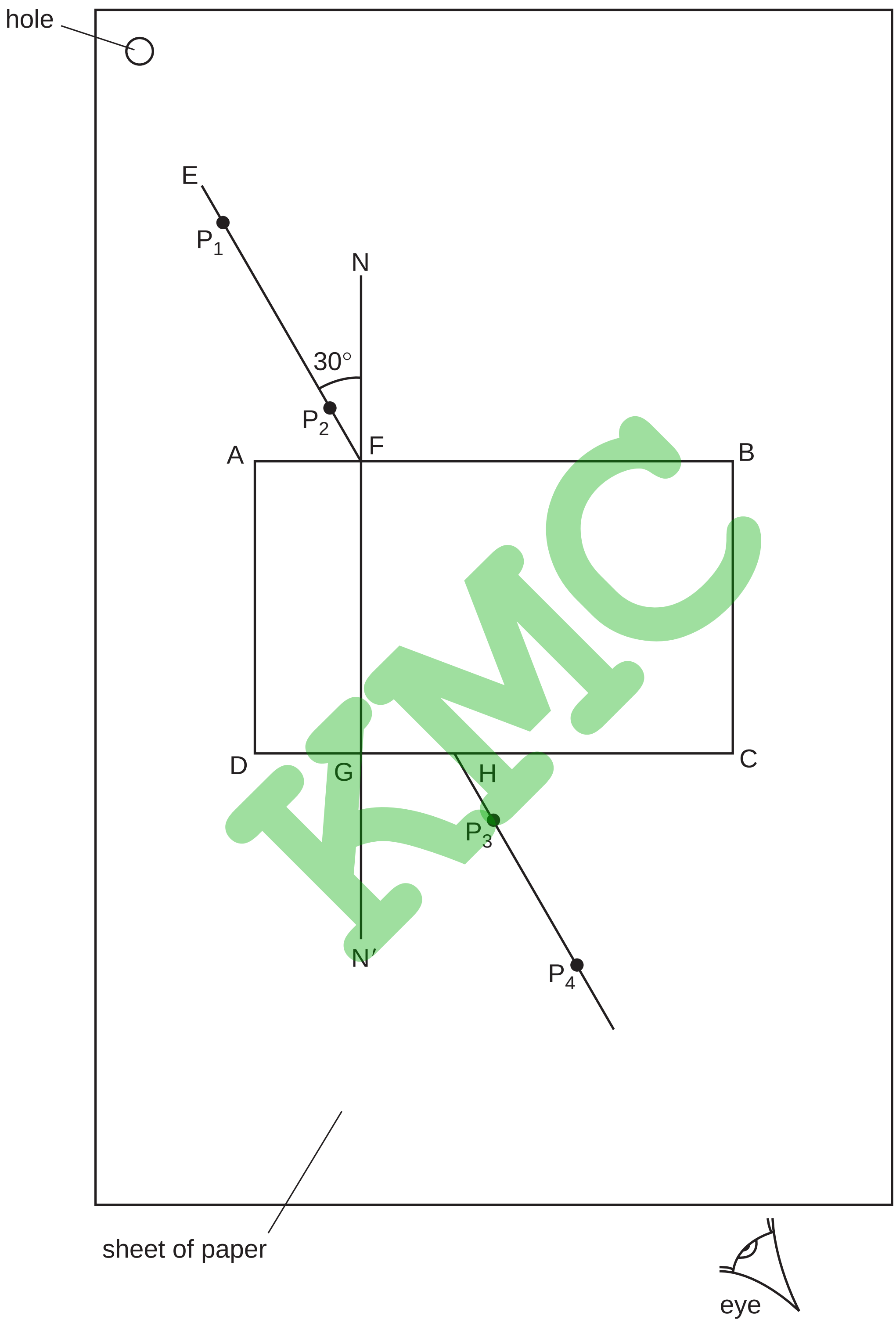

Fig. 4.1

(a) Place the transparent block, largest face down, on the sheet of plain paper supplied. The block should be approximately in the middle of the paper. Draw the outline ABCD of the block .

(b) Remove the block and draw the normal NN′ to side AB so that the normal is 2.0 cm from A. Label the point G where NN′ crosses DC.

(c) Draw the line EF at an angle of 30° to the normal, as shown in Fig. 4.1.

(d) Place the paper on the pin board.

(e) Place two pins P_1 and P_2 on line EF as shown in Fig. 4.1.

(f) Replace the block and observe the images of P_1 and P_2 through side CD of the block so that the images of P_1 and P_2 appear one behind the other. Place two pins P_3 and P_4 between your eye and the block so that P_3 and P_4 and the images of P_1 and P_2, seen through the block, appear one behind the other. Mark the positions of P_1, P_2, P_3 and P_4. Remove the block.

(g) Draw a line joining the positions of P_3 and P_4. Continue the line until it meets CD. Label this point H.

(h) Measure and record the length *a* of the line GH.

(i) Draw the line HF.

(j) Measure and record the length *b* of the line HF.

(k) Extend the straight line EF within the outline of the block to a point I. The distance FI must be exactly equal to *b*.

(l) From I draw a line that meets NN′ at a right angle. Label this position J.

(m) Measure and record the length *c* of the line IJ.

(n) Calculate the refractive index *n* of the material of the block using the equation

$$n = \frac{c}{a}.$$

Tie your sheet of paper into your Answer Booklet opposite page 6.

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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

PHYSICS **0625/05**

Paper 5 Practical Test **May/June 2007**

1 hour 15 minutes

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

If you have been given an Answer Booklet, follow the instructions on the front cover of the Booklet.
Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
You are expected to record all your observations as soon as these observations are made.
An account of the method of carrying out the experiments is **not** required.

At the end of the examination, hand in only the Answer Booklet.

This document consists of **8** printed pages and **1** Answer Booklet.

SPA (MML 13215 4/06) T25790/7

UNIVERSITY *of* CAMBRIDGE International Examinations

1 *In this experiment you are to investigate the temperature of a mixture of hot and cold water.*

Record all of your observations on page 2 of your Answer Booklet.

Carry out the following instructions referring to Fig. 1.1.

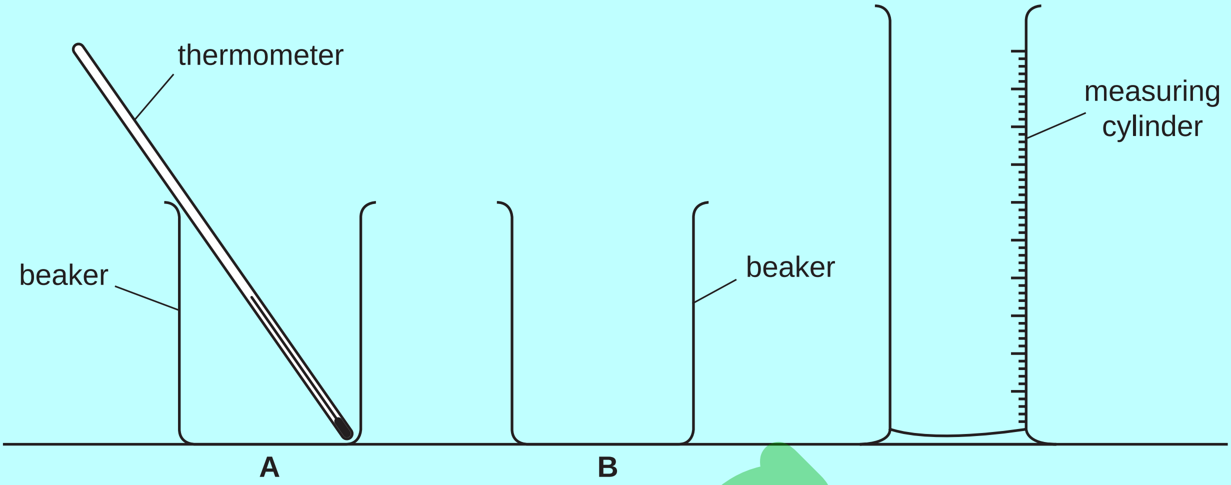

Fig. 1.1

(a) Pour 50 cm^3 of water from the supply labelled 'water at room temperature' into the measuring cylinder. Transfer this to the beaker labelled **A**.

(b) Measure and record the temperature θ_1 of the water in beaker **A**.

(c) Pour 50 cm^3 of water from the supply labelled 'hot water' into the measuring cylinder. Transfer this to the beaker labelled **B**.

(d) Measure and record the temperature θ_2 of the water in beaker **B**.

(e) As soon as you have recorded the temperature θ_2 pour the water from beaker **B** into beaker **A**.

(f) Measure and record the temperature θ_3 of the mixture of hot and cold water in beaker **A**.

(g) Do not pour the water out of beaker **A**. Repeat steps **(c)** and **(d)** and record the new value of θ_2.

(h) As soon as you have recorded the new temperature θ_2 add the water from beaker **B** to the water already in beaker **A**.

(i) Measure and record the new temperature θ_3 of the mixture of hot and cold water in beaker **A**.

(j) A theoretical calculation based on the equation

thermal energy lost by hot water = thermal energy gained by cold water

predicts higher values of the temperature θ_3 than the values that are obtained by this experiment.

Suggest

(i) a practical explanation for this difference,

(ii) two practical improvements that you could make to the procedure for this experiment to obtain a result that is closer to the theoretical result.

2 *In this experiment you are to investigate the position of a sheet of card that is hanging from a pivot.*

Record all of your observations on page 3 of your Answer Booklet.

Carry out the following instructions referring to Fig. 2.1.

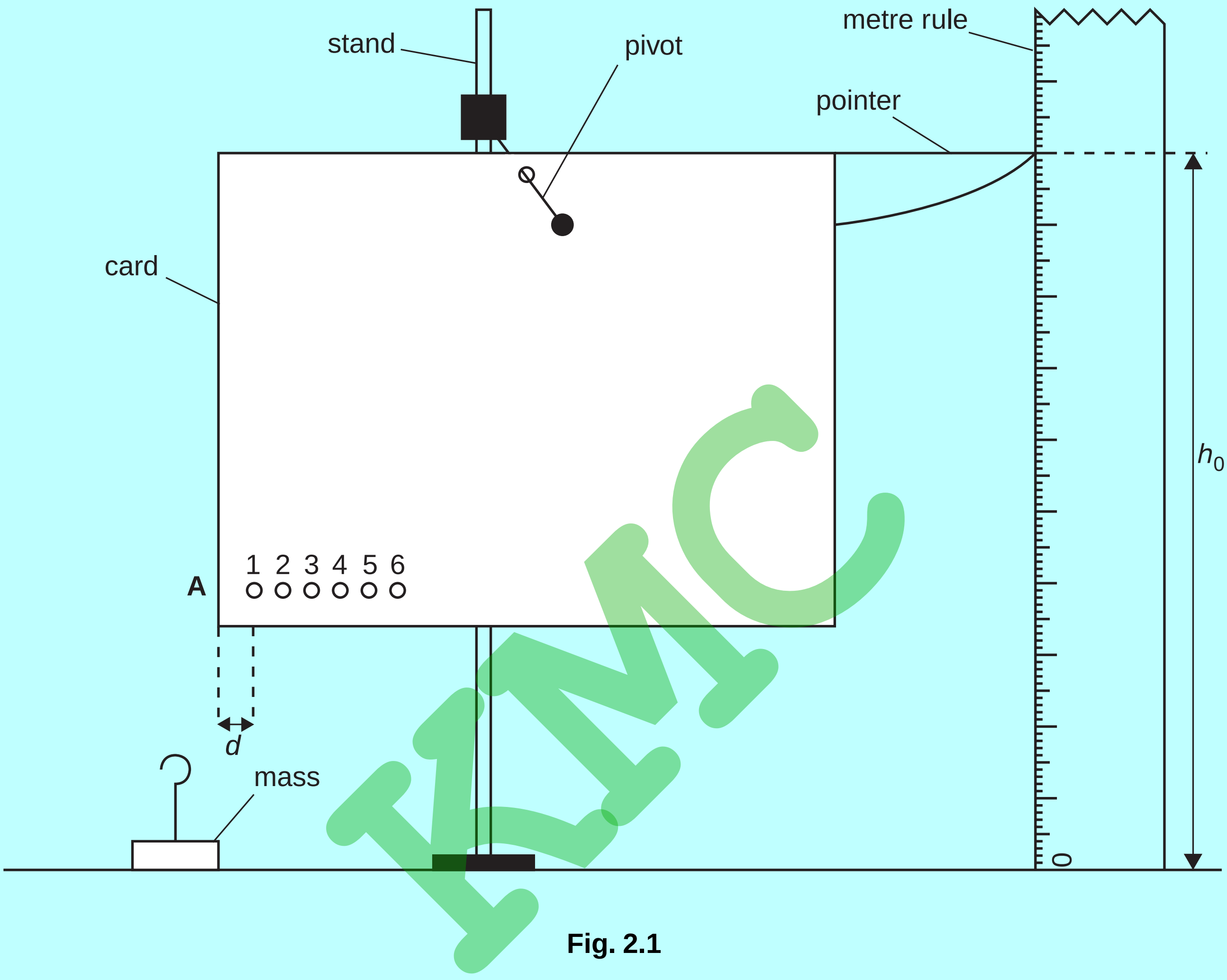

Fig. 2.1

(a) Place the metre rule close to the end of the pointer as shown in Fig. 2.1. The rule should be vertical. Record the height h_0 of the pointer above the bench.

(b) Remove the card from the pivot.

(c) Measure and record the distance *d* between the centre of the hole labelled **1** and the edge of the card at **A** as shown in Fig. 2.1.

(d) Repeat step **(c)** for each of the remaining holes **2** – **6**.

(e) Replace the card on the pivot as shown in Fig. 2.1.

(f) Hang the 50 g mass from the hole **1** in the card. Record the new height *h* of the pointer above the bench.

(g) Calculate the difference in heights *b* using the equation

$$b = (h - h_0).$$

(h) Repeat steps **(f)** and **(g)** for each of the remaining holes **2** – **6**.

(i) Plot the graph of *b* / mm (y-axis) against *d* / mm (x-axis).

(j) A student suggests that *b* is directly proportional to *d*. By reference to your graph state whether or not your results support the student's suggestion. Give a reason for your answer.

(k) It is important when recording the heights that the rule is vertical. State briefly how you checked that the rule was vertical.

3 *In this experiment you will investigate the resistance of a wire.*

Record all of your observations and answers on page 4 of your Answer Booklet.

Carry out the following instructions referring to Fig. 3.1, which shows the circuit that has been set up for you.

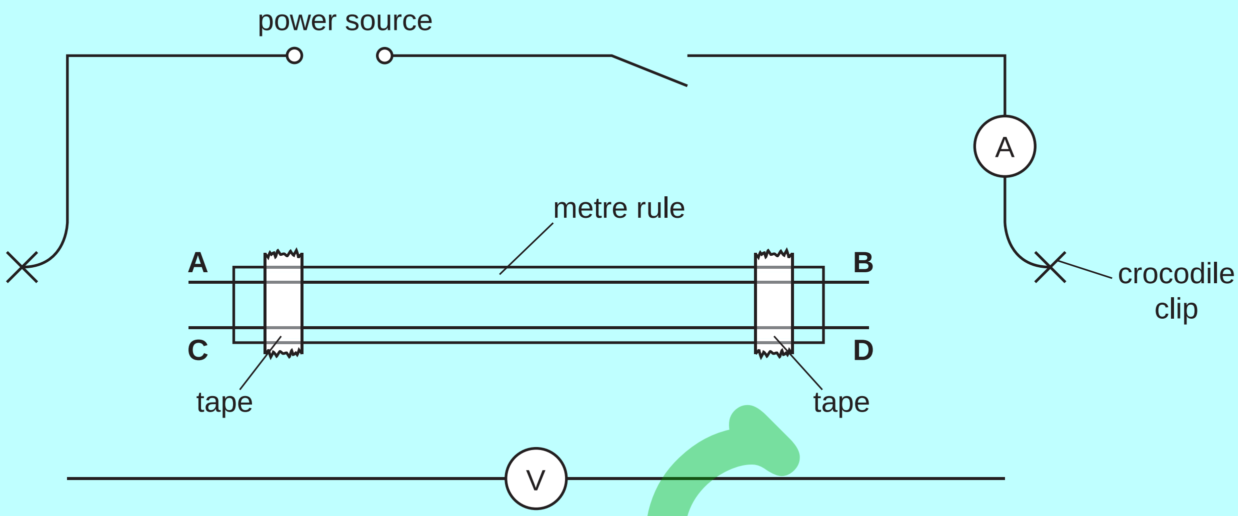

Fig. 3.1

You are provided with two lengths of resistance wire **AB** and **CD**.

(a) Connect the wire **AB** between the two crocodile clips.

(b) Switch on and, using the voltmeter, record the p.d. V across the wire between **A** and **B**.

(c) Using the ammeter, record the current I in the wire.

(d) Switch off.

(e) Calculate the resistance *R* of the wire **AB**, using the equation

$$R = V / I.$$

(f) Repeat the steps **(a)** to **(e)** using the wire **CD**.

(g) Complete the column headings in the table.

(h) The two wires, **AB** and **CD** are made of the same material and are of the same length. The diameter of wire **AB** is half the diameter of wire **CD**. Look at the results in the table. Here are four possible relationships between *R* and the diameter *d* of the wire. Select the relationship that best matches your results. Tick the appropriate box in the Answer Booklet.

- R is proportional to d
- R is proportional to $1/d$
- R is proportional to d^2
- R is proportional to $1/d^2$

(i) Explain the reason for your answer.

4 *In this experiment you will investigate the formation of images by a lens.*

Record all of your observations and answers on page 5 of your Answer Booklet.

Carry out the following instructions referring to Fig. 4.1.

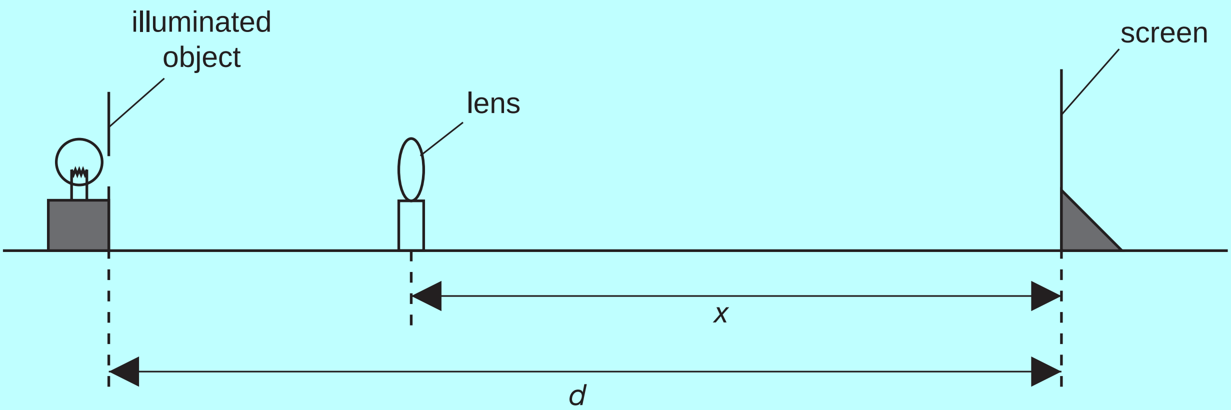

Fig. 4.1

(a) Place the screen at a distance $d = 0.800\,\text{m}$ from the illuminated object.

(b) Place the lens between the object and the screen and adjust its position until a clearly focused magnified image is formed on the screen.

(c) Measure and record the distance x between the centre of the lens and the screen.

(d) Without moving the illuminated object or the screen, move the lens towards the screen until a clearly focused diminished image is formed on the screen.

(e) Measure and record the distance y between the centre of the lens and the screen.

(f) Calculate the focal length f of the lens using the equation

$$f = \frac{xy}{d}.$$

(g) Repeat steps **(a)** to **(f)** with the distance d increased to $0.900\,\text{m}$.

(h) Calculate the average value of the focal length f.

(i) Outline any two steps that you took in this experiment in order to obtain an accurate result.

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME		
CENTRE NUMBER		CANDIDATE NUMBER

4186051396

PHYSICS **0625/05**

Paper 5 Practical Test **May/June 2008**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of this page.
Write in dark blue or black pen. You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

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.

For Examiner's Use	
1	
2	
3	
4	
Total	

This document consists of **11** printed pages and **1** blank page.

1 In this experiment, you are to determine the weight of a mass using a balancing method. Carry out the following instructions referring to Fig. 1.1.

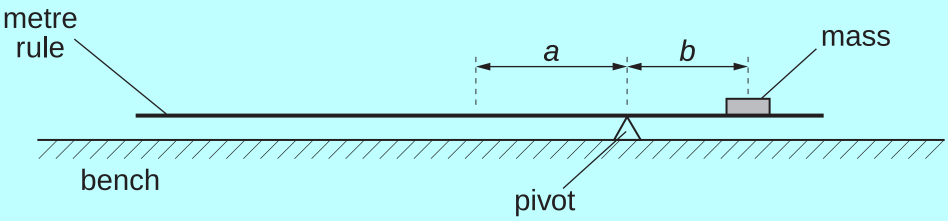

Fig. 1.1

(a) Place the mass on the metre rule so that its centre is directly above the 10.0 cm mark.

(b) Describe, with the aid of a diagram, how you judged that the centre of the mass was directly above the 10.0 cm mark.

[1]

(c) Place the rule on the pivot so that the rule is as near as possible to being balanced.

(d) Measure and record the distance *a* from the 50.0 cm mark (centre) of the rule to the pivot and the distance *b* from the centre of the mass to the pivot.

a = ...

b = ...[3]

(e) Calculate the weight W of the mass, using the equation

$$W = \frac{ka}{b}.$$

The value of k is given to you on a card close to the apparatus. Record the value of k.

k = ...

W = ...[1]

(f) Repeat the steps **(c)** to **(e)**, with the centre of the mass directly above the 20.0 cm mark on the metre rule.

a = ...

b = ...

W = ...[3]

(g) Calculate and record the average of the two values for W. Show your working.

Average value for W = ...[2]

[Total: 10]

2 In this experiment you are to compare the combined resistance of lamps in different circuit arrangements.

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(a) The circuit shown in Fig. 2.1 has been set up for you.

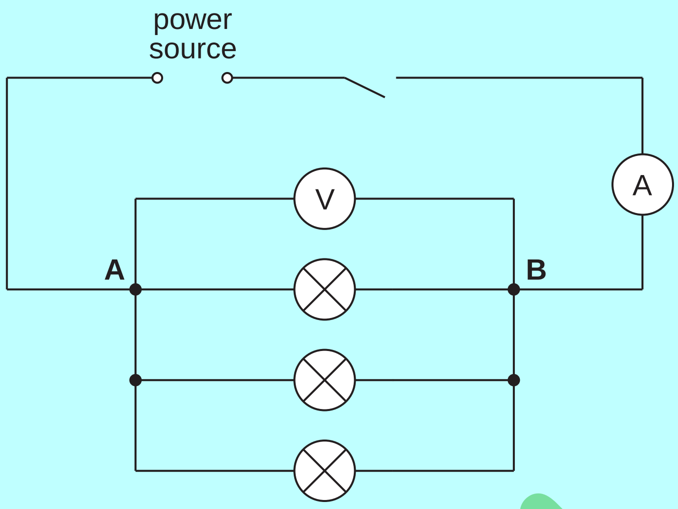


Fig. 2.1

(i) Switch on. Measure and record in row 1 of Table 2.1 (on page 5) the current I in the circuit and the p.d. V across points **A** and **B**. Switch off.

(ii) Calculate the combined resistance R of the three lamps using the equation

$$R = \frac{V}{I}.$$

Record this value of R in the table.

(iii) Complete the column headings for each of the V, I and R columns of the table.

(iv) Disconnect the lamps and then reconnect them between points **A** and **B** as shown in Fig. 2.2.

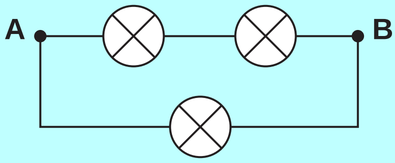


Fig. 2.2

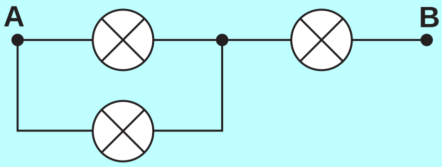


Fig. 2.3

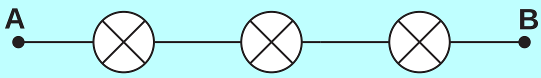


Fig. 2.4

(v) Switch on. Measure and record in row 2 of Table 2.1 the current I in the circuit and the p.d. V across points **A** and **B**. Switch off.

(vi) Calculate the combined resistance R of the three lamps using the equation

$$R = \frac{V}{I}.$$

Record this value of R in Table 2.1.

Table 2.1

	V I	*I* I	*R* I
Fig. 2.1			
Fig. 2.2			
Fig. 2.3			
Fig. 2.4			

(vii) Repeat steps **(iv)** to **(vi)** using the arrangements of the lamps shown in Fig. 2.3 and Fig. 2.4. [7]

(b) Theory suggests that, if all three lamps have the same resistance under all conditions, the combined resistance *R* recorded in row 1 will be one ninth of the combined resistance *R* recorded in row 4.

(i) State whether, within the limits of experimental accuracy, your results support this theory. Justify your answer by reference to the results.

statement ....

justification ....

....

(ii) Suggest a reason why the results may not support the theory.

....

....[3]

[Total: 10]

For Examiner's Use

3 In this experiment you are to investigate the effect of surface area exposed to the air on the rate of cooling of hot water.

Carry out the following instructions, referring to Fig. 3.1.

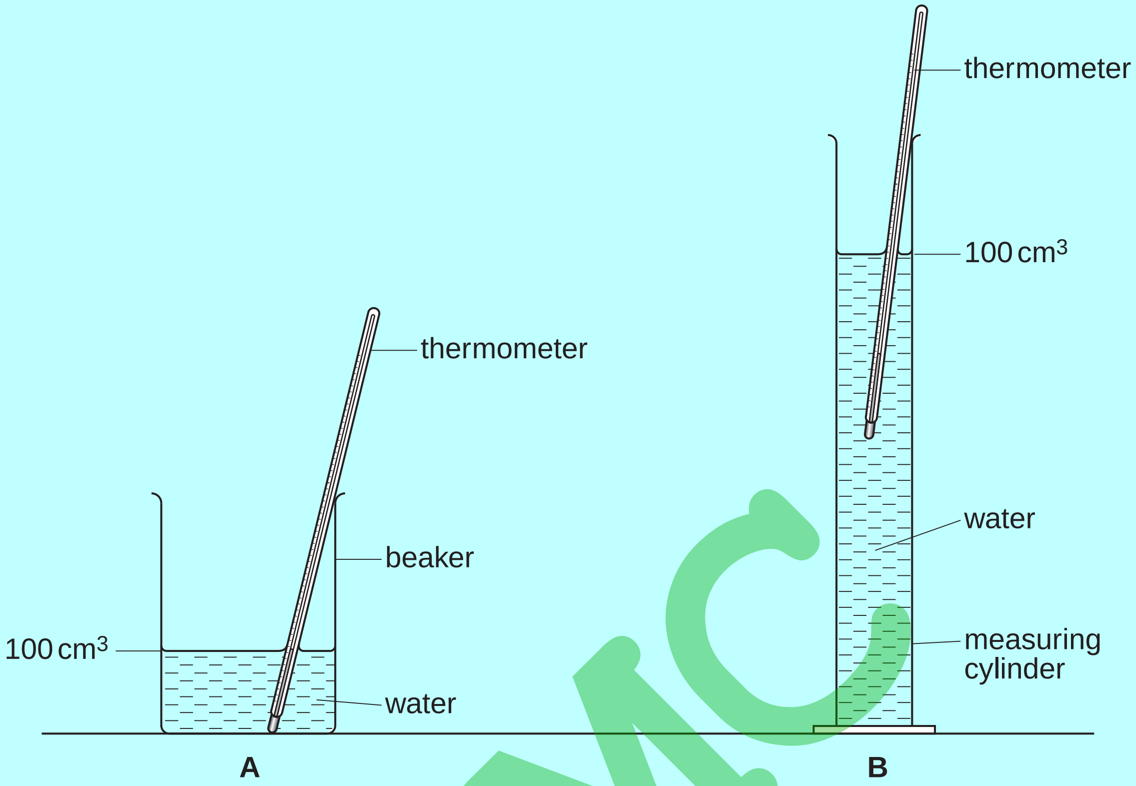


Fig. 3.1

You are provided with two containers labelled **A** (a beaker) and **B** (a measuring cylinder). You also have a supply of hot water.

(a) **(i)** Pour 100 cm^3 of hot water into container **A**.

(ii) Measure the temperature θ of the hot water. Record this temperature in Table 3.1 (on page 8) for time t = 0 s.

(iii) Start the stopwatch and then record the temperature of the water at 30 s intervals for a total of four minutes.

Table 3.1

	container **A** (beaker)	container **B** (measuring cylinder)
t/s	θ/°C	θ/°C
0		
30		
60		
90		
120		
150		
180		
210		
240		

[3]

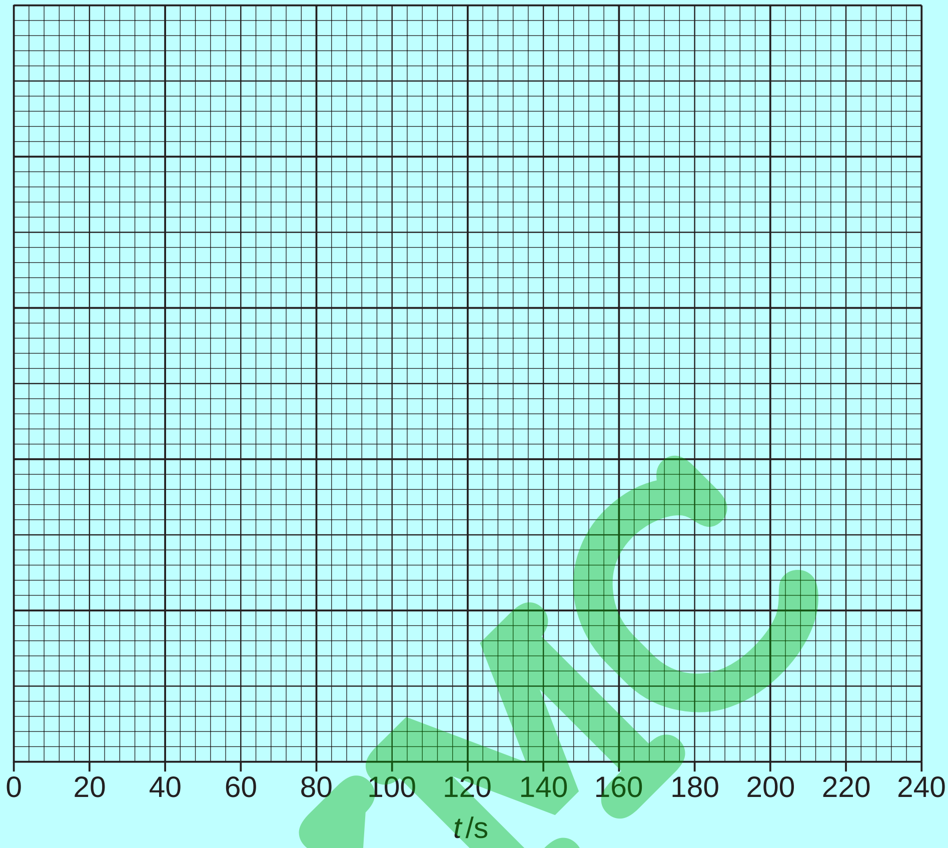
(iv) Pour 100 cm^3 of hot water into container **B**.

(v) Repeat steps **(ii)** and **(iii)**.

For Examiner's Use

(b) **(i)** Use the data in Table 3.1 to plot a graph of the temperature of the water in the beaker (*y*-axis) against time (*x*-axis). Draw the best fit curve.

(ii) Using the same graph axes, plot another graph, of the temperature of the water in the measuring cylinder against time.



[5]

(c) The experiment you have just done was designed to investigate the effect of the surface area exposed to the air on the rate of cooling of hot water.
State the effect of a larger surface area on the rate of cooling. Justify your answer by reference to your graph.

statement ....

justification ....

....[2]

[Total: 10]

4 In this experiment you are to determine a quantity called the refractive index of the material of a transparent block.

For Examiner's Use

Carry out the following instructions referring to Fig. 4.1.

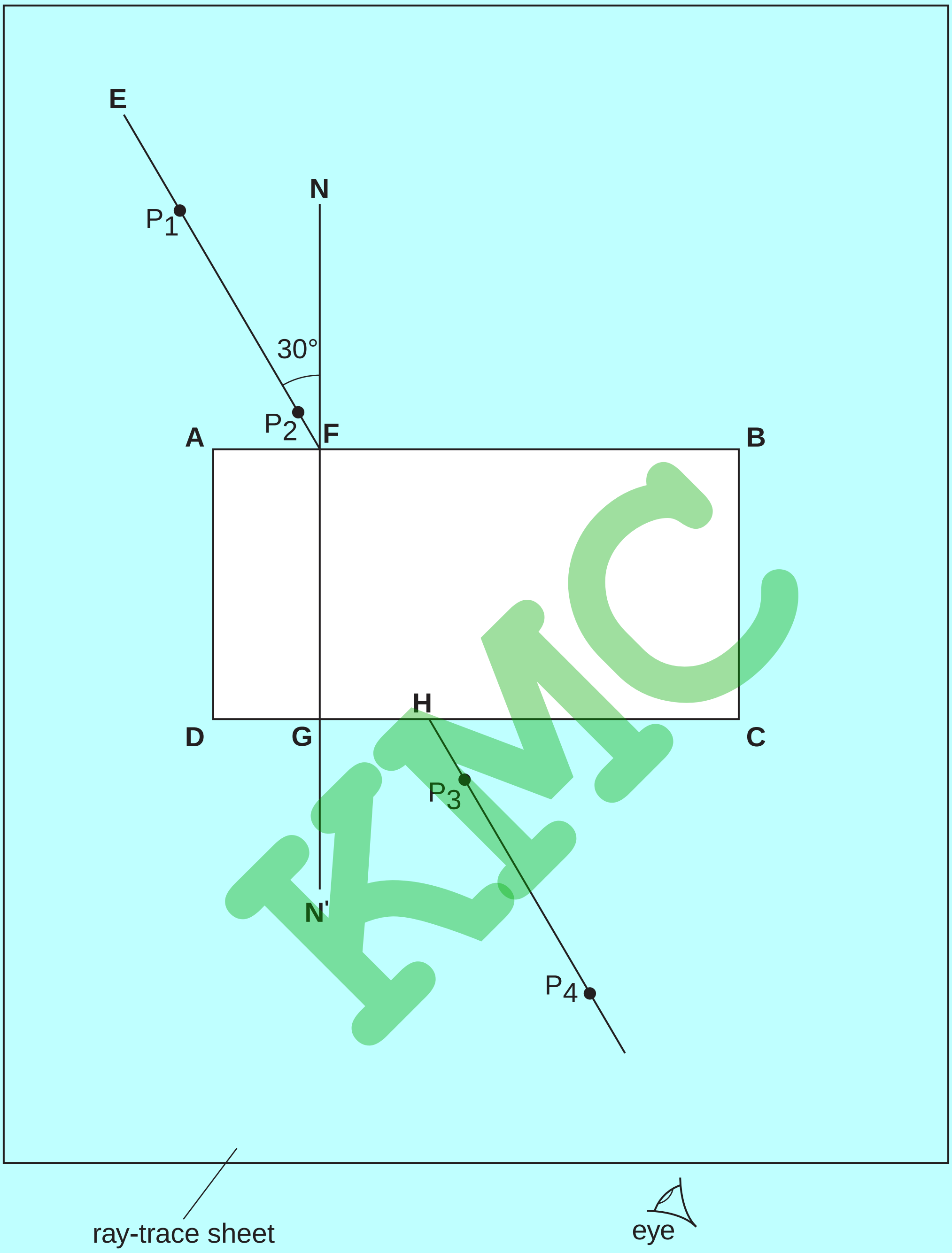


Fig. 4.1

(a) Place the transparent block, largest face down, on the ray-trace sheet supplied. The block should be approximately in the middle of the paper. Draw the outline of the block **ABCD**.

(b) Remove the block and draw the normal **NN'** to side **AB** so that the normal is 2.0 cm from **A**. Label the point **G** where **NN'** crosses **DC**. Label the point **F** where **NN'** crosses **AB**.

(c) Draw the line **EF** at an angle of 30° to the normal as shown in Fig. 4.1.

For Examiner's Use

(d) Place the paper on the pin board.

(e) Place two pins P_1 and P_2 on line **EF** as shown in Fig. 4.1.

(f) Replace the block and observe the images of P_1 and P_2 through side **CD** of the block so that the images of P_1 and P_2 appear one behind the other.
Place two pins P_3 and P_4 between your eye and the block so that P_3 and P_4 and the images of P_1 and P_2, seen through the block, appear one behind the other.
Mark the positions of P_1, P_2, P_3 and P_4. Remove the block.

(g) Draw a line joining the positions of P_3 and P_4. Continue the line until it meets **CD**. Label this point **H**.

(h) Measure and record the length *a* of the line **GH**.

a = ...[1]

(i) Draw the line **HF**.

(j) Measure and record the length *b* of the line HF.

b = ...[1]

(k) Extend the straight line **EF** through the outline of the block to a point **J**. The point **J** must be at least 5 cm from the block. The line **EJ** crosses the line **CD**. Label this point **K**.

(l) **(i)** Measure and record the length *c* of the line **GK**.

c = ...

(ii) Measure and record the length *d* of the line **FK**.

d = ...[1]

(m) Calculate the refractive index *n* of the material of the block using the equation

$$n = \frac{cb}{ad}$$

n = ...[2]

Tie your ray-trace sheet opposite this page. [5]

[Total: 10]

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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

4126398727

PHYSICS **0625/05**

Paper 5 Practical Test **May/June 2009**

1 hour 15 minutes

Candidates answer on the Question Paper

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

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.

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1	
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3	
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Total	

This document consists of **10** printed pages and **2** blank pages.

SP SJF4894/SW T76311/3

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1 In this experiment, you are to make two sets of measurements as accurately as you can in order to determine the density of glass.

Carry out the following instructions referring to Fig. 1.1.

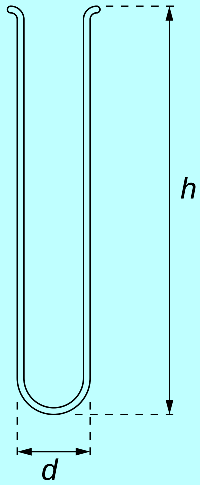

Fig. 1.1

Method 1

(a) (i) Use the two blocks of wood and the rule to measure the external diameter *d* of the test-tube in cm.

d = ... cm

(ii) Draw a labelled diagram to show how you used the blocks of wood and the rule to find, as accurately as possible, a value for the external diameter of the test-tube.

(iii) Measure the height *h* of the test-tube in cm.

h = ... cm

(iv) Calculate the external volume V_e of the test-tube using the equation

$$V_e = \frac{\pi d^2 h}{4}.$$

V_e = ...
[3]

(b) Use the balance provided to measure the mass m_1 of the test-tube.

m_1 = ... [1]

(c) **(i)** Completely fill the test-tube with water. Pour the water into the measuring cylinder and record the volume V_i of the water.

V_i = ...

(ii) Calculate the density ρ of the glass using the equation

$$\rho = \frac{m_1}{(V_e - V_i)}.$$

ρ = ...
[1]

Method 2

(d) (i) Pour water into the measuring cylinder up to about the 175 cm^3 mark. Record this volume V_1.

V_1 = ...

(ii) Carefully lower the test-tube, open end uppermost, into the measuring cylinder so that it floats. Record the new volume reading V_2 from the measuring cylinder.

V_2 = ...

(iii) Calculate the difference in volumes $(V_2 - V_1)$.

$(V_2 - V_1)$ = ...

(iv) Calculate the mass m_2 of the test-tube using the equation

$m_2 = k(V_2 - V_1)$ where $k = 1.0\,g/cm^3$.

m_2 = ...

[3]

(e) (i) Use the wooden rod to push the test-tube, open end uppermost, down to the bottom of the measuring cylinder so that the test-tube is full of water and below the surface. Remove the wooden rod. Record the new volume reading V_3 from the measuring cylinder.

V_3 = ...

(ii) Calculate the density ρ of the glass using the equation

$$\rho = \frac{m_2}{(V_3 - V_1)}.$$

ρ = ...

[2]

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2 In this experiment, you are to investigate the cooling of thermometer bulbs under different conditions.

Carry out the following instructions referring to Fig. 2.1.

You are provided with two thermometers, **A** and **B**. Thermometer **B** has cotton wool wrapped around the bulb. Do **not** remove this cotton wool.

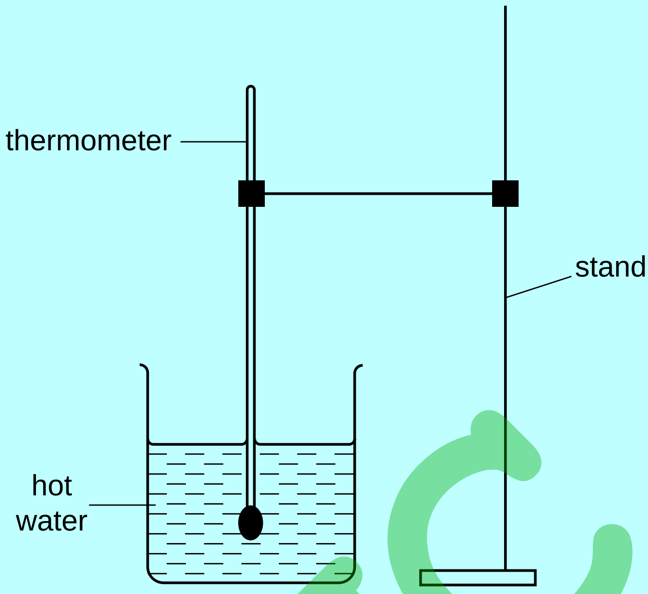


Fig. 2.1

(a) **(i)** Place thermometer **A** in the beaker of hot water. Measure θ, the temperature of the water. Record θ in Table 2.1 at time t = 0 s.

(ii) Remove the thermometer from the water, starting the stopclock as you do so. Record in Table 2.1 the temperature θ of the thermometer bulb at 30 s intervals until you have a total of seven values.

Table 2.1

	Thermometer **A**	Thermometer **B**
t /	θ /	θ /

(iii) Repeat steps **(i)** and **(ii)** using thermometer **B**.

(iv) Complete Table 2.1 by inserting the appropriate unit in each of the time and temperature column headings. [6]

(b) State which thermometer cooled more quickly. Justify your answer by reference to your readings.

Statement ....

Justification ....

....

.... [2]

(c) To make a fair comparison between the rates of cooling of the two thermometer bulbs under different conditions (in this experiment one thermometer bulb is covered with cotton wool) it is important to control other experimental conditions. Suggest two conditions that should be controlled in this experiment.

1 ....

....

2 ....

.... [2]

3 In this experiment, you will investigate the resistance of a wire.

Carry out the following instructions referring to Fig. 3.1, which shows the circuit that has been set up for you.

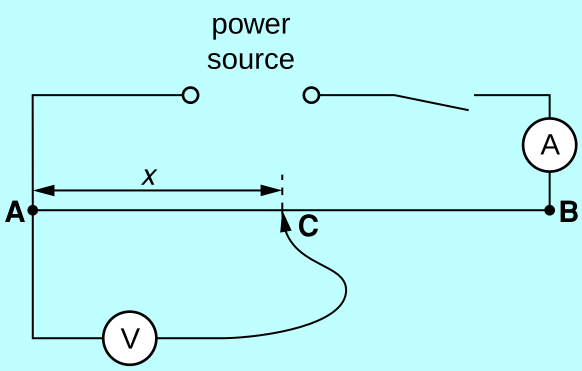


Fig. 3.1

You are provided with a length of resistance wire **AB**.

(a) Place the sliding contact **C** on the resistance wire **AB** at a distance *x* from **A**, where $x = 0.100\,\text{m}$.

(b) Record the value of *x* in Table 3.1.

(c) Switch on. Using the voltmeter, measure the p.d. *V* across the wire between **A** and **C**. Record the value of *V* in Table 3.1.

(d) Using the ammeter, measure the current I in the wire. Record the value of I.

I = ... [1]

(e) Take the sliding contact away from the wire **AB** and switch off.

(f) Calculate the resistance *R* of the section **AC** of the wire using the equation $R = \frac{V}{I}$.

(g) Record *R* in the table.

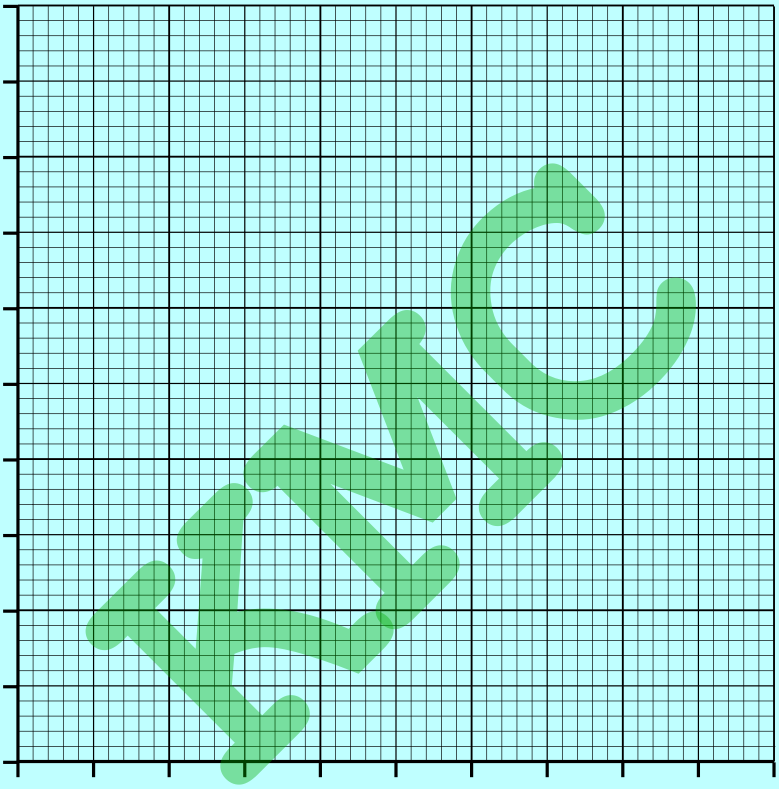
Table 3.1

x / m	*V* / V	*R* / Ω

[3]

(h) Repeat steps **(a)** to **(g)** with the sliding contact at distances of x = 0.300 m, 0.500 m, 0.700 m and 0.900 m from **A**.

(i) Plot a graph of R/Ω (y-axis) against x/m (x-axis). [3]



(j) Within the limits of experimental accuracy, what do you conclude about the variation of resistance with distance along the wire? Justify your conclusion by reference to your graph.

Statement ....

Justification ....

.... [1]

(k) Using your graph, determine a value for the resistance R when the length x = 0.750 m. Show clearly on your graph how you obtained the necessary information.

R = ... [2]

4 In this experiment, you are to determine the focal length of a converging lens.

Carry out the following instructions referring to Fig. 4.1.

Fig. 4.1

(a) Place the lens so that its centre is a distance u = 25.0 cm from the illuminated object.

(b) Record in Table 4.1 the distance u in cm from the centre of the lens to the illuminated object, as shown in Fig. 4.1.

(c) Place the screen close to the lens. Move the screen away from the lens until a focused image of the object is seen on the screen.

(d) Measure and record in Table 4.1 the distance v in cm from the centre of the lens to the screen.

Table 4.1

u / cm	v / cm	f / cm

[5]

(e) Calculate and record in the table the focal length f of the lens using the equation

$$f = \frac{uv}{(u + v)}.$$

(f) Place the lens so that its centre is 45.0 cm from the illuminated object.

(g) Repeat steps **(b)** to **(e)**.

(h) Calculate the average value of the focal length.

Average value of the focal length = ...
[3]

(i) State and briefly explain one precaution you took in order to obtain reliable measurements.

Statement ....

Explanation ....

.... [2]

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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

5659002653

PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2010**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

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.

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3	
4	
Total	

This document consists of **10** printed pages and **2** blank pages.

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1 In this experiment, you are to investigate the stretching of springs.

You have been provided with the apparatus shown in Fig. 1.1.

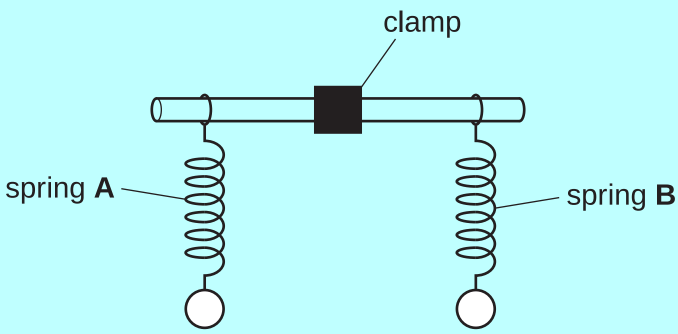

Fig. 1.1

(a) **(i)** Measure the length l_A of spring **A**.

l_A = ... mm

(ii) On Fig. 1.1 show clearly where you decided to start and end the length measurement l_A.

(iii) Hang the 200 g mass on spring **A**. Measure the new length l of the spring.

l = ... mm

(iv) Calculate the extension e_A of spring **A** using the equation $e_A = (l - l_A)$.

e_A = ... mm
[3]

(b) **(i)** Measure the length l_B of spring **B**.

l_B = ... mm

(ii) Hang the 200 g mass on spring **B**. Measure the new length l of the spring.

l = ... mm

(iii) Calculate the extension e_B of spring **B** using the equation $e_B = (l - l_B)$

e_B = ... mm
[2]

(c) Use the small length of wooden rod provided to hang the 400 g mass midway between the springs as shown in Fig. 1.2.

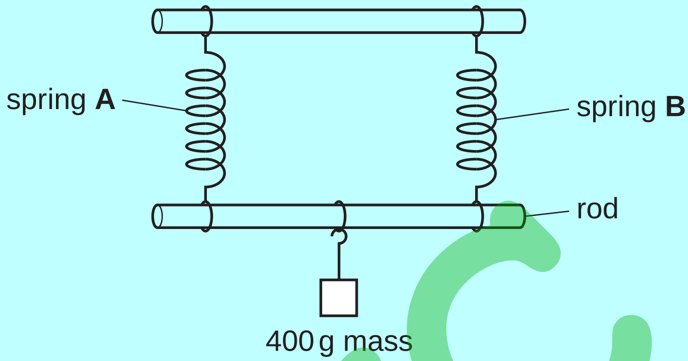

Fig. 1.2

(i) Measure the new lengths of each of the springs.

spring **A**: l = ... mm

spring **B**: l = ... mm

(ii) Calculate the extension of each spring using the appropriate equation from parts **(a)** and **(b)**.

spring **A**: e = ... mm

spring **B**: e = ... mm

(iii) Calculate the average of these two extensions e_{av}. Show your working.

e_{av} = ...mm
[2]

(d) Theory suggests that $\frac{(e_{\mathbf{A}} + e_{\mathbf{B}})}{2} = e_{\text{av}}$.

State whether your results support this theory and justify your answer with reference to the results.

Statement ....

Justification ....

.... [2]

(e) Describe briefly one precaution that you took to obtain accurate length measurements.

....

....

.... [1]

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2 In this experiment, you are to investigate the cooling of water.

Carry out the following instructions referring to Fig. 2.1.
You are provided with a beaker containing hot water and a thermometer.

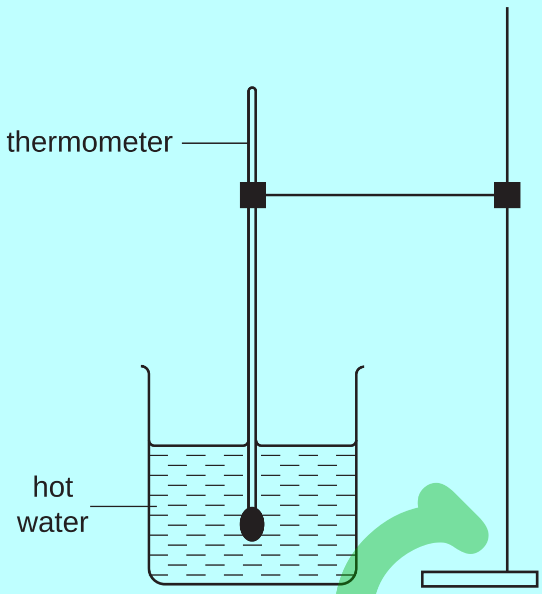


Fig. 2.1

(a) **(i)** Place the thermometer in the beaker of water. Measure the temperature θ of the water. Record θ in Table 2.1 at time $t = 0$ s.

(ii) Start the stopclock and record in Table 2.1 the temperature of the water at 30 s intervals until you have a total of six values up to time $t = 150$ s. Do not stop the stopclock, but take one final reading of the temperature of the water at time $t = 300$ s. Record this value in the table.

Table 2.1

t / s	θ / °C
0	
30	
60	
90	
120	
150	
300	

[2]

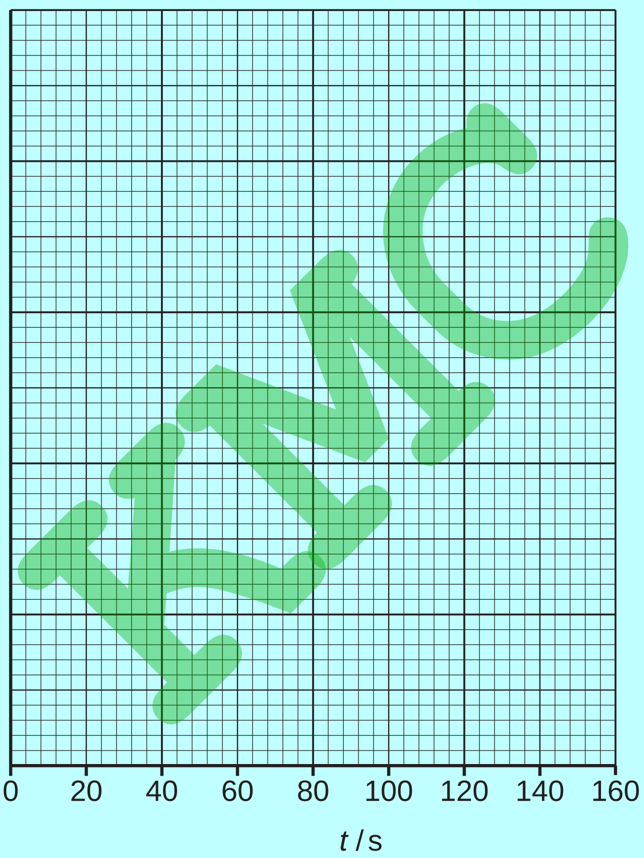
(b) **(i)** Using the information in the table, calculate the temperature change T_1 of the water in the first 150 s.

T_1 = ...

(ii) Using the information in the table, calculate the temperature change T_2 of the water in the final 150 s.

T_2 = ... [3]

(c) Plot a graph of θ / °C (*y*-axis) against *t* / s (*x*-axis) for the first 150 s. [5]



3 In this experiment, you will investigate the effect of the length of resistance wire in a circuit on the potential difference across a lamp.

The circuit has been set up for you.

(a) Fig. 3.1 shows the circuit without the voltmeter. Draw on the circuit diagram the voltmeter as it is connected in the circuit. [2]

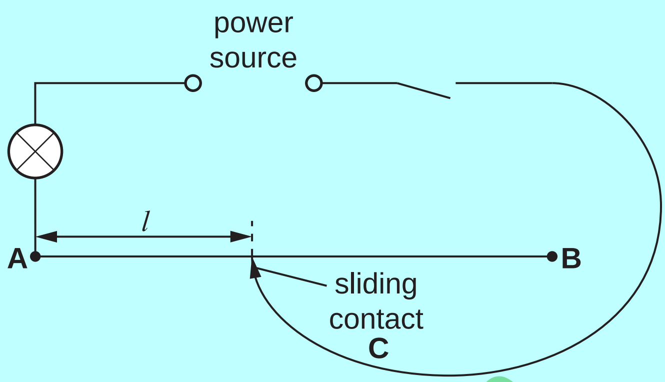


Fig. 3.1

(b) **(i)** Switch on and place the sliding contact **C** on the resistance wire at a distance l = 0.150 m from end **A**. Record the value of l and the potential difference V across the lamp in Table 3.1. Switch off.

(ii) Repeat step **(i)** using the following values of l: 0.350 m, 0.550 m, 0.750 m and 0.950 m. Record all the values of l and V in Table 3.1.

Table 3.1

l / m	V / V	$\frac{V}{l}$ /

(iii) For each pair of readings in the table calculate and record in the table the value of $\frac{V}{l}$.

(iv) Complete the table by writing in the unit for $\frac{V}{l}$. [5]

(c) A student suggests that the potential difference V across the lamp is directly proportional to the length l of resistance wire in the circuit. State whether or not you agree with this suggestion and justify your answer by reference to your results.

Statement ....

Justification ....

.... [2]

(d) State one precaution that you would take in order to obtain accurate readings in this experiment.

....

....

.... [1]

4 In this experiment, you are to investigate reflection from a plane mirror.

Carry out the following instructions referring to Fig. 4.1.

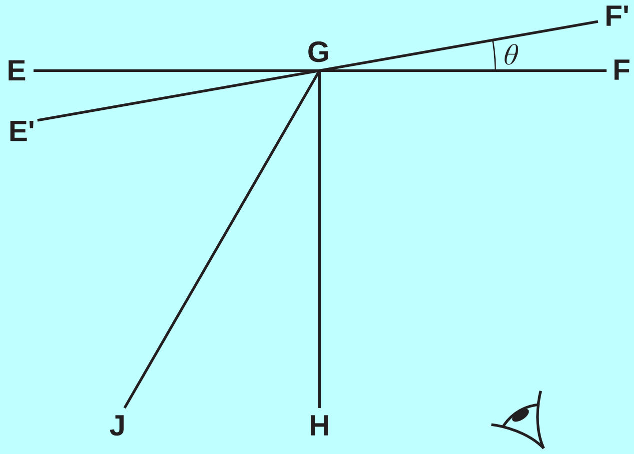


Fig. 4.1

(a) Draw a straight line **EF** across the ray trace sheet, about 10 cm from the top of the sheet.

(b) Draw a normal **GH** to line **EF** so that point **G** is approximately at the centre of line **EF**.

(c) Draw a line **GJ** at an angle of incidence $i = 30°$ to the normal as shown in Fig. 4.1.

(d) Place the ray trace sheet on the pin board. Place the mirror so that it stands along the line **EF**.

(e) Push a pin P_1 into the surface at a point on **GJ** close to the mirror. Label this point **A**.

(f) Push another pin P_2 into the surface on **GJ** some distance from the mirror. Label this point **B**.

(g) View the images of the pins P_1 and P_2 from the direction indicated by the eye in Fig. 4.1. Push two pins P_3 and P_4 into the surface between your eye and the mirror so that P_3, P_4 and the images of P_1 and P_2 appear exactly in line.

(h) Mark the positions of pins P_3 and P_4 on the ray trace sheet with letters **C** and **D**. Remove the pins and the mirror. Using a rule, draw a line joining **C** and **D**, and continue this line to meet the line **EF**.

(i) Measure the angle of reflection r_1 between lines **GH** and **CD**.

r_1 = ... [1]

(j) Draw a line **E'GF'** such that the angle θ between this line and the line **EGF** is 10°. (See Fig. 4.1). Place the mirror so that it stands along the line **E'F'**.

(k) Push the pins P_1 and P_2 into the ray trace sheet at the same points **A** and **B** used previously.

(l) Repeat step **(g)**.

(m) Mark the positions of pins P_3 and P_4 on the ray trace sheet with letters **C'** and **D'**. Remove the pins and the mirror. Using a rule, draw a line joining **C'** and **D'**, and continue this line to meet the line **E'F'**.

(n) **(i)** Measure the angle r_2 between lines **GH** and **C'D'**.

r_2 = ...

(ii) Calculate the angle α through which the reflected ray has moved.

α = ...

(iii) Calculate the difference between 2θ and α.

difference between 2θ and α = ... [2]

(o) Theory suggests that if the mirror is moved through an angle θ then the reflected ray will move through an angle of 2θ. State whether your result supports the theory and justify your answer by reference to the result.

Statement ....

Justification ....

.... [2]

Tie your ray trace sheet into this Booklet between pages 10 and 11. [5]

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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

7257678223

PHYSICS **0625/52**

Paper 5 Practical Test **May/June 2010**

1 hour 15 minutes

Candidates answer on the Question Paper

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

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.

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1 In this experiment, you are to determine the mass of a load using a balancing method.

Carry out the following instructions referring to Fig. 1.1.

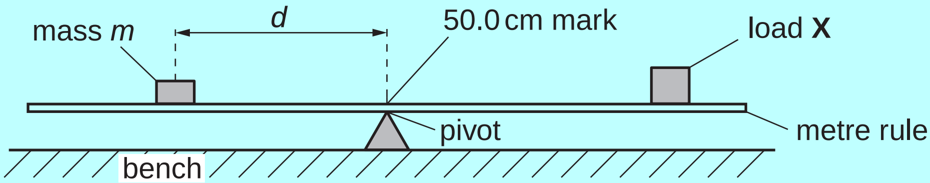


Fig. 1.1

The load **X** has been taped to the metre rule so that its centre is exactly over the 90.0 cm mark. Do not move this load.

(a) Place a mass of 40 g on the rule and adjust its position so that the rule is as near as possible to being balanced with the 50.0 cm mark exactly over the pivot as shown in Fig. 1.1.

(i) Record in Table 1.1 the distance *d* from the centre of the 40 g mass to the 50.0 cm mark on the rule.

(ii) Repeat step **(i)** using masses of 50 g, 60 g, 70 g and 80 g to obtain a total of five sets of readings. Record the readings in the table.

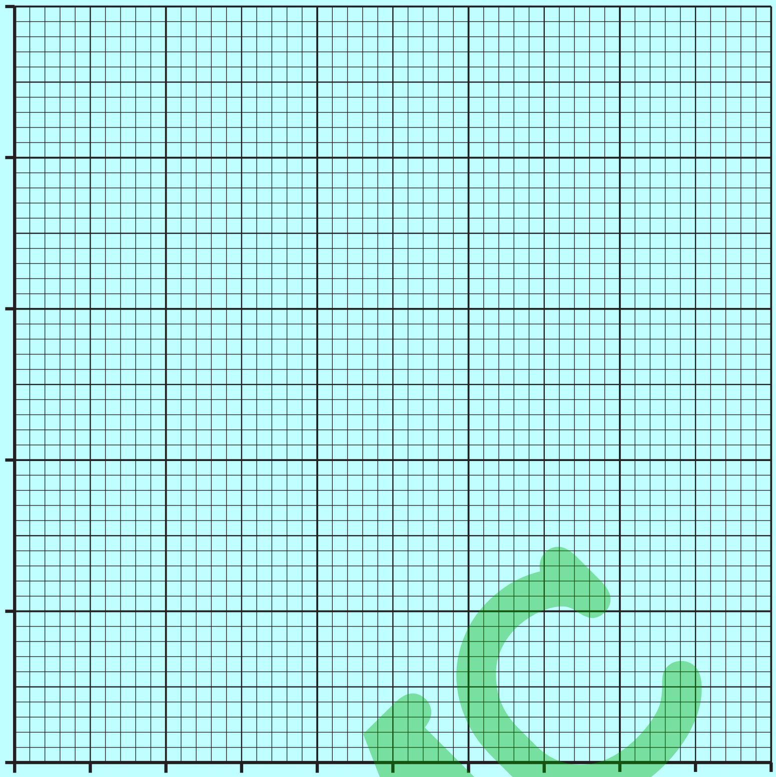
(iii) For each value of *d* calculate $\frac{1}{d}$ and enter the values in the table.

Table 1.1

m / g	d / cm	$\frac{1}{d}\Big/\frac{1}{\text{cm}}$
40		
50		
60		
70		
80		

[2]

(b) Plot a graph of m/g (y-axis) against $\frac{1}{d} \Big/ \frac{1}{\text{cm}}$ (x-axis).



[4]

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

G = ... [2]

(d) Determine the mass μ of the load **X** using the equation $\mu = \frac{G}{k}$ where k = 40.0 cm.

μ = ... [2]

2 In this experiment you will investigate the rate of cooling of water in different containers.

Carry out the following instructions referring to Fig. 2.1.

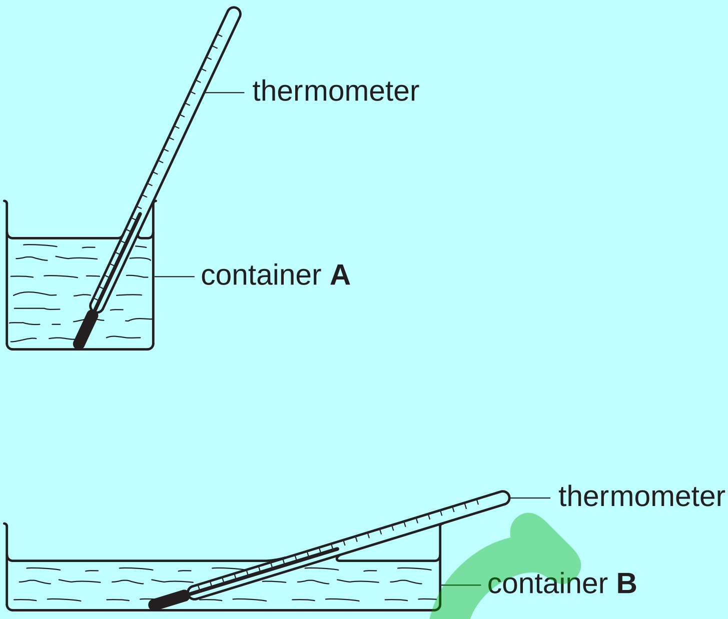


Fig. 2.1

(a) **(i)** Pour approximately 200 cm^3 of hot water into container **A**.

(ii) Place the thermometer in container **A**.

(iii) Record in Table 2.1 the temperature of the water at 30 s intervals from t = 0 s until you have a total of seven values up to time t = 180 s.

(iv) Place the thermometer in container **B**.

(v) Pour hot water into container **B** until there is sufficient at least to cover the thermometer bulb.

(vi) Repeat step **(iii)**.

(vii) Complete the column headings in the table.

Table 2.1

	(Container **A**)	(Container **B**)
t /	θ /	θ /

[5]

(b) Calculate the temperature change of the water in each container over the period of 180 s.

Container **A** temperature change = ...

Container **B** temperature change = ... [1]

(c) State which container, **A** or **B** has the greater rate of cooling. Justify your answer by reference to your readings.

Statement ....

Justification ....

....

.... [2]

(d) To make a fair comparison between the rates of cooling of the hot water in the two containers it is important to control other experimental conditions. Suggest two conditions that should be controlled in this experiment.

1 ....

2 .... [2]

3 In this experiment, you are to determine the resistances of lamps in different circuit arrangements.

Carry out the following instructions, referring to Fig. 3.1.

The circuit shown in Fig. 3.1 has been set up for you. This is Circuit 1.

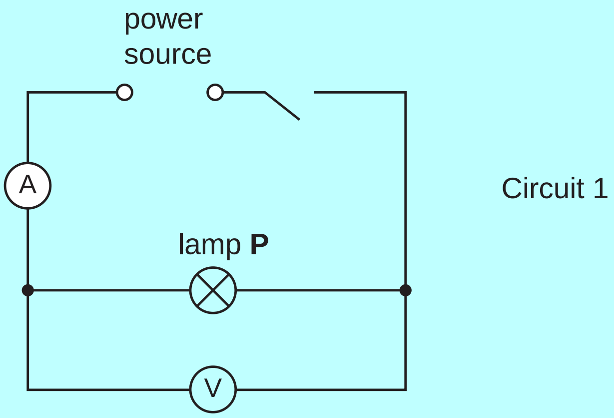


Fig. 3.1

(a) Switch on. Measure and record in Table 3.1 the current I in the circuit and the p.d. V across lamp **P**. Switch off.

(b) Calculate the resistance R of lamp **P** using the equation $R = \frac{V}{I}$.

Record this value of R in the table.

(c) Replace lamp **P** with lamp **Q**. This is Circuit 2 (not shown). Repeat steps **(a)** and **(b)**.

(d) Return lamp **P** to the circuit so that lamps **P** and **Q** are in parallel with each other. This is Circuit 3. Repeat steps **(a)** and **(b)**.

Table 3.1

	V /	I /	R /
Circuit 1			
Circuit 2			
Circuit 3			

[5]

(e) Complete the column headings in the table.

(f) Draw a diagram of Circuit 3 using standard circuit symbols.

[3]

(g) A student suggests that the resistance of lamp **P** added to the resistance of lamp **Q** should be equal to the combined resistance of the two lamps when arranged in parallel in Circuit 3. State whether or not your results support this suggestion and justify your answer with reference to your experimental results.

Statement ....

Justification ....

....

....

.... [2]

4 In this experiment you will investigate refraction and reflection of light in a transparent block.

Carry out the following instructions referring to Fig. 4.1.

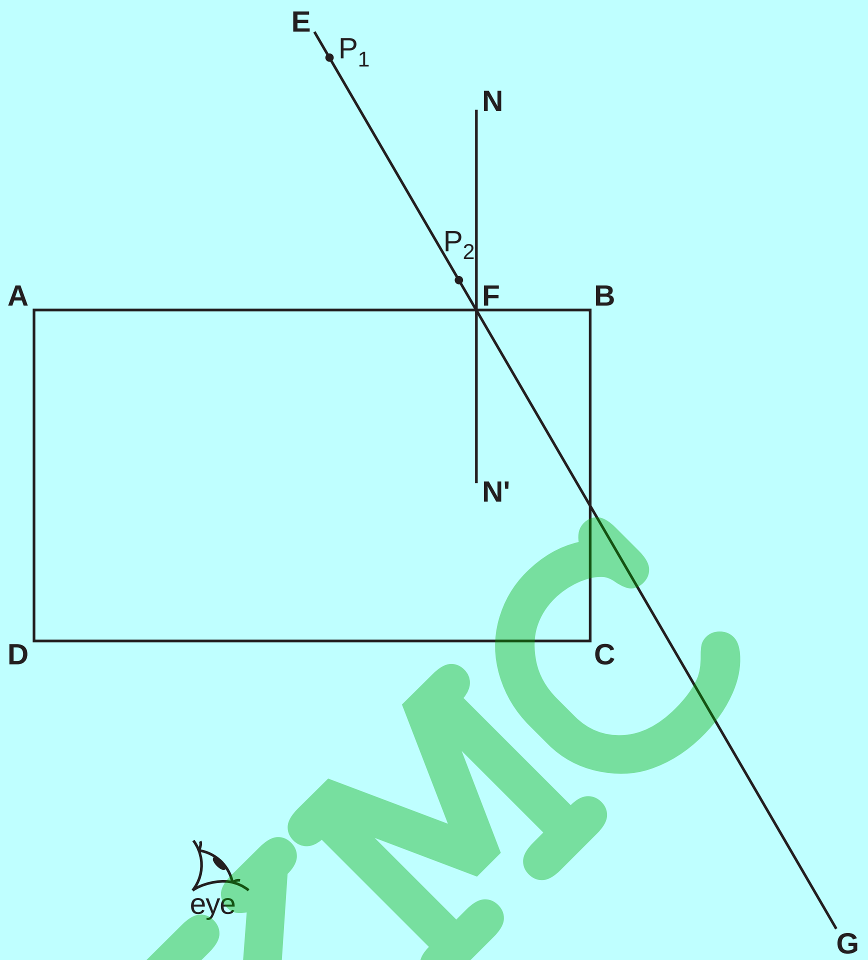


Fig. 4.1

(a) Place the transparent block, largest face down, on the ray-trace sheet supplied. The block should be approximately in the middle of the paper. Draw the outline of the block **ABCD**.

(b) Remove the block and draw the normal **NN'** to side **AB** so that the normal is 2.0 cm from **B**. Label the point **F** where **NN'** crosses **AB**.

(c) Draw the line **EF** at an angle of incidence i = 30° to the normal. Continue the line so that it crosses **BC** and extends about 5 cm beyond **BC** as shown in Fig. 4.1. Label the end of the line **G**.

(d) Place the paper on the pin board.

(e) Push two pins P_1 and P_2 into line **EF** as indicated in Fig. 4.1.

(f) Replace the block and observe the images of P_1 and P_2 through side **CD** of the block from the direction indicated by the eye in Fig. 4.1 so that the images of P_1 and P_2 appear one behind the other.
Push two pins P_3 and P_4 into the surface, between your eye and the block, so that P_3, P_4 and the images of P_1 and P_2, seen through the block, appear in line.
Mark the positions of P_1, P_2, P_3 and P_4. Remove the block.

(g) Draw a line joining the positions of P_3 and P_4. Continue the line so that it crosses **CD** and extends beyond **BC** to cross line **EFG**. Label the end of the line **H**.

(h) Remove the pins from the ray trace sheet. Measure the smaller angle θ between line **EFG** and the line joining the positions of P_3, P_4 and **H**.

θ = ... [1]

(i) Calculate the difference $(\theta - 2i)$.

$(\theta - 2i)$ = ... [1]

(j) Repeat steps **(c)** to **(i)** using an angle of incidence i = 40° to the normal.

θ = ...

$(\theta - 2i)$ = ... [1]

(k) Theory suggests that $\theta = 2i$. State whether your result supports the theory and justify your answer by reference to your results.

Statement ....

Justification ....

....

....[2]

Tie your ray trace sheet into this Booklet between pages 8 and 9. [5]

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International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2011**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
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DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

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.

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[Turn over

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1 In this experiment you are to determine the position of the centre of mass of a triangular card.

Carry out the following instructions referring to Fig. 1.1.

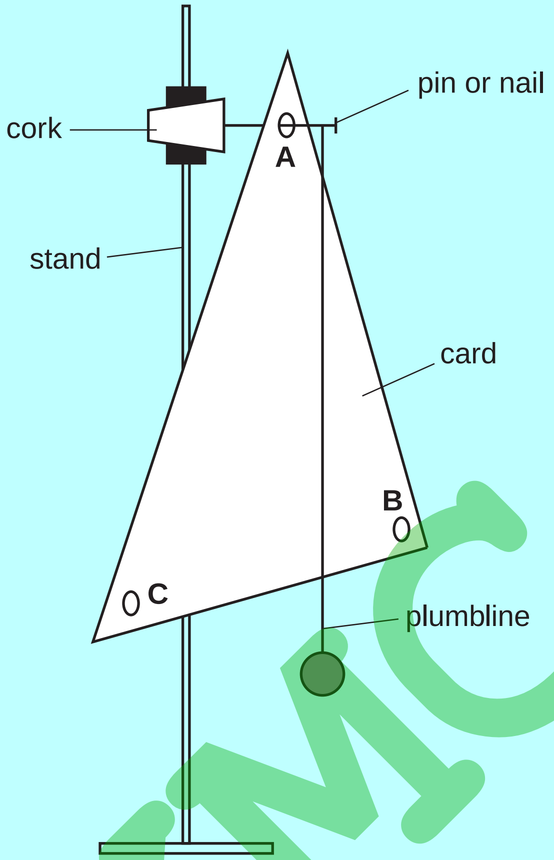


Fig. 1.1

You are provided with a small mass attached to a length of thread. This is referred to as the plumbline.

(a) Measure and record the lengths of the three sides of the triangular sheet of card.

length 1 = ...

length 2 = ...

length 3 = ... [1]

(b) **(i)** Hang the card on the nail through hole **A**.

(ii) Hang the plumbline from the nail so that it is close to the card but not touching it.

(iii) When the card and plumbline are still, make a small mark at the edge of the card where the plumbline crosses the edge.

(iv) Remove the card and draw a line from the mark to hole **A**.

(c) Repeat the steps in **(b)** using hole **B**.

(d) Repeat the steps in **(b)** using hole **C**.

For Examiner's Use

(e) Place your card in the space below and draw around its outline.

On your diagram on page 4,

(i) show the positions of each of the holes **A**, **B** and **C** with a small, neat circle. Label each circle with the appropriate letter (**A**, **B** or **C**),

(ii) show the positions of each of the marks you made in **(b)(iii)** with a small neat cross (✕),

(iii) draw the lines between the positions of the holes **A**, **B** and **C** and the corresponding marks, as on your sheet of card. [5]

(f) If the experiment is completely accurate, the centre of mass of the card is at the position where the three lines meet.

On your diagram judge the best position for the centre of mass.

Draw a line from this position to the right-angled corner of the card and measure the distance *a* between the centre of mass and the right-angled corner of the card.

a = ... [3]

(g) In this experiment it is important that the card is able to swing freely. For this reason the plumbline should not touch the card, but be a small distance from the card. This could cause an inaccuracy in marking the card at the correct position (part **(b)(iii)**).

Describe how you minimised the possible inaccuracy. You may draw a diagram.

....

.... [1]

[Total: 10]

For Examiner's Use

2 In this experiment you will investigate the rate of cooling of water.

Carry out the following instructions referring to Fig. 2.1. You are provided with a beaker of hot water.

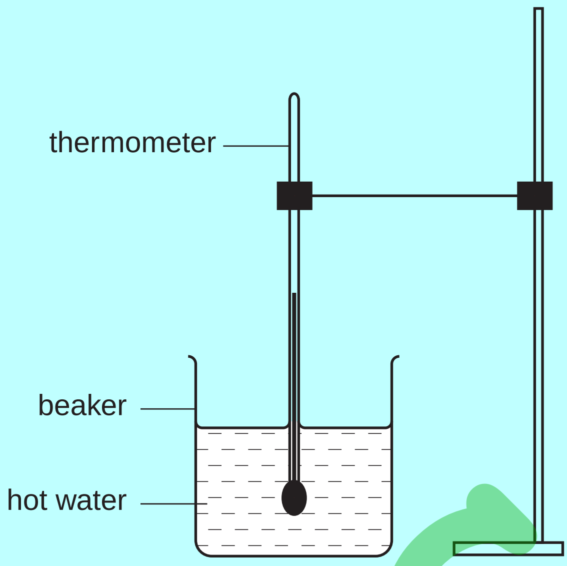


Fig. 2.1

(a) **(i)** Place the thermometer into the water as shown in Fig. 2.1.

(ii) When the temperature shown on the thermometer stops rising, record the temperature θ in Table 2.1 at time t = 0 s and immediately start the stopclock.

(iii) Record in the table the temperature of the water at 30 s intervals from t = 30 s until you have a total of seven values up to t = 180 s.

Table 2.1

t /	θ /
0	

(b) Complete the column headings in the table. [3]

For Examiner's Use

(c) **(i)** Calculate the temperature fall T_1 during the first 30 s of cooling.

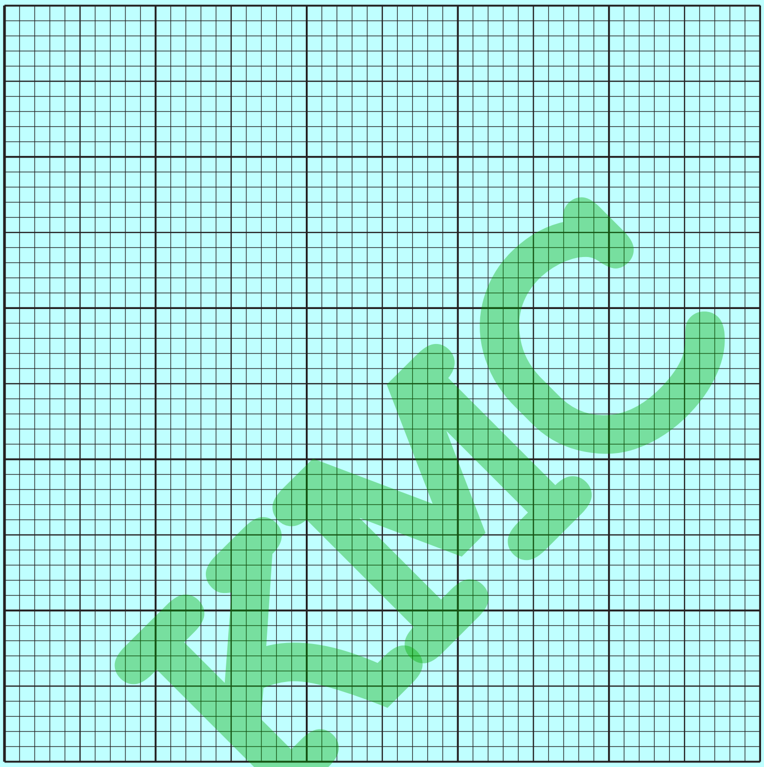
T_1 = ...

(ii) Calculate the temperature fall T_2 during the final 30 s of cooling.

T_2 = ...

[1]

(d) Plot the graph of temperature (*y*-axis) against time (*x*-axis).



[4]

(e) **(i)** State how the rate of cooling in the first 30 s differs from the rate of cooling in the final 30 s.

....

....

(ii) Explain how the graph line shows this difference.

....

....

[2]

[Total: 10]

3 In this experiment you will measure the currents in lamps in a circuit.

Carry out the following instructions referring to Fig. 3.1.

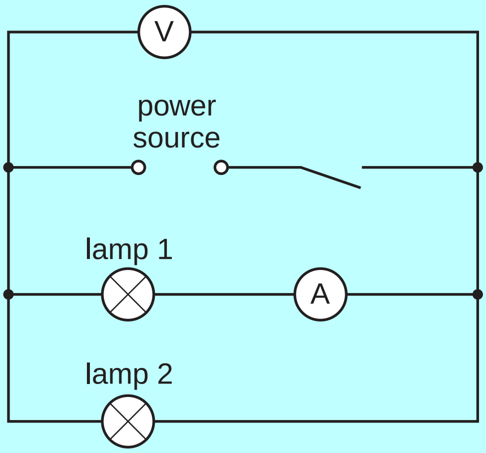


Fig. 3.1

(a) The circuit shown in Fig. 3.1 is set up for you.

Switch on.

Record in Table 3.1 the potential difference V across the lamps and the current I in lamp 1.

Switch off. [1]

(b) Rearrange the circuit so that the ammeter is connected in series with lamp 2.

Switch on, and record in the table the potential difference V across the lamps and the current I in lamp 2.

Switch off. [1]

Table 3.1

	V /	I /	R /
lamp 1			
lamp 2			

(c) **(i)** Calculate the resistance R of each lamp, using the equation $R = \frac{V}{I}$ and enter the results in the table.

(ii) Add together the two values of R to calculate R_S, the sum of the resistances.

For Examiner's Use

R_S = ...

(iii) Complete the column headings in the table.

[3]

(d) Rearrange the circuit so that the lamps and the ammeter are all in series. Do not change the position of the voltmeter.

(i) Record the readings on the voltmeter and the ammeter.

voltmeter reading = ...

ammeter reading = ...

(ii) Use the voltmeter and ammeter readings to calculate R_T the combined resistance of the two lamps in series.

R_T = ... [2]

(e) A student suggests that the values of R_S and R_T should be equal.

State whether your results support this suggestion and justify your statement by reference to the calculated values.

statement ....

justification ....

.... [2]

(f) State, without reference to the values of resistance that you have calculated, one piece of evidence that you have observed during the experiment that shows that the temperature of the lamp filaments changes.

....

.... [1]

[Total: 10]

4 In this experiment you will investigate the reflection of light by a plane mirror.

Carry out the following instructions, referring to Fig. 4.1.

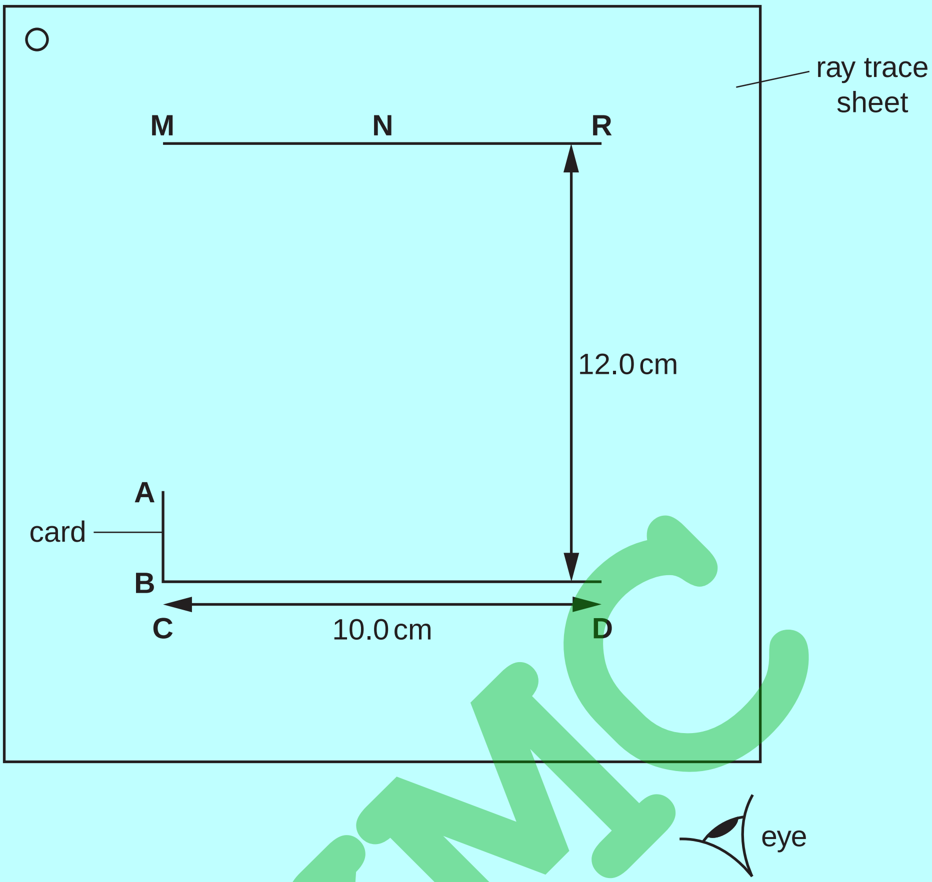


Fig. 4.1

(a) Draw a line 10 cm long near the top of the ray trace sheet. Label the line **MR**. Draw a normal to this line at its centre. Label the normal **NL**.

(b) Draw a line 10 cm long that is parallel to line **MR** and 12 cm below it. Label this line **CD**.

(c) Place the mirror, with its reflecting face vertical, on the line **MR**.

(d) Place the card so that it stands vertically with end **B** at **C** and such that the card is at right angles to line **CD** (see Fig. 4.1). Draw a line along the edge of the card and label the line **AB**.

(e) Remove the card and the mirror. Draw a line from the edge **A** of the card to the point **N**. Replace the card and the mirror.

(f) Place a pin P_1 on line **AN**. Label the position of P_1.

(g) View the image of the edge **A** of the card in the mirror from the direction indicated by the eye in Fig. 4.1. Place two pins P_2 and P_3 some distance apart so that pins P_3, P_2 and the reflections of P_1 and the edge **A** of the card, all appear exactly one behind the other. Label the positions of P_2 and P_3.

(h) Remove the pins and the mirror and draw in the line joining the positions of P_2 and P_3. Continue the line until it meets the normal.

For Examiner's Use

For Examiner's Use

(i) Measure and record in Table 4.1 the angle of incidence *i* between the line **AN** and the normal. Measure, and record in the table, the angle of reflection *r* between the normal and the line passing through P_2 and P_3.

Table 4.1

edge	*i* / °	*r* / °
A		
B		

[3]

(j) Repeat the steps **(e)** – **(i)** but using edge **B** of the card instead of edge **A**.

(k) In spite of carrying out this experiment with care, it is possible that the values of the angle of reflection *r* will not be exactly the same as the values obtained from theory. Suggest two possible causes of this inaccuracy.

1. ....

....

2. ....

.... [2]

Tie in your ray trace sheet between pages 10 and 11. [5]

[Total: 10]

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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

PHYSICS **0625/52**

Paper 5 Practical Test **May/June 2011**

1 hour 15 minutes

Candidates answer on the Question Paper

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

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.

For Examiner's Use	
1	
2	
3	
4	
Total	

This document consists of **9** printed pages and **3** blank pages.

DC (AC/DJ) 28852/6

UNIVERSITY *of* CAMBRIDGE International Examinations

For Examiner's Use

1 In this experiment you will investigate the loading of a metre rule.

Carry out the following instructions referring to Fig. 1.1.

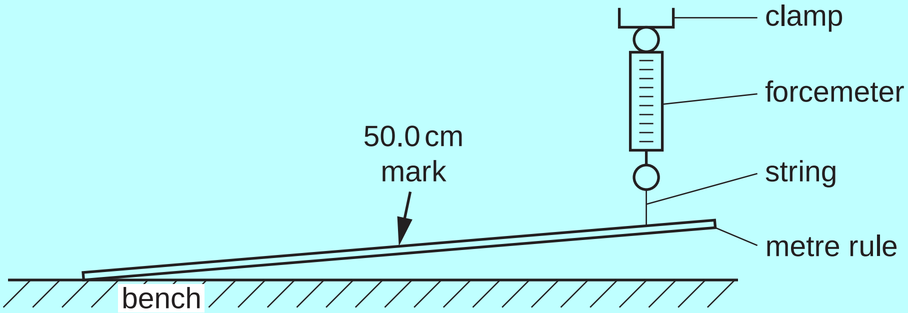


Fig. 1.1

You are provided with a metre rule that is attached at one end to the bench. The other end is supported by a forcemeter. Do not change the position of the forcemeter or move the end of the rule that is attached to the bench. You are also provided with a range of masses.

(a) Without placing a mass on the rule, record in Table 1.1 the reading *F* on the forcemeter.

(b) Place a 100 g mass on the rule at the 50.0 cm mark shown in Fig. 1.1. Record in the table the value of the mass *m* and the reading *F* on the forcemeter.

(c) Repeat step **(b)** using masses of 200 g, 300 g, 400 g and 500 g.

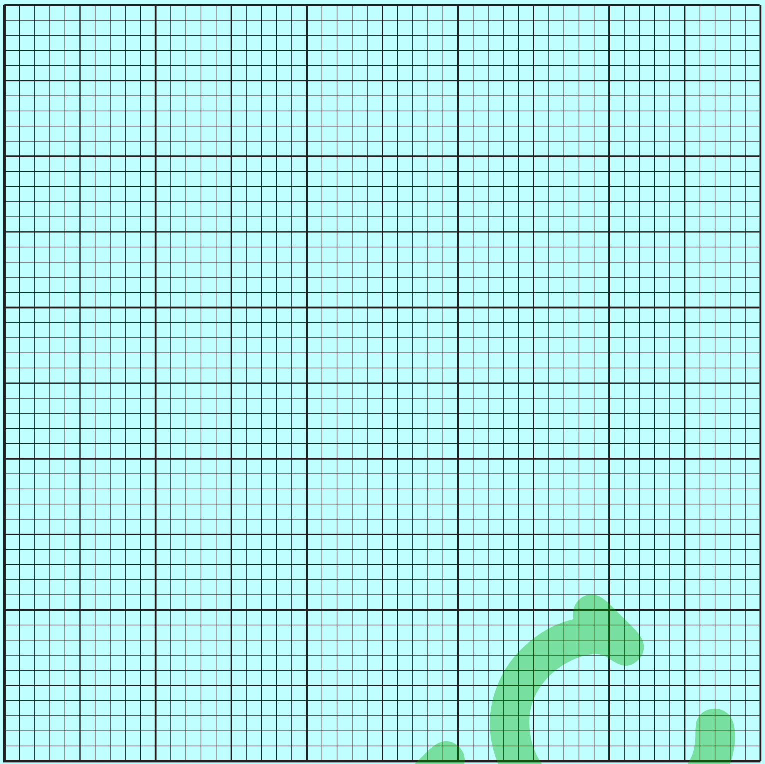
Table 1.1

m / g	*F* / N
0	

[3]

For Examiner's Use

(d) Plot a graph of F / N (y-axis) against m / g (x-axis).



[4]

(e) Use the graph to find the value of F when m = 375 g. Show clearly on the graph how you obtained the result.

F = ... [2]

(f) The forcemeter shows a reading when no mass has been added to the metre rule. Assuming that the forcemeter has no zero error, suggest a reason for the reading.

suggested reason ....

.... [1]

[Total: 10]

For Examiner's Use

2 In this experiment you will investigate the rate of cooling of water.

Carry out the following instructions referring to Fig. 2.1. You are provided with a supply of hot water.

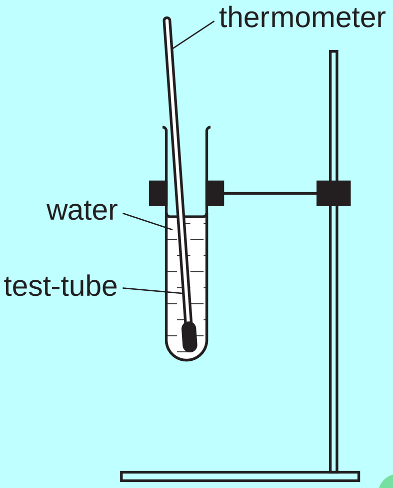


Fig. 2.1

(a) Measure and record room temperature θ_R.

θ_R = ... [1]

(b) Pour hot water into the test-tube until it is about two thirds full of water. Place the thermometer in the water.

(c) **(i)** When the thermometer reading stops rising, measure the temperature θ of the water in the test-tube and immediately start the stopclock. Record θ in Table 2.1 at time t = 0 s.

(ii) Record in the table the time t and the temperature θ of the water every 30 s until you have a total of seven readings.

(d) Remove the thermometer and pour away the water from the test-tube. Wrap the cotton wool round the test-tube and secure it with the elastic bands. Repeat the steps in **(b)** and **(c)**.

(e) Complete the time and temperature column headings in the table.

Table 2.1

t /	tube without cotton wool θ /	tube with cotton wool θ /
0		

[5]

(f) State in which experiment the cooling was more rapid. Justify your answer by reference to your readings.

experiment ....

justification ....

....

....[2]

(g) If these experiments were to be repeated in order to check the results, it would be important to control the conditions. Suggest two conditions that should be controlled.

1. ....

2. .... [2]

[Total: 10]

For Examiner's Use

3 In this experiment you will investigate the resistance of a wire in different circuit arrangements.

For Examiner's Use

The circuit shown in Fig. 3.1 has been set up for you.

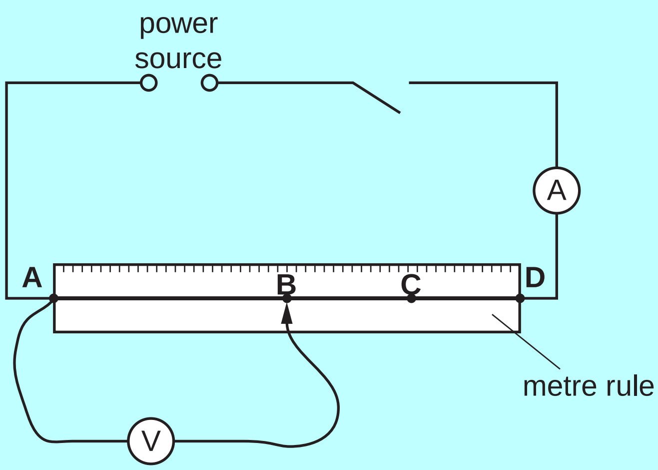


Fig. 3.1

(a) **(i)** Switch on. Measure and record in Table 3.1 the current *I* in the circuit and the p.d. *V* across the section of wire **AB**. Switch off.

(ii) Record in the table the length l of the wire **AB**.

(iii) Calculate the resistance *R* of the section of wire **AB** using the equation

$$R = \frac{V}{I}.$$

Record this value of *R* in the table.

(iv) Complete the column headings in the table.

(v) Repeat steps **(i)** – **(iii)** with the voltmeter connected across section **AC** of the wire.

(vi) Repeat steps **(i)** – **(iii)** with the voltmeter connected across section **AD** of the wire.

Table 3.1

voltmeter connected across	l /	I /	V /	R /
AB				
AC				
AD				

[7]

(b) It is suggested that the resistance of the wire **AB** should be half the resistance of the wire **AD**. State whether your results support this suggestion and justify your answer with reference to your results.

statement ....

justification ....

.... [2]

(c) It is known that changes in temperature affect the resistance of the wire. Suggest how you can limit the temperature changes when carrying out this experiment.

....

.... [1]

[Total: 10]

For Examiner's Use

4 In this experiment you will investigate the refraction of light through a transparent block.

Carry out the following instructions referring to Fig. 4.1.

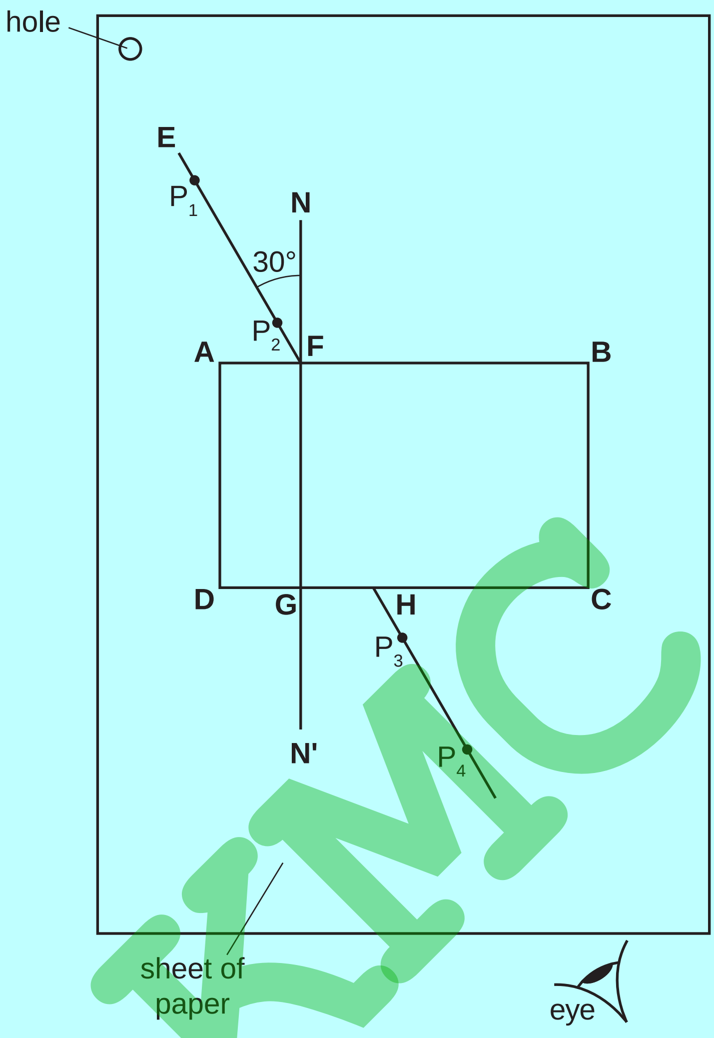


Fig. 4.1

(a) Place the transparent block, largest face down, on the sheet of plain paper supplied. The block should be approximately in the middle of the paper. Draw and label the outline **ABCD** of the block.

(b) Remove the block and draw the normal **NN'** to side **AB** so that the normal is 2.0 cm from **A**. Label the point **F** where **NN'** crosses **AB** and **G** where it crosses **DC**.

(c) Draw the line **EF** at an angle of 30° to the normal, as shown in Fig. 4.1.

. **(d)** Place the paper on the pin board.

(e) Place two pins P_1 and P_2 on line **EF** as shown in Fig. 4.1.

(f) Replace the block and observe the images of P_1 and P_2 through side **CD** of the block so that the images of P_1 and P_2 appear one behind the other. Place two pins P_3 and P_4 between your eye and the block so that P_3, P_4 and the images of P_1 and P_2, seen through the block, appear one behind the other. Mark and label the positions of P_1, P_2, P_3 and P_4. Remove the block.

For Examiner's Use

(g) Draw a line joining the positions of P_3 and P_4. Continue the line until it meets **CD**. Label this point **H**.

(h) Measure and record the length *a* of the line **GH**.

a = ... [1]

(i) Draw the line **HF**.

(j) Measure and record the length *b* of the line **HF**.

b = ...[1]

(k) Calculate the refractive index *n* of the material of the block using the equation $n = \frac{b}{2a}$.

n = ... [2]

(l) This experiment can be carried out using a ray of light, produced by a ray box, instead of by using optical pins. A student suggests that the ray box method will be more accurate. Assuming that the experiment is carried out with care, suggest one possible cause of inaccuracy using the optical pin method and one using the ray box method.

optical pin method ....

....

ray box method ....

.... [2]

Tie your ray trace sheet into this Booklet between pages 8 and 9. [4]

[Total: 10]

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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

7413011205

PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2012**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

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.

For Examiner's Use	
1	
2	
3	
4	
Total	

This document consists of **9** printed pages and **3** blank pages.

UNIVERSITY of CAMBRIDGE International Examinations

For Examiner's Use

1 The aim of this experiment is to determine the internal volume of a test-tube using two displacement methods.

Carry out the following instructions referring to Figs. 1.1, 1.2 and 1.3. You are supplied with a beaker of water.

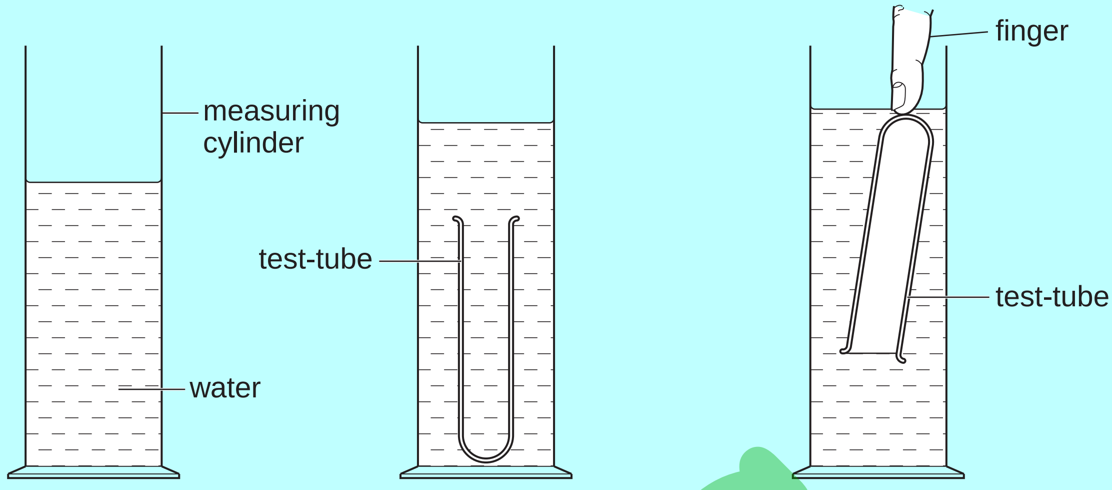


Fig. 1.1 **Fig. 1.2** **Fig. 1.3**

(a) (i) Pour approximately 80 cm^3 of water from the beaker into the measuring cylinder. Record the volume V_1 of water.

V_1 = ...

(ii) Lower the test-tube, closed end first, into the water in the measuring cylinder and push it down until it is filled with water, as shown in Fig. 1.2. Record the new water level V_2.

V_2 = ...

(iii) Calculate the volume V_G of the glass of the test-tube using the equation $V_G = (V_2 - V_1)$.

V_G = ...
[3]

(b) Remove the test-tube from the measuring cylinder and pour the water from the tube and the measuring cylinder into the beaker.

(i) Pour approximately 70 cm^3 of water from the beaker into the measuring cylinder. Record the volume V_3 of water.

V_3 = ...

(ii) Gently put the test-tube, open end first, into the water in the measuring cylinder and carefully push it down with your finger or pencil until it is just covered with water, as shown in Fig. 1.3. Record the new water level V_4.

V_4 = ...

(iii) Calculate the increase in water level $(V_4 - V_3)$.

$(V_4 - V_3)$ = ...

(iv) Calculate the volume V_A of air in the test-tube using the equation $V_A = (V_4 - V_3) - V_G$.

V_A = ...
[3]

(c) Remove the test-tube from the measuring cylinder and pour the water from the measuring cylinder into the beaker. Fill the test-tube to the top with water from the beaker. Pour the water from the test-tube into the measuring cylinder. Record the volume V_W of water from the tube.

V_W = ...
[1]

(d) The aim of this experiment is to determine the internal volume of the test-tube by two methods. The two values are V_A (obtained from parts **(a)** and **(b)**) and V_W (obtained from part **(c)**). The values obtained from your readings may not be the same.

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_A may be inaccurate and two reasons why the value V_W may be inaccurate.

V_A:

reason 1 ....

....

reason 2 ....

....

V_W:

reason 1 ....

....

reason 2 ....

....
[3]

[Total: 10]

2 In this experiment, you will investigate the heating of a thermometer bulb.

Carry out the following instructions, referring to Figs. 2.1 and 2.2.

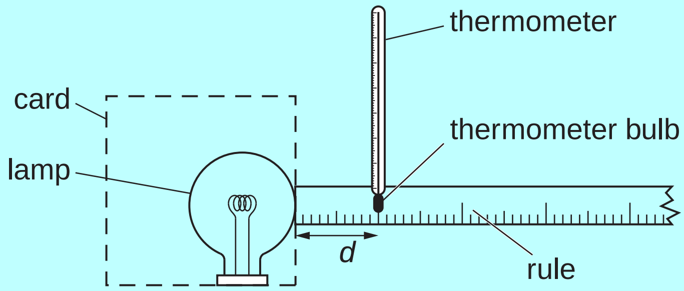


Fig. 2.1

You are provided with a lamp and a rule. Do not move the lamp or the rule. During the experiment, you will read temperature values from the thermometer. You should use the card provided to shield your eyes from the direct rays of the lamp.

(a) Record the value of room temperature θ_R shown on the thermometer.

θ_R = ... [1]

(b) Switch on the lamp. Leave the lamp switched on until you have completed all the readings.

(i) Place the thermometer so that its bulb is a horizontal distance *d* = 100 mm from the surface of the lamp, as shown in Fig. 2.1. Record in Table 2.1 the distance *d* between the thermometer bulb and the surface of the lamp. Also record the temperature θ shown on the thermometer.

(ii) Move the thermometer so that its bulb is a distance *d* = 80 mm from the surface of the lamp.

In the table, record the distance *d* and the temperature θ.

Table 2.1

d /	θ /

(iii) Repeat the steps described in **(b)(ii)**, but using values of *d* of 60 mm, 40 mm, 20 mm and 10 mm.

(iv) Complete the column headings in the table.

[4]

(c) Move the thermometer away from the lamp and wait for about a minute for the thermometer to cool.

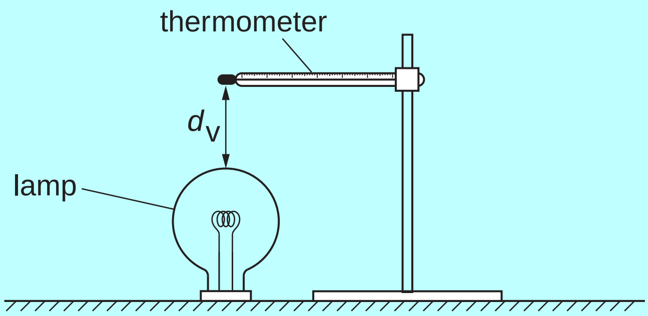


Fig. 2.2

(i) Place the thermometer so that its bulb is a vertical distance d_V = 100 mm from the top surface of the lamp, as shown in Fig. 2.2. Use the 100 mm rod provided to obtain the correct distance. Record the temperature θ_V shown on the thermometer.

θ_V = ... [1]

(ii) Calculate the difference between θ_V and the thermometer reading θ_H at a horizontal distance of 100 mm from the lamp. State whether θ_V is higher, lower or the same as θ_H.

temperature difference = ...

θ_V is .... [1]

(d) A student suggests that θ_V will be higher than the thermometer reading θ_H because thermal energy will travel by infra-red radiation and convection to the thermometer bulb above the lamp but by infra-red radiation only when the bulb is to one side of the lamp.

If the experiment were to be repeated in order to investigate this suggestion, it would be important to control the conditions. Suggest two such conditions, relevant to this investigation, that should be controlled.

1. ....

2. ....
[2]

(e) Briefly describe a precaution that you took in this experiment in order to obtain a reliable result.

....

.... [1]

[Total: 10]

3 In this experiment, you will determine the resistance of a resistor in a circuit.

Carry out the following instructions referring to Fig. 3.1. The circuit is set up for you.

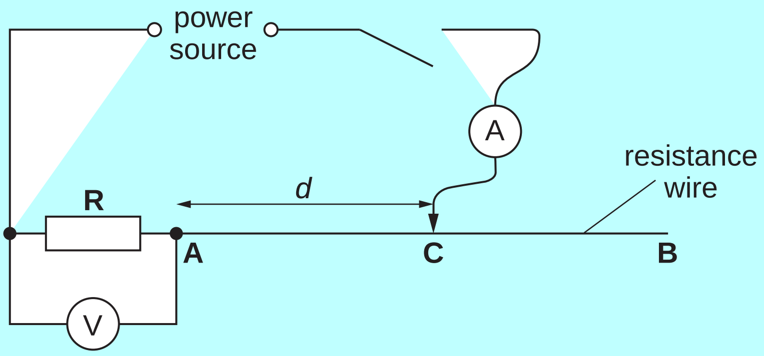


Fig. 3.1

(a) (i) Place the sliding contact **C** on the resistance wire at a distance d = 30.0 cm from point **A**. Switch on. Measure and record in Table 3.1 the current I in the circuit and the p.d. V across the resistor **R**. Switch off.

(ii) Repeat the procedure in step **(i)** using d values of 40.0 cm, 50.0 cm, 70.0 cm and 90.0 cm.

(iii) Complete the column headings in the table.

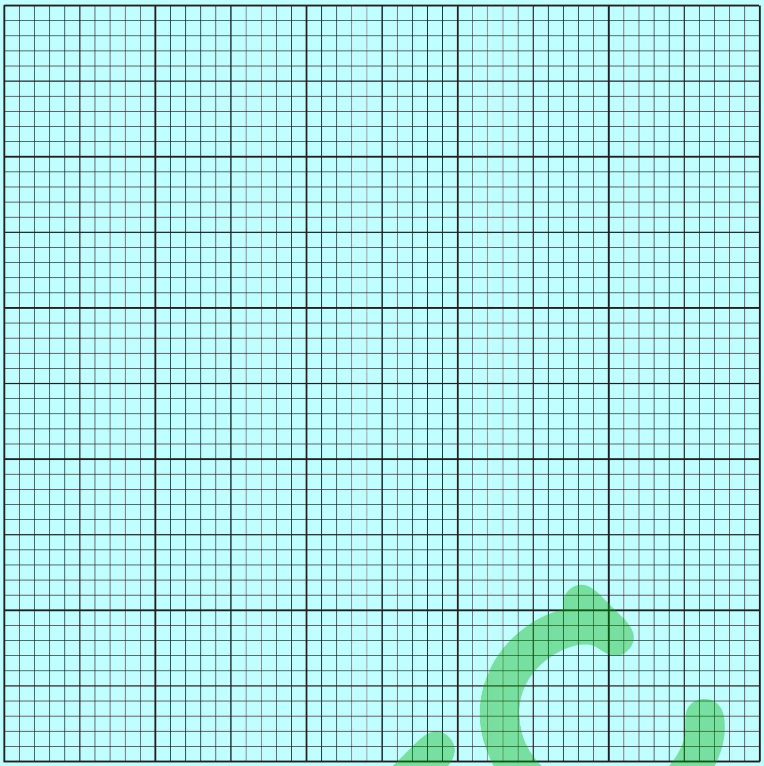
Table 3.1

d /	V /	I /
30.0		
40.0		
50.0		
70.0		
90.0		

[2]

For Examiner's Use

(b) Plot a graph of V/V (y-axis) against I/A (x-axis).



[4]

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

G = ... [2]

(d) The gradient G of the graph is numerically equal to the resistance R of the resistor **R**.

Write a value for the resistance R to a suitable number of significant figures for this experiment.

R = ... [2]

[Total: 10]

4 In this experiment, you will determine the focal length of a lens.

Carry out the following instructions referring to Fig. 4.1.

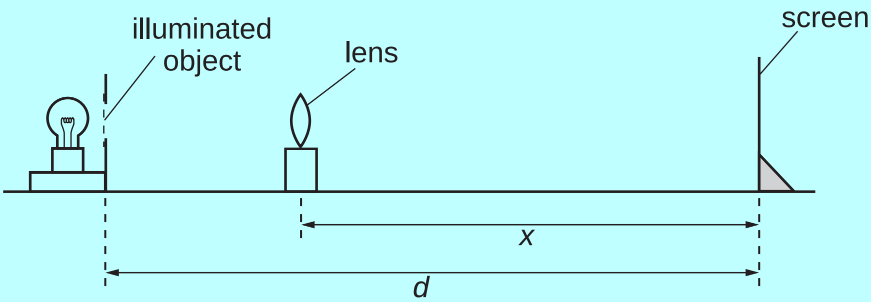


Fig. 4.1

(a) Place the screen at a distance d = 0.800 m from the illuminated object.

(b) Place the lens between the object and the screen and close to the object. Move the lens towards the screen until an **enlarged** image is formed on the screen. Adjust the position of the lens until the image is as clearly focused as possible.

(c) Measure and record the distance x between the centre of the lens and the screen.

x = ... [1]

(d) Without moving the illuminated object or the screen, move the lens towards the screen until a clearly focused **diminished** image is formed on the screen.

(e) Measure and record the distance y between the centre of the lens and the screen.

y = ... [2]

(f) Calculate the focal length f of the lens using the equation $f = \frac{xy}{d}$.

f = ... [1]

(g) Turn the lens through an angle of 180° so that the other side of the lens faces the screen. Repeat steps **(a)** to **(f)**.

x = ...

y = ...

f = ...
[3]

(h) A student suggests that the two values of the focal length f should be the same. State whether or not your results support this suggestion. Justify your answer by reference to the results.

statement ....

justification ....

....
[2]

(i) Briefly describe a precaution that you took in this experiment in order to obtain a reliable result.

....

....

.... [1]

[Total: 10]

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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

4288656769

PHYSICS **0625/52**

Paper 5 Practical Test **May/June 2012**

1 hour 15 minutes

Candidates answer on the Question Paper

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

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.

For Examiner's Use	
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This document consists of **10** printed pages and **2** blank pages.

DC (LEO/SW) 42226/4

UNIVERSITY *of* CAMBRIDGE International Examinations

1 In this experiment, you will investigate the effect of a load on a rule attached to a forcemeter.

For Examiner's Use

Carry out the following instructions, referring to Fig. 1.1. The apparatus has been set up for you.

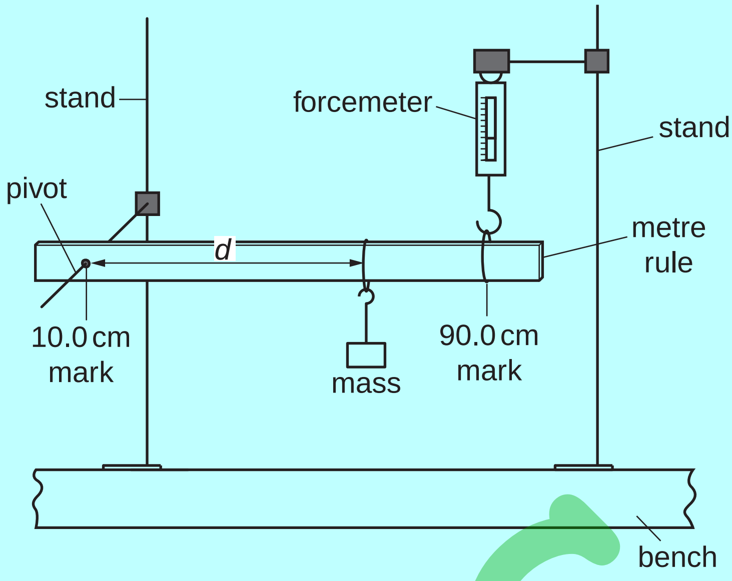

Fig. 1.1

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

(a) (i) Move the mass to a distance *d* = 70.0 cm from the pivot. Record the distance *d* in Table 1.1.

(ii) Adjust the position of the forcemeter by raising or lowering the clamp until the rule is horizontal and the forcemeter is vertical. Measure and record in the table the reading *F* on the forcemeter.

Table 1.1

d /	*F* /

(iii) Repeat steps **(i)** and **(ii)** using *d* values of 60.0 cm, 50.0 cm, 40.0 cm, 30.0 cm, 20.0 cm and 10.0 cm.

(iv) Complete the column headings in the table. [5]

(b) A 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. ....

2. ....
[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.

....

....[1]

(d) Describe briefly how you checked that the rule was horizontal. You may draw a diagram.

....

....

....[1]

[Total: 10]

2 In this experiment, you will investigate the rate of cooling of water.

You are provided with a supply of hot water. Carry out the following instructions referring to Fig. 2.1.

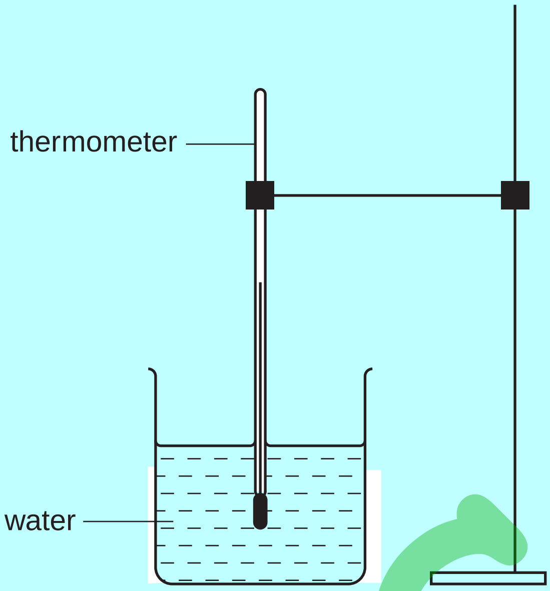

Fig. 2.1

(a) Measure and record room temperature θ_R.

θ_R = ... [1]

(b) (i) Pour approximately 200 cm^3 of the hot water supplied into the beaker. Place the thermometer in the beaker of water.

Measure the temperature θ of the water. Record θ in Table 2.1 at time t = 0 s.

(ii) Start the stopclock and record in the table the temperature of the water at 30 s intervals until you have a total of six values up to time t = 150 s.

Table 2.1

t / s	θ / °C

[2]

(c) Plot a graph of θ / °C (y-axis) against t / s (x-axis).

[5]

(d) As you read these words, this experiment is being carried out by candidates in many different countries, using identical apparatus.

Suggest two differences in the conditions in the various laboratories that might lead to different graphs.

1. ....

2. ....

[2]

[Total: 10]

For Examiner's Use

3 In this experiment, you will investigate resistor combinations in circuits.

Carry out the following instructions referring to Fig. 3.1.

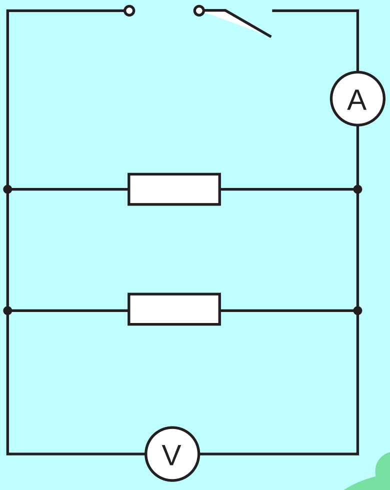

Fig. 3.1

(a) **(i)** Switch on. Measure and record the potential difference V_1 across the resistors and the current I_1 in the circuit. Switch off.

V_1 = ...

I_1 = ...

(ii) Calculate the total resistance R_P of the combination of the two resistors arranged in parallel, using the equation $R_P = \frac{V_1}{I_1}$.

R_P = ...

(iii) Calculate $4R_P$.

$4R_P$ = ...
[2]

(b) Rearrange the circuit so that the two resistors are connected in **series** and the voltmeter is connected to measure the potential difference across **both** resistors.

(i) Switch on. Measure and record the potential difference V_2 across the resistors and the current I_2 in the circuit. Switch off.

V_2 = ...

I_2 = ...

(ii) Calculate the total resistance R_S of the combination of the two resistors arranged in series, using the equation $R_S = \dfrac{V_2}{I_2}$.

R_S = ...
[2]

(c) Theory suggests that $R_S = 4R_P$ if the two resistors have the same value.

State whether your results indicate that the two resistors have the same value. Justify your answer with reference to the results.

statement ....

justification ....

....
[1]

(d) Using the circuit described in **(b)**, replace the two series resistors with the two lamps.

(i) Draw a circuit diagram of the new circuit using standard symbols.

[2]

(ii) Switch on. Measure and record the potential difference V_3 across the lamps and the current I_3 in the circuit. Switch off.

V_3 = ...

I_3 = ...

(iii) Calculate the total resistance L_S of the combination of the two lamps arranged in series using the equation $L_S = \dfrac{V_3}{I_3}$.

L_S = ...[1]

(e) Rearrange the circuit to that shown in Fig. 3.1 but with the lamps in place of the resistors.

(i) Switch on. Measure and record the potential difference V_4 across the lamps and the current I_4 in the circuit. Switch off.

V_4 = ...

I_4 = ...

(ii) Calculate the total resistance L_P of the combination of the two lamps arranged in parallel using the equation $L_P = \dfrac{V_4}{I_4}$.

L_P = ...

(iii) Calculate $4L_P$.

$4L_P$ = ...

[1]

(f) A student suggests that using lamps instead of resistors changes the conditions of the experiment and that $4L_P$ will not be equal to L_s because of a heating effect.

From your own observations, state one piece of evidence that supports the student's suggestion that there is a heating effect. You should not do any further calculations.

....

....[1]

[Total: 10]

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4 In this experiment, you will determine the refractive index of the material of a transparent block.

Carry out the following instructions, referring to Fig. 4.1.

For Examiner's Use

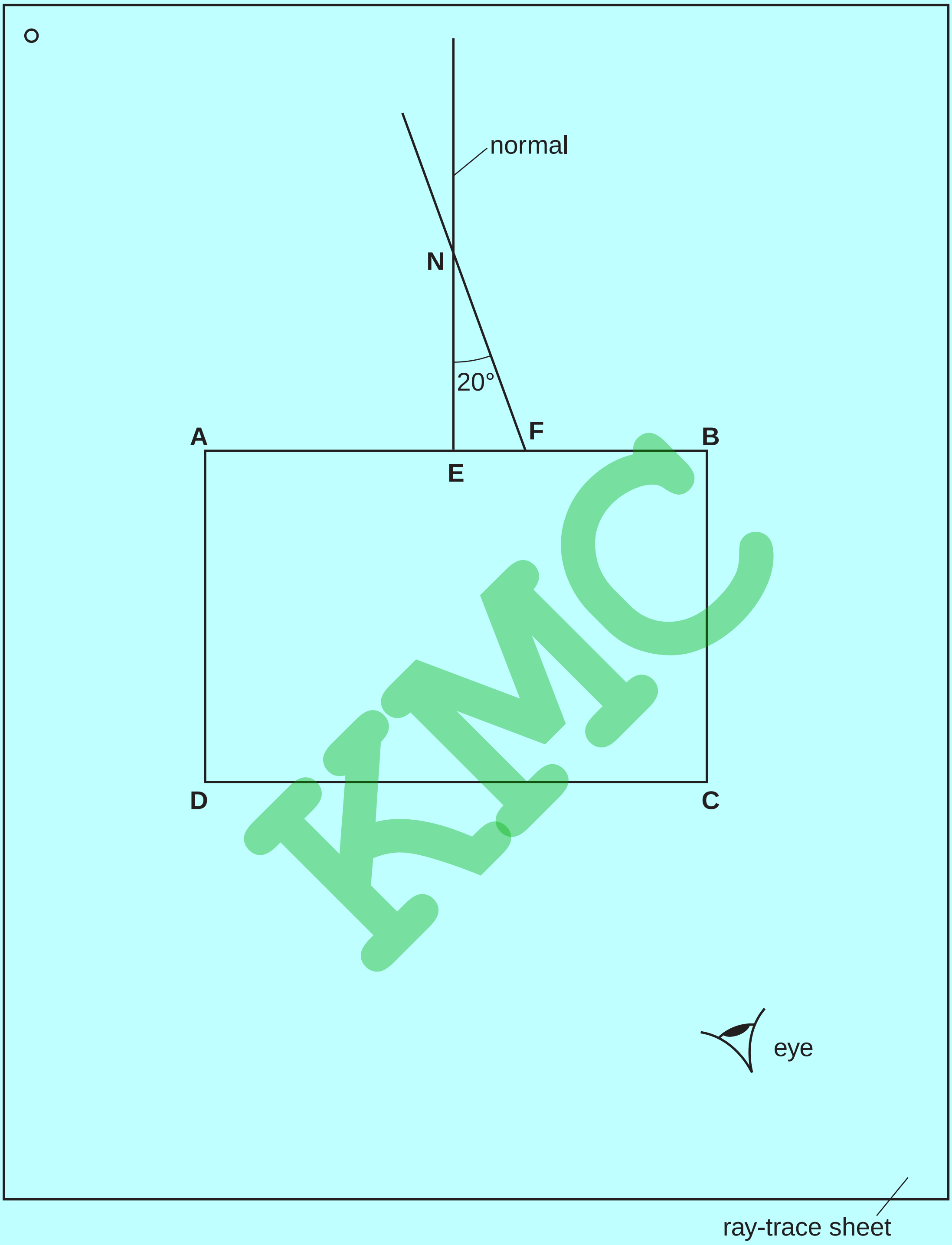

Fig. 4.1

(a) Place the transparent block, largest face down, on the ray-trace sheet supplied. The block should be approximately in the middle of the paper. Draw the outline of the block **ABCD**.

(b) Remove the block and draw a normal at the centre of side **AB**. Label the point **E** where the normal crosses **AB**. Mark a point **N** on the normal 4.0 cm from **E** and outside the block as shown in Fig. 4.1.

(c) Draw a line **NF** to the right of the normal and at an angle of 20° to the normal as shown in Fig. 4.1. **F** is the point where the line meets **AB**. Measure and record the length *a* of the line **NF**.

a = ... [1]

(d) Extend the line **NF** beyond **N** and place the paper on the pin board.

(e) Place two pins P_1 and P_2 on the line through **F** and **N**, placing one pin close to **F.**

(f) Replace the block and observe the images of P_1 and P_2 through side **CD** of the block so that the images of P_1 and P_2 appear one behind the other.

Place two pins P_3 and P_4 between your eye and the block so that P_3 and P_4 and the images of P_1 and P_2, seen through the block, appear one behind the other.

Mark the positions of P_1, P_2, P_3 and P_4. Remove the block.

(g) Draw a line joining the positions of P_3 and P_4. Continue the line until it meets **CD**. Label this point **G**.

(h) Draw the line **GF** and continue it until it meets the normal. Label this point **H**.

(i) Measure and record the length *b* of the line **FH**.

b = ...[1]

(j) Calculate the refractive index *n* of the material of the block, using the equation $n = \frac{b}{a}$.

n = ...[2]

(k) Repeat steps **(c)** – **(j)** but with the line from **N** drawn at 25° to the left of the normal.

a = ...

b = ...

n = ...
[1]

Tie your ray trace into this Booklet between pages 10 and 11. [5]

[Total: 10]

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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

6173585894

PHYSICS **0625/53**

Paper 5 Practical Test **May/June 2012**

1 hour 15 minutes

Candidates answer on the Question Paper

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
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Answer **all** questions.

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.

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DC (SLM/SW) 57712

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[Turn over

1 In this experiment, you will investigate the effect of a load on a rule attached to a forcemeter.

For Examiner's Use

Carry out the following instructions, referring to Fig. 1.1. The apparatus has been set up for you.

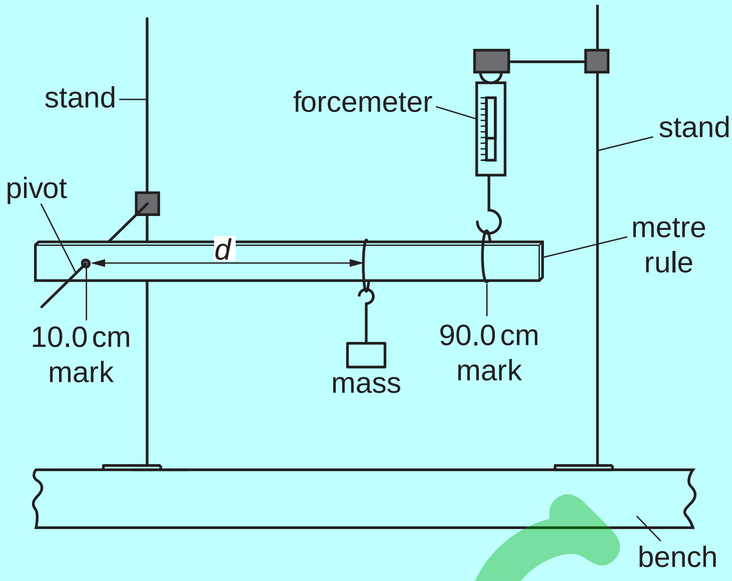

Fig. 1.1

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

(a) **(i)** Move the mass to a distance *d* = 70.0 cm from the pivot. Record the distance *d* in Table 1.1.

(ii) Adjust the position of the forcemeter by raising or lowering the clamp until the rule is horizontal and the forcemeter is vertical. Measure and record in the table the reading *F* on the forcemeter.

Table 1.1

d /	*F* /

(iii) Repeat steps **(i)** and **(ii)** using *d* values of 60.0 cm, 50.0 cm, 40.0 cm, 30.0 cm, 20.0 cm and 10.0 cm.

(iv) Complete the column headings in the table. [5]

(b) A 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. ....

2. ....

[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.

....

....[1]

(d) Describe briefly how you checked that the rule was horizontal. You may draw a diagram.

....

....

....[1]

[Total: 10]

2 In this experiment, you will investigate the rate of cooling of water.

You are provided with a supply of hot water. Carry out the following instructions referring to Fig. 2.1.

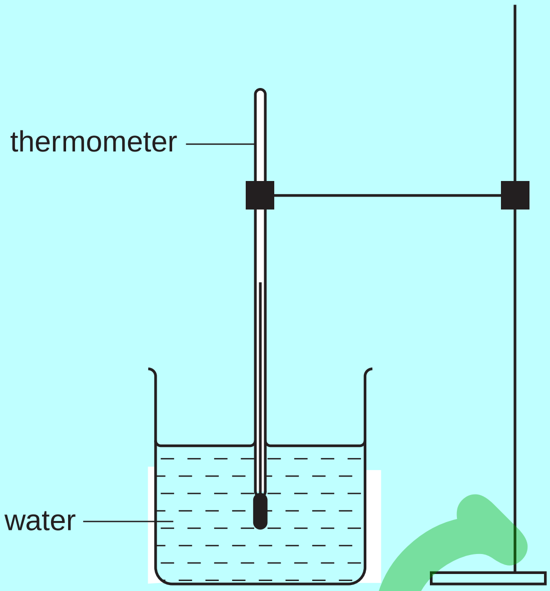

Fig. 2.1

(a) Measure and record room temperature θ_R.

θ_R = ... [1]

(b) (i) Pour approximately 200 cm^3 of the hot water supplied into the beaker. Place the thermometer in the beaker of water.

Measure the temperature θ of the water. Record θ in Table 2.1 at time t = 0 s.

(ii) Start the stopclock and record in the table the temperature of the water at 30 s intervals until you have a total of six values up to time t = 150 s.

Table 2.1

t / s	θ / °C

[2]

(c) Plot a graph of θ / °C (y-axis) against t / s (x-axis).

[5]

(d) As you read these words, this experiment is being carried out by candidates in many different countries, using identical apparatus.

Suggest two differences in the conditions in the various laboratories that might lead to different graphs.

1. ....

2. ....
[2]

[Total: 10]

3 In this experiment, you will investigate resistor combinations in circuits.

Carry out the following instructions referring to Fig. 3.1.

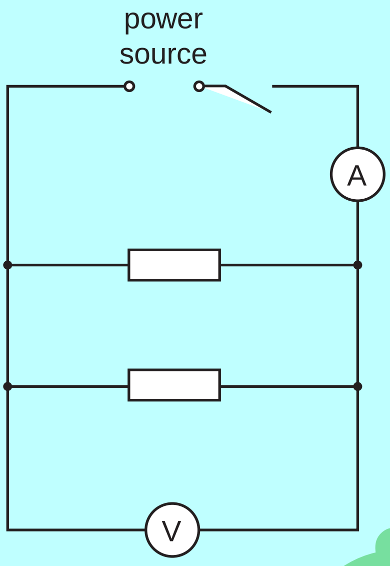

Fig. 3.1

(a) **(i)** Switch on. Measure and record the potential difference V_1 across the resistors and the current I_1 in the circuit. Switch off.

V_1 = ...

I_1 = ...

(ii) Calculate the total resistance R_P of the combination of the two resistors arranged in parallel, using the equation $R_P = \frac{V_1}{I_1}$.

R_P = ...

(iii) Calculate $4R_P$.

$4R_P$ = ...
[2]

(b) Rearrange the circuit so that the two resistors are connected in **series** and the voltmeter is connected to measure the potential difference across **both** resistors.

(i) Switch on. Measure and record the potential difference V_2 across the resistors and the current I_2 in the circuit. Switch off.

V_2 = ...

I_2 = ...

(ii) Calculate the total resistance R_S of the combination of the two resistors arranged in series, using the equation $R_S = \frac{V_2}{I_2}$.

R_S = ...
[2]

(c) Theory suggests that $R_S = 4R_P$ if the two resistors have the same value.

State whether your results indicate that the two resistors have the same value. Justify your answer with reference to the results.

statement ....

justification ....

....
[1]

(d) Using the circuit described in **(b)**, replace the two series resistors with the two lamps.

(i) Draw a circuit diagram of the new circuit using standard symbols.

[2]

(ii) Switch on. Measure and record the potential difference V_3 across the lamps and the current I_3 in the circuit. Switch off.

V_3 = ...

I_3 = ...

(iii) Calculate the total resistance L_S of the combination of the two lamps arranged in series using the equation $L_S = \frac{V_3}{I_3}$.

L_S = ...[1]

(e) Rearrange the circuit to that shown in Fig. 3.1 but with the lamps in place of the resistors.

(i) Switch on. Measure and record the potential difference V_4 across the lamps and the current I_4 in the circuit. Switch off.

V_4 = ...

I_4 = ...

(ii) Calculate the total resistance L_P of the combination of the two lamps arranged in parallel using the equation $L_P = \frac{V_4}{I_4}$.

L_P = ...

(iii) Calculate $4L_P$.

$4L_P$ = ...

[1]

(f) A student suggests that using lamps instead of resistors changes the conditions of the experiment and that $4L_P$ will not be equal to L_s because of a heating effect.

From your own observations, state one piece of evidence that supports the student's suggestion that there is a heating effect. You should not do any further calculations.

....

....[1]

[Total: 10]

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4 In this experiment, you will determine the refractive index of the material of a transparent block.

Carry out the following instructions, referring to Fig. 4.1.

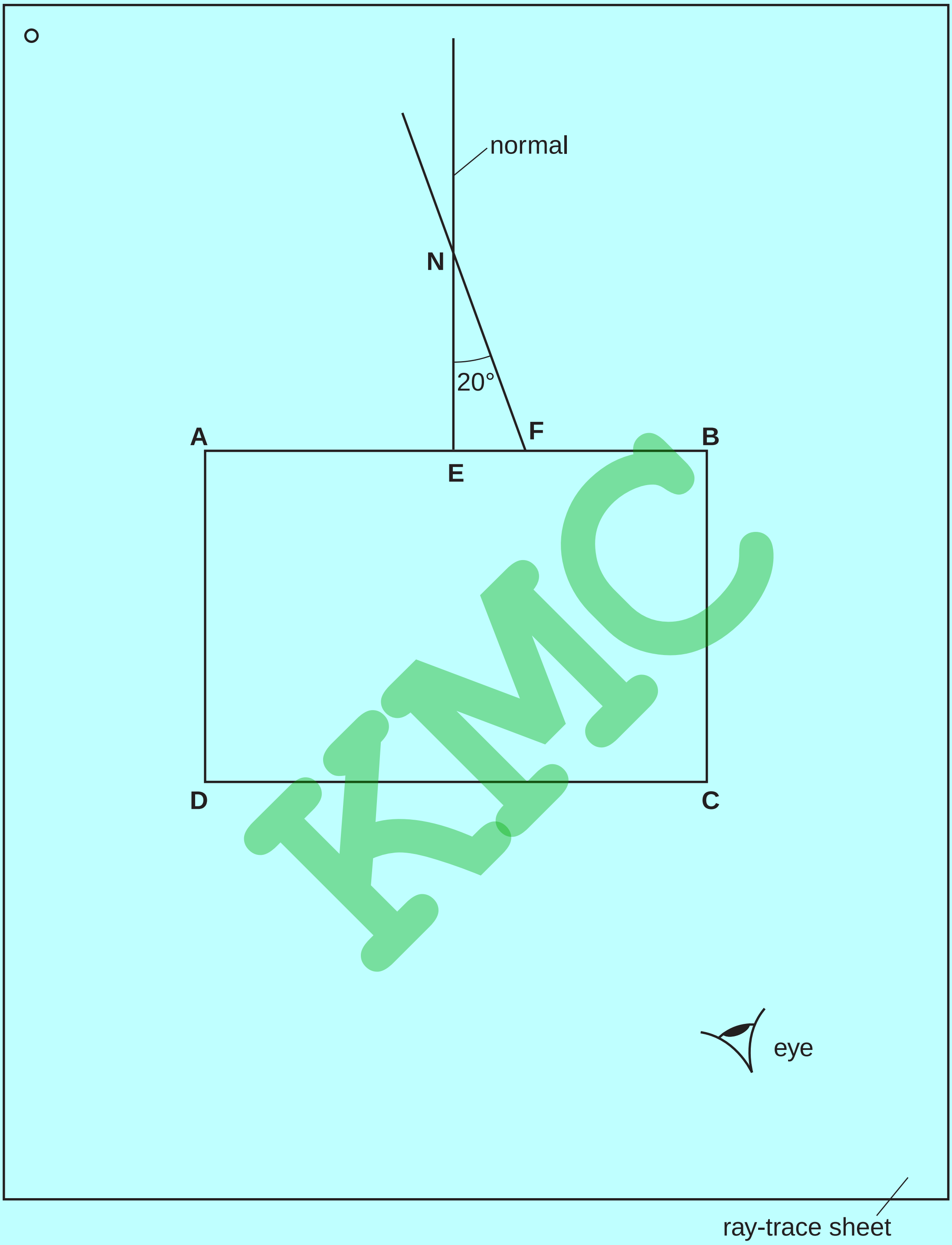

Fig. 4.1

(a) Place the transparent block, largest face down, on the ray-trace sheet supplied. The block should be approximately in the middle of the paper. Draw the outline of the block **ABCD**.

(b) Remove the block and draw a normal at the centre of side **AB**. Label the point **E** where the normal crosses **AB**. Mark a point **N** on the normal 4.0 cm from **E** and outside the block as shown in Fig. 4.1.

For Examiner's Use

(c) Draw a line **NF** to the right of the normal and at an angle of 20° to the normal as shown in Fig. 4.1. **F** is the point where the line meets **AB**. Measure and record the length *a* of the line **NF**.

a = ... [1]

(d) Extend the line **NF** beyond **N** and place the paper on the pin board.

(e) Place two pins P_1 and P_2 on the line through **F** and **N**, placing one pin close to **F.**

(f) Replace the block and observe the images of P_1 and P_2 through side **CD** of the block so that the images of P_1 and P_2 appear one behind the other.

Place two pins P_3 and P_4 between your eye and the block so that P_3 and P_4 and the images of P_1 and P_2, seen through the block, appear one behind the other.

Mark the positions of P_1, P_2, P_3 and P_4. Remove the block.

(g) Draw a line joining the positions of P_3 and P_4. Continue the line until it meets **CD**. Label this point **G**.

(h) Draw the line **GF** and continue it until it meets the normal. Label this point **H**.

(i) Measure and record the length *b* of the line **FH**.

b = ...[1]

(j) Calculate the refractive index *n* of the material of the block, using the equation $n = \frac{b}{a}$.

n = ...[2]

(k) Repeat steps **(c)** – **(j)** but with the line from **N** drawn at 25° to the left of the normal.

a = ...

b = ...

n = ...
[1]

Tie your ray trace into this Booklet between pages 10 and 11. [5]

[Total: 10]

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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2013**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

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DC (RW/CGW) 58672/4

UNIVERSITY *of* CAMBRIDGE International Examinations

[Turn over

1 The aim of this experiment is to investigate the stability of a block.

Carry out the following instructions referring to Figs. 1.1, 1.2 and 1.3.

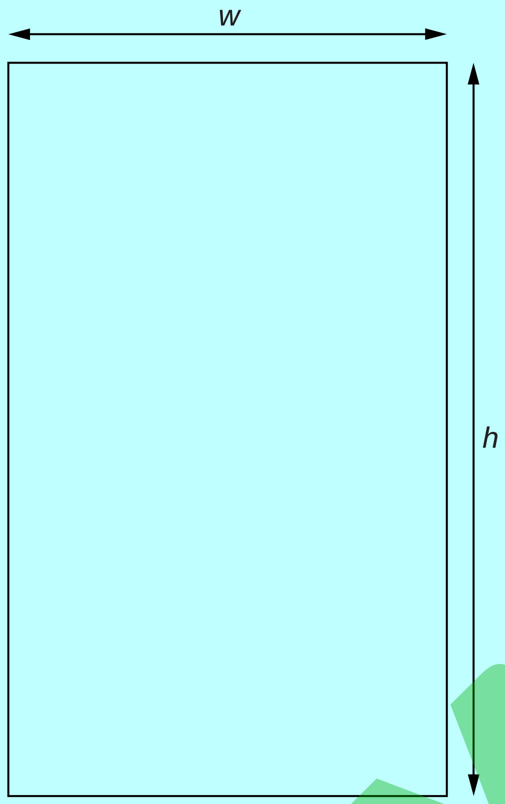

Fig. 1.1

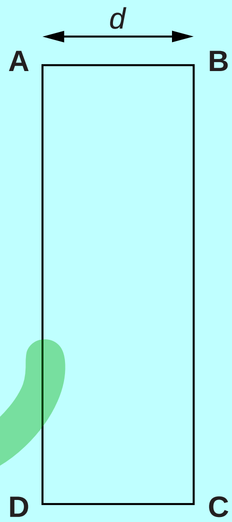

Fig. 1.2

(a) Measure and record the height *h*, width *w* and depth *d* of **your** transparent block.

h = ...

w = ...

d = ...
[2]

For Examiner's Use

(b) Place the block in the space below with the **smallest** face in contact with the paper. Carefully draw round the outline, as shown in Fig. 1.2. Remove the block from the paper.

(i) Label the corners of your outline **A**, **B**, **C** and **D**, as shown in Fig. 1.2.

(ii) On your diagram, draw a line **AC**.

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

α = ...[1]

For Examiner's Use

(c) Place the block on the paper towel at the edge of the bench, as shown in Fig. 1.3.

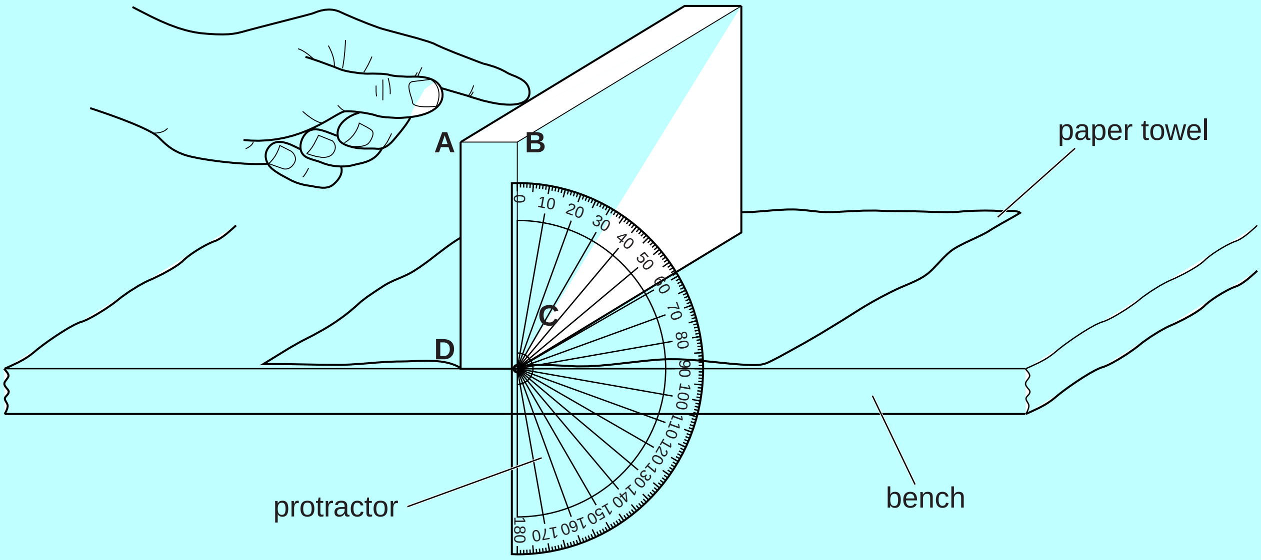

Fig. 1.3

(i) Hold the protractor next to face **ABCD** of the block as shown in Fig. 1.3. Gently push the top of the block (as indicated in Fig. 1.3) until the block tips over.

(ii) Record the angle θ, between side **BC** of the block and the vertical line on the protractor, when the block **just starts** to tip over.

θ = ... [1]

(iii) Repeat steps **(i)** and **(ii)** a suitable number of times for this experiment. Record the readings in the space below.

[2]

(iv) Calculate the average θ_{av} of all your values for θ. Show your working. Give your value of θ_{av} to a suitable number of significant figures for this experiment.

θ_{av} = ... [2]

(d) A student suggests that θ_{av} should be equal to α.

State whether your results support this suggestion. Justify your statement by reference to your results.

statement ....

justification ....

....

....
[2]

[Total: 10]

For Examiner's Use

2 In this experiment, you will investigate the scale of a thermometer.

Carry out the following instructions, referring to Figs. 2.1 and 2.2.

(a) Record the value of room temperature θ_R shown on the thermometer.

θ_R = ... [1]

(b) You are provided with a supply of hot water. Pour 200 cm^3 of hot water into the beaker. Place the thermometer into the beaker of hot water, as shown in Fig. 2.1.

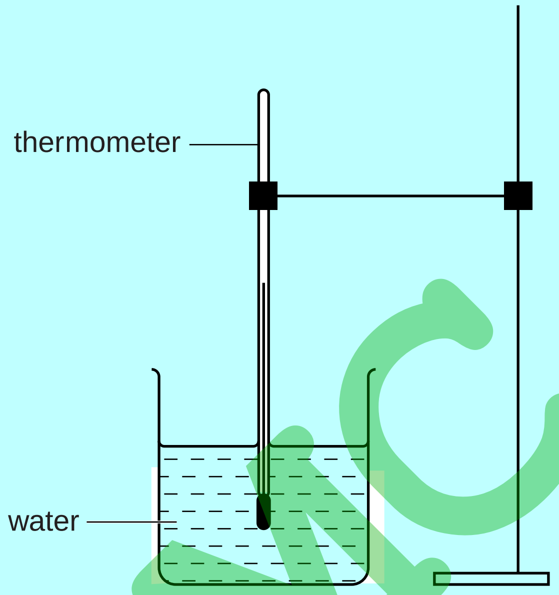

Fig. 2.1

(c) **(i)** When the thermometer reading stops rising, measure the temperature θ of the water in the beaker and immediately start the stopclock. Record θ in Table 2.1 at time t = 0 s.

(ii) Record in the table the time t and the temperature θ of the water every 30 s until you have a total of seven readings. [3]

Table 2.1

t /	θ /	d /

(d) Remove the thermometer from the beaker and the clamp.

For Examiner's Use

(i) Measure and record in the table the distance *d* from the bottom end of your thermometer to the position of the first temperature reading in the table. Fig. 2.2 shows a measurement of *d* being made for a temperature of 81 °C. You must use your own temperature reading and thermometer.

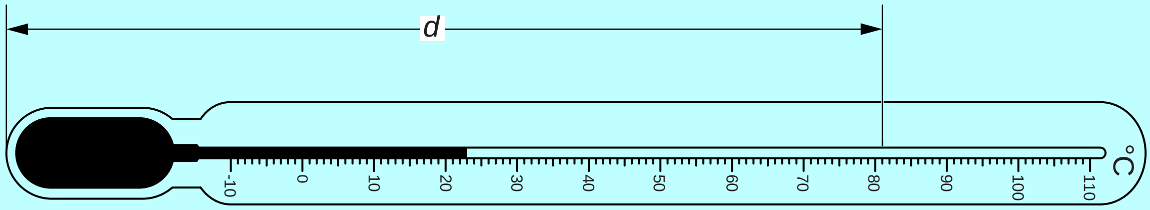

Fig. 2.2

(ii) Measure *d* for all the other temperature readings. Record your values in the table. [1]

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

Question 2 continues on the next page.

(e) A student carried out this experiment and plotted a graph of θ against *d*. A sketch of the graph obtained is shown in Fig. 2.3.

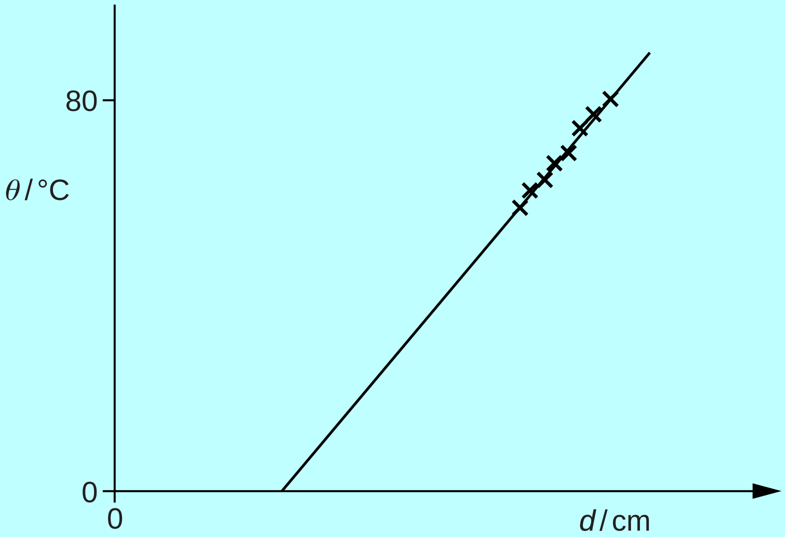

Fig. 2.3

(i) Explain how the graph line shows that θ is not directly proportional to *d*.

....

....

(ii) Suggest why, when θ = 0 °C, the value of *d* is not zero.

....

....

....

.... [2]

(iii) Describe briefly the method you would use to determine, as accurately as possible, the distance between the 1 °C marks on the thermometer.

....

....

....

.... [2]

[Total: 10]

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For Examiner's Use

3 In this experiment, you will investigate the resistance of a wire.

The circuit shown in Fig. 3.1 has been set up for you.

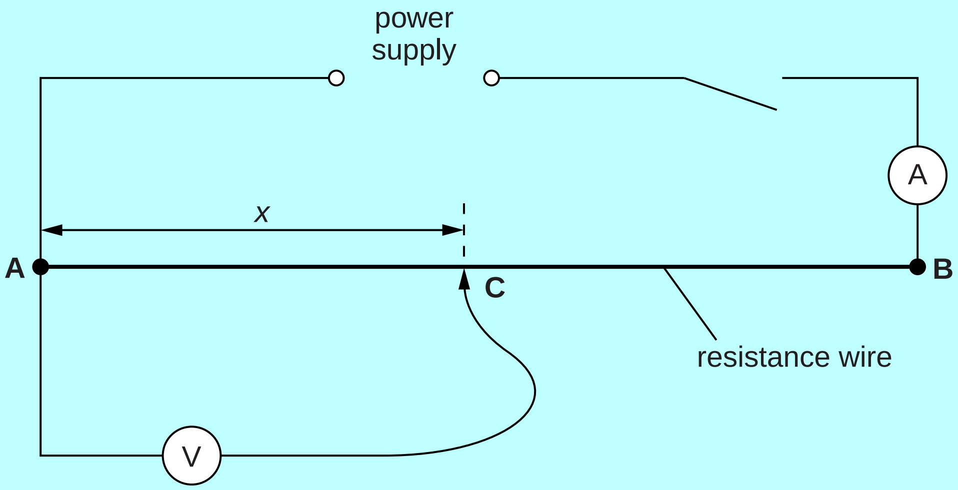


Fig. 3.1

(a) **(i)** Switch on. Measure, and record in Table 3.1, the current I in the circuit and the potential difference V across a length x = 10.0 cm of the wire **AB**. Switch off.

(ii) Calculate the resistance R of 10.0 cm of the wire **AB**, using the equation $R = \frac{V}{I}$. Record this value of R in the table.

(iii) Complete the column headings in the table.

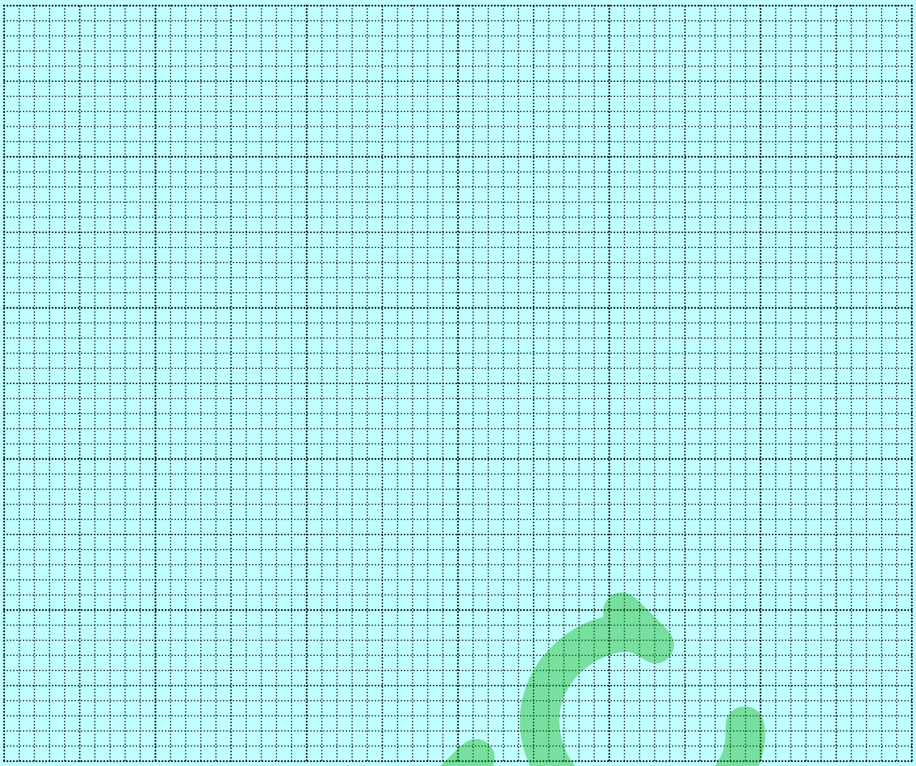
(iv) Repeat steps **(i)** and **(ii)** with values of x equal to 30.0 cm, 50.0 cm, 70.0 cm and 90.0 cm.

Table 3.1

x /	V /	I /	R /
10.0			
30.0			
50.0			
70.0			
90.0			

[3]

(b) Plot a graph of V/V (y-axis) against R/Ω (x-axis).



[4]

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

G = ...[3]

[Total: 10]

For Examiner's Use

For Examiner's Use

4 In this experiment, you will investigate the position of the image in a plane mirror.

Carry out the following instructions referring to Fig. 4.1.

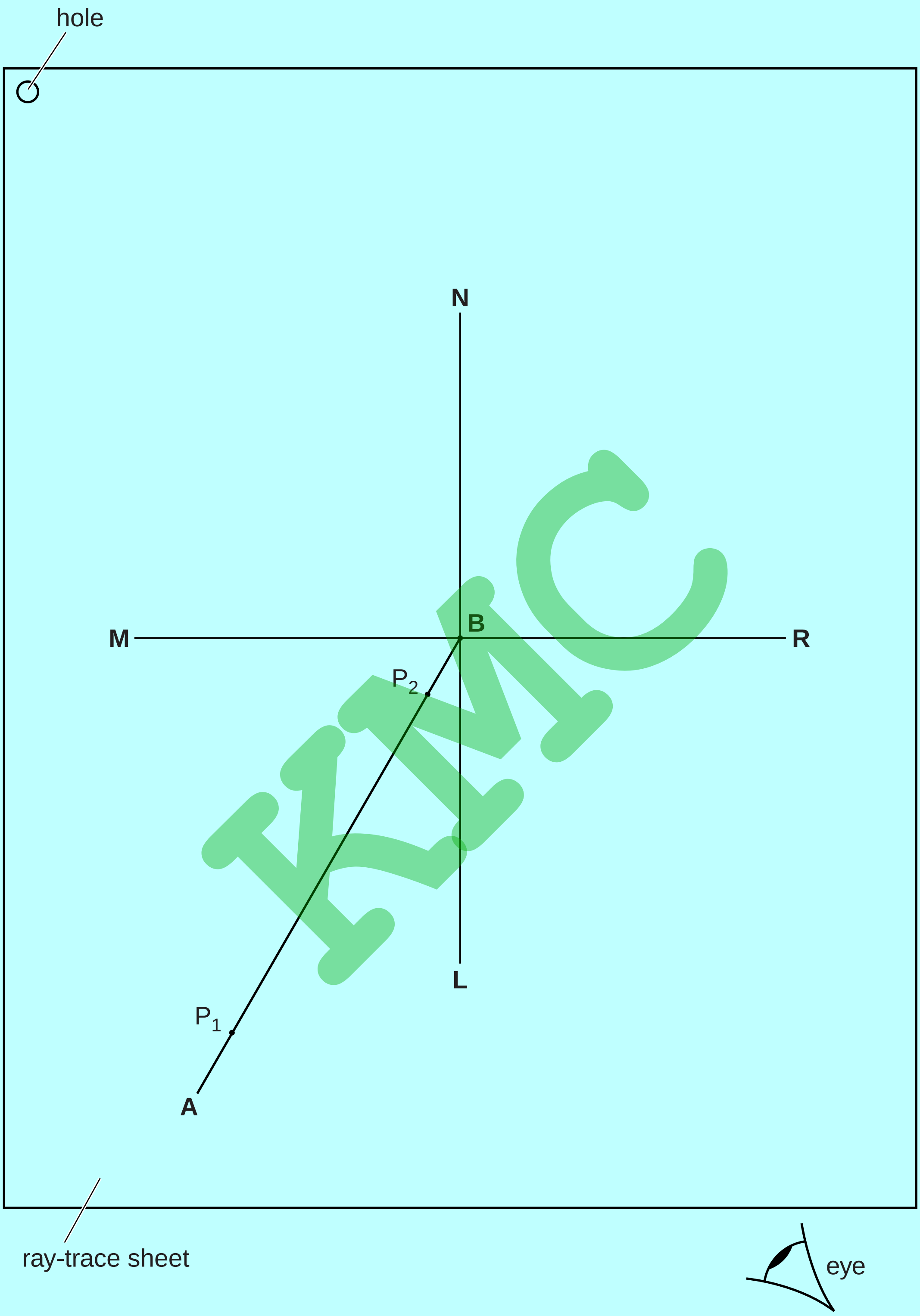


Fig. 4.1

For Examiner's Use

(a) Draw a line 10.0 cm long near the middle of the ray-trace sheet. Label the line **MR**. Draw a normal to this line that passes through its centre. Label the normal **NL**. Label the point at which **NL** crosses **MR** with the letter **B**.

(b) Draw a line 8.0 cm long from **B** at an angle of incidence $i = 30°$ to the normal below **MR** and to the left of the normal. Label the end of this line **A**.

(c) Place a pin P_1 on line **AB** at a distance 7.0 cm from **B**.

(d) Place a pin P_2 on line **AB** at a distance 1.0 cm from **B**.

(e) Place the reflecting face of the mirror vertically on the line **MR**.

(f) View the images of pins P_1 and P_2 from the direction indicated by the eye in Fig. 4.1. Place two pins P_3 and P_4 some distance apart so that pins P_3 and P_4, and the images of P_2 and P_1, all appear exactly one behind the other. Label the positions of P_3 and P_4.

(g) Remove the pins and the mirror and draw the line joining the positions of P_3 and P_4. Continue the line until it crosses **MR** and extends at least 8.0 cm beyond **MR**.

(h) Replace pin P_1 on line **AB** in the same position as in **(c)**, at a distance 7.0 cm from **B**.

(i) Place pin P_2 **1.0 cm to the right of its position** in part **(d)**.

(j) Repeat the steps in parts **(e)** to **(g)**.

(k) Label with a **Y** the point where the two lines beyond **MR** cross.

(l) **(i)** Draw a line from P_1 to **MR** that meets **MR** at a right angle. Measure and record the length *a* of this line.

a = ...

(ii) Draw a line from the point labelled **Y** to **MR** that meets **MR** at a right angle. Measure and record the length *b* of this line.

b = ...
[2]

(m) A student suggests that the length *a* should be equal to the length *b*.

State whether your results support this suggestion. Justify your statement by reference to your results.

statement ....

justification ....

....

....
[2]

(n) Suggest a precaution that you took, when placing the pins, in order to obtain reliable results.

....

.... [1]

Tie your ray-trace sheet into this Booklet between pages 12 and 13. [5]

[Total: 10]

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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

PHYSICS **0625/52**

Paper 5 Practical Test **May/June 2013**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

For Examiner's Use	
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Total	

This document consists of **11** printed pages and **1** blank page.

DC (NH/JG) 58684/5

UNIVERSITY of CAMBRIDGE International Examinations

[Turn over

For Examiner's Use

1 In this experiment, you will determine the mass of a metre rule using two methods.

Method 1.

Carry out the following instructions, referring to Fig. 1.1.

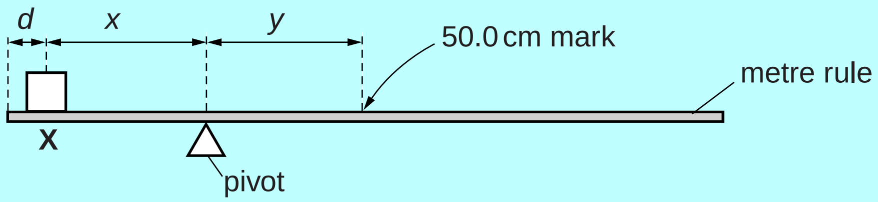

Fig. 1.1

You are provided with a 100 g mass, labelled **X**.

(a) **(i)** Place the mass **X** on the rule so that its centre is at a distance d = 5.0 cm from the zero end of the rule, as shown in Fig. 1.1. Record the value of d in Table 1.1.

(ii) Adjust the position of the rule so that it is as near as possible to being balanced, with the 50.0 cm mark to the right of the pivot.

(iii) Measure, and record in the table, the distance x from the centre of the mass **X** to the pivot.

(iv) Measure, and record in the table, the distance y from the pivot to the 50.0 cm mark on the rule.

(v) Repeat the steps **(i)** – **(iv)** using d = 10.0 cm.

Table 1.1

d /cm	x /cm	y /cm

[3]

(b) **(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

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

M = ... [1]

For Examiner's Use

(ii) Repeat step **(b)(i)** using the values of x and y in the second row of the table.

M = ...[1]

(iii) Calculate the average value of M.

average value of M = ...[1]

Method 2.

(c) Measure the mass M of the rule using the balance provided.

M = ...[1]

(d) A student carrying out this experiment expects that the values of the mass 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]

Question 1 continues on the next page.

(e) Explain briefly how you judge the position of the centre of the mass **X** when it is on the rule in **(a)(iii)**. You may draw a diagram.

For Examiner's Use

....

....

....[1]

[Total: 10]

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For Examiner's Use

2 In this experiment, you will investigate the cooling of water.

You are provided with a supply of hot water and a supply of cold water. Carry out the following instructions, referring to Fig. 2.1.

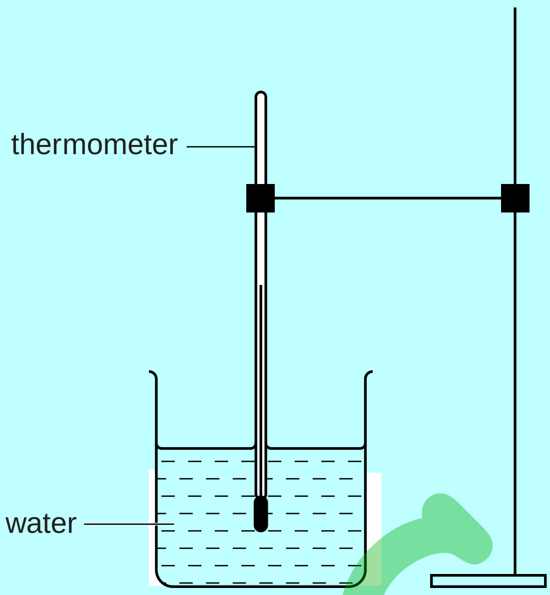

Fig. 2.1

(a) Measure and record the temperature θ_C of the cold water supplied.

θ_C = ...[1]

(b) (i) Pour approximately 200 cm^3 of hot water into the beaker. Place the thermometer in the beaker of water. When the thermometer reading stops rising, measure the temperature θ of the water in the beaker and immediately start the stopclock. In Table 2.1, record θ at time t = 0 s.

(ii) In the table, record the temperature of the water at 30 s intervals until you have a total of six values up to time t = 150 s.

Table 2.1

t / s	θ / °C
0	
30	
60	
90	
120	
150	

[2]

(c) Empty the beaker. Pour approximately 200 cm^3 of hot water into the beaker. Place the thermometer in the beaker of water. When the thermometer reading stops rising, measure the temperature θ_H of the water in the beaker.

θ_H = ...[1]

(d) **(i)** Pour 10 cm^3 of the cold water into the beaker of hot water. Stir briefly. Measure and record the temperature θ_1 of the water.

θ_1 = ...[1]

(ii) Pour another 10 cm^3 of the cold water into the beaker of hot water. Stir briefly. Measure and record the temperature θ_2 of the water.

θ_2 = ...[1]

(e) Using the evidence that you have from the table and the readings in parts **(c)** and **(d)**, estimate the volume *V* of cold water that added to the hot water would give the same temperature drop as allowing the hot water to cool for 150 s. Explain briefly how you arrived at your answer.

....

....

....

....

V = ...[2]

(f) This laboratory investigation could be used as a small-scale model for a process in a factory. The laboratory investigation would be repeated many times.

Suggest two conditions that should be kept constant in order to provide reliable results.

1. ....

2. ....

[2]

[Total: 10]

3 In this experiment, you will determine the focal length of a lens.

Carry out the following instructions, referring to Fig. 3.1.

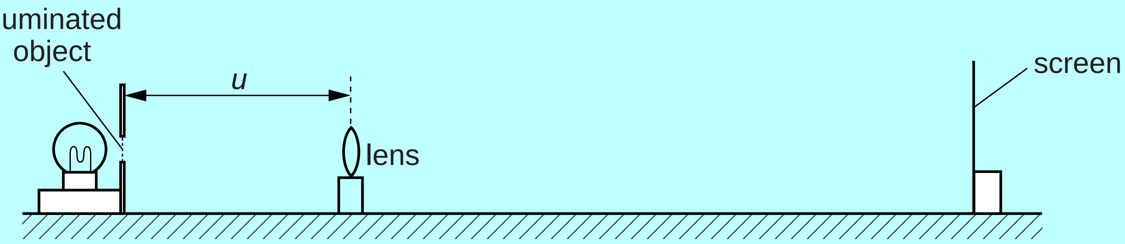

Fig. 3.1

(a) Place the lens a distance u = 25.0 cm from the illuminated object. Move the screen until a sharply focused image of the object is seen on the screen.

(b) Measure, and record in Table 3.1, the height h of the image on the screen.

(c) Repeat the steps in **(a)** and **(b)** using u values of 30.0 cm, 35.0 cm, 40.0 cm and 45.0 cm.

(d) Calculate, and record in the table, the values of $\frac{1}{h}$.

Table 3.1

u / cm	h / cm	$\frac{1}{h}$ / $\frac{1}{\text{cm}}$
25.0		
30.0		
35.0		
40.0		
45.0		

[2]

For Examiner's Use

(e) Plot a graph of u/cm (y-axis) against $\frac{1}{h} \Big/ \frac{1}{\text{cm}}$ (x-axis). You do not need to begin the axes at the origin (0,0).

[4]

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

G = ...[2]

(g) Calculate the focal length f of the lens, using the equation $f = \frac{G}{1.5}$ cm. Give your answer to a suitable number of significant figures for this experiment.

f = ...[2]

[Total: 10]

For Examiner's Use

4 In this experiment, you will investigate lamps in series and parallel combinations.

Carry out the following instructions, referring to Fig. 4.1.

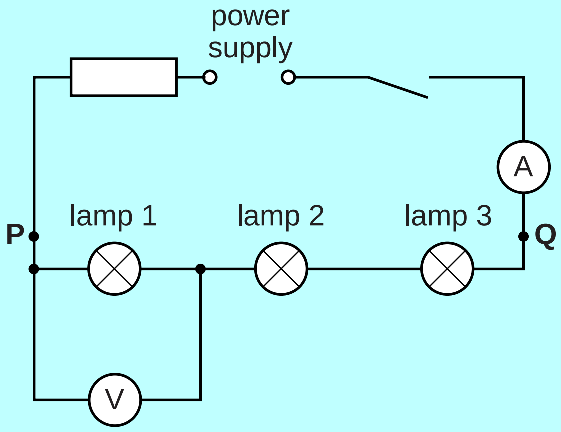

Fig. 4.1

(a) **(i)** Switch on. Measure and record the potential difference V_1 across lamp 1 and the current I in the circuit. Switch off.

V_1 = ...

I = ...
[2]

(ii) Calculate the resistance R_1 of lamp 1 using the equation $R_1 = \frac{V_1}{I}$.

R_1 = ... [1]

(iii) Disconnect the voltmeter and reconnect it to measure the potential difference V_2 across lamp 2.

V_2 = ...

(iv) Disconnect the voltmeter and reconnect it to measure the potential difference V_3 across lamp 3.

V_3 = ...
[1]

(v) Calculate the total potential difference V_T across the three lamps using the equation $V_T = V_1 + V_2 + V_3$.

V_T = ... [1]

(b) **(i)** Complete the circuit diagram in Fig. 4.2 to show the three lamps in **parallel** with each other between **P** and **Q**. Show the voltmeter connected to measure the potential difference V_P across the lamps. Use standard symbols.

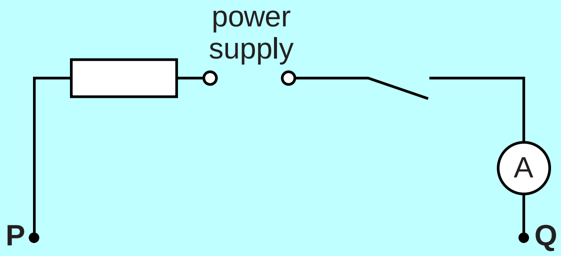

Fig. 4.2

[2]

(ii) Disconnect the lamps and the voltmeter. Rearrange them to make the circuit shown in your circuit diagram.

(iii) Switch on. Measure and record the potential difference V_P across the lamps and the total current I_T. Switch off.

V_P = ...

I_T = ...

(iv) Calculate the total resistance R_P of the lamps arranged in parallel, using the equation $R_P = \frac{V_P}{I_T}$.

R_P = ...
[1]

Question 4 continues on the next page.

For Examiner's Use

(c) A student suggests that R_P should be equal to $\frac{R_1}{3}$.

State whether your results support this suggestion and justify your answer by reference to the results.

statement ....

justification ....

.... [1]

(d) Another student suggests that R_P may not be equal to $\frac{R_1}{3}$ because the lamp filaments are hotter when the lamps are connected in parallel than when the lamps are connected in series.

State one piece of evidence that shows that the lamp filaments are hotter in the parallel circuit.

....

.... [1]

[Total: 10]

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

9243784656

PHYSICS **0625/53**

Paper 5 Practical Test **May/June 2013**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

For Examiner's Use	
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Total	

This document consists of **12** printed pages.

DC (KN/SW) 58834/6

UNIVERSITY *of* CAMBRIDGE International Examinations

[Turn over

1 In this experiment, you will determine the magnification produced by a converging lens.

Carry out the following instructions, referring to Fig. 1.1.
The distance u between the illuminated triangle and the lens has been set for you.
Do not change this distance.

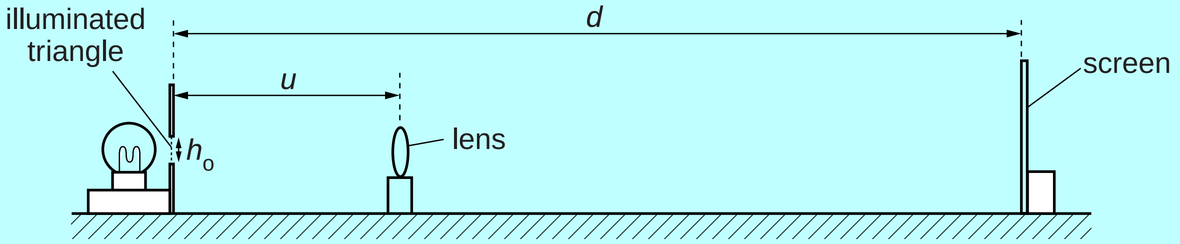


Fig. 1.1

(a) **(i)** Carefully measure u and record the value.

u = ...

(ii) Place the screen near the lens. Move the screen away from the lens until a sharp image of the triangle is seen on the screen.

(iii) Carefully measure d, the distance between the illuminated triangle and the screen, and record the value.

d = ...

(iv) Calculate a value m for the magnification, using your answers to **(a)(i)** and **(a)(iii)**, and the equation $m = \dfrac{d - u}{u}$.

m = ...
[2]

(b) **(i)** Measure h_o, the height of the illuminated triangle, and record the value.

h_o = ...

(ii) Measure h_i, the height of the sharp image on the screen, and record the value.

h_i = ...

(iii) Calculate M, another value for the magnification, using your answers to **(b)(i)** and **(b)(ii)**, and the equation $M = \dfrac{h_i}{h_o}$.

M = ...
[2]

(c) A student says that the values of *m* and *M* should be the same.

State whether or not your findings support this. Justify your answer by reference to your results for *m* and *M*.

statement ....

....

justification ....

....

.... [2]

(d) **(i)** In the space below, sketch the sharp image seen on the screen.

(ii) Describe one difficulty you might have found when measuring the height of this image.

....

....

.... [2]

(e) State two precautions which you took to make the experiment reliable.

1. ....

....

2. ....

.... [2]

[Total: 10]

For Examiner's Use

2 In this experiment, you will investigate how water cools.

The thermometers have been set up in the clamps for you. **Do not** adjust the heights of the thermometers.
Carry out the following instructions, referring to Fig. 2.1.

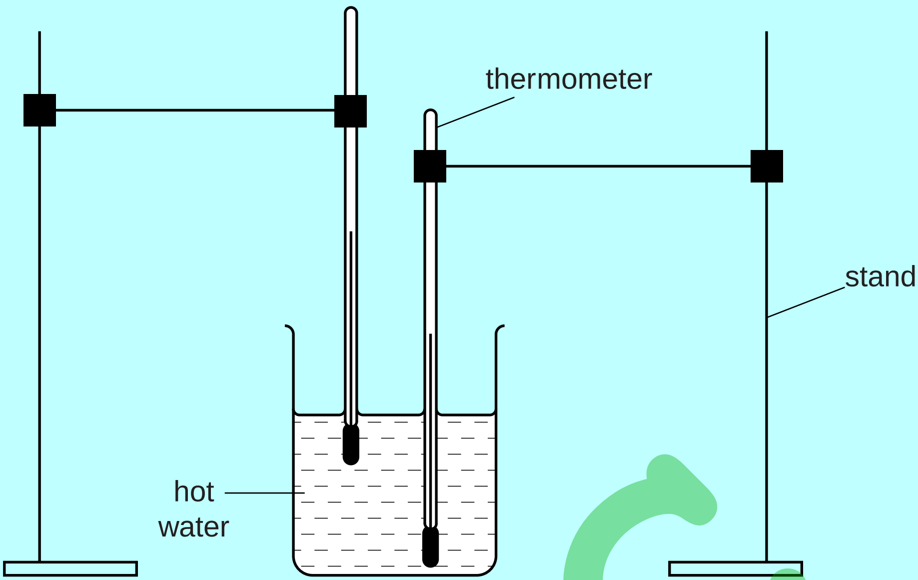


Fig. 2.1

(a) (i) Pour hot water into the beaker until it just covers the bulb of the upper thermometer. Do not stir the water for the rest of the experiment.

(ii) Wait for about 30 seconds before taking any measurements.

(iii) Start the stopclock and read both thermometers.
In the top row of Table 2.1, record these temperatures.

(iv) Record in the table the temperature θ of each thermometer at 1 minute intervals until time t = 6 minutes.

(v) Complete the column headings in the table.

Table 2.1

	thermometer bulb near the bottom of the beaker	thermometer bulb near the surface of the water
t / min	θ /	θ /
0		
1		
2		
3		
4		
5		
6		

[4]

(b) State in which position of the thermometer bulb the average rate of cooling is the greater. Justify your answer by referring to your results.

position ....

justification ....

....

.... [2]

(c) What precaution do your results suggest should be taken when measuring the temperatures of liquids?

Explain how your results show that this is a sensible precaution.

precaution ....

....

explanation ....

....

.... [2]

(d) Another IGCSE student wants to repeat your experiment in order to check the results.

Suggest two experimental conditions which should be kept the same.

1. ....

....

2. ....

.... [2]

[Total: 10]

3 In this experiment, you will investigate the resistance of electric circuits with lamps connected in different combinations.

The apparatus has been set up for you as shown in Fig. 3.1.

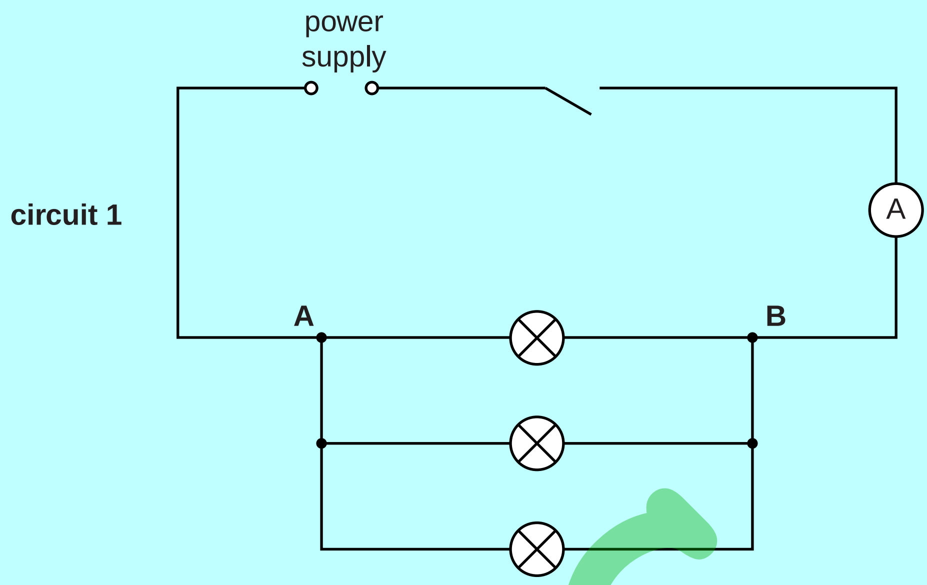


Fig. 3.1

(a) On Fig. 3.1, draw the symbol for a voltmeter, connected to measure the potential difference between **A** and **B**. [1]

(b) **(i)** Connect your voltmeter to the apparatus to measure the potential difference V between **A** and **B**.

(ii) Switch on. Measure, and record in Table 3.1, the potential difference V and the current I shown by the ammeter. Switch off.

Table 3.1

circuit	V /	I /	R /
1			
2			
3			

[5]

(c) **(i)** Reconnect the lamps between **A** and **B** as shown in Fig. 3.2.

(ii) Repeat steps **(b)(i)** and **(b)(ii)** for circuit 2.

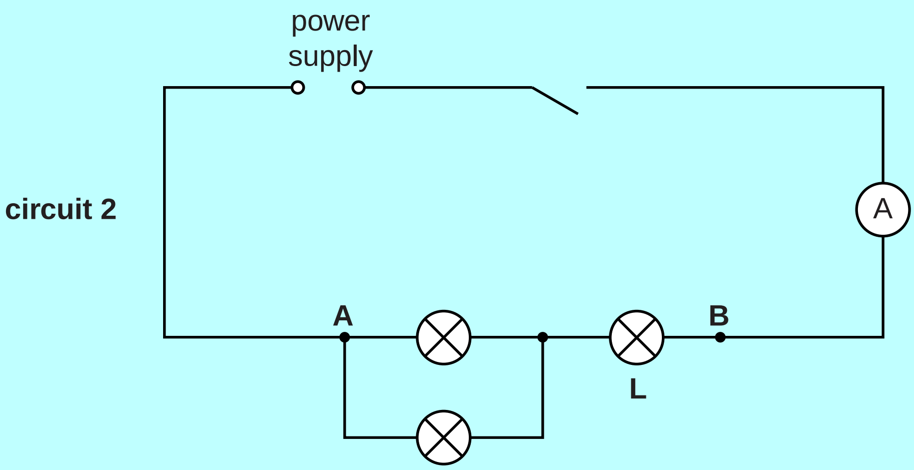


Fig. 3.2

(d) **(i)** Reconnect the lamps between **A** and **B** as shown in Fig. 3.3.

(ii) Repeat steps **(b)(i)** and **(b)(ii)** for circuit 3.

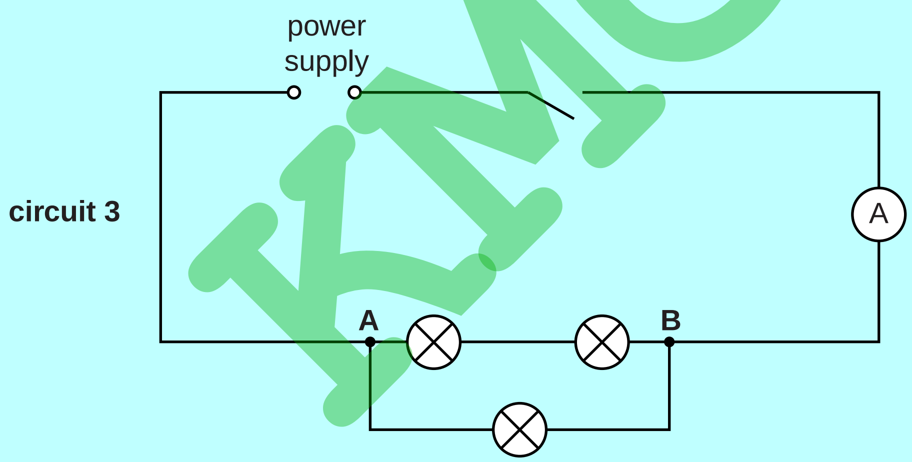


Fig. 3.3

(e) Calculate, and record in the table, the total resistance R of each combination of the lamps, using the equation $R = \frac{V}{I}$.

(f) Complete the column headings in the table.

Question 3 continues on the next page.

(g) If each of the lamps has the same resistance, the total resistance of the lamps in circuit 3 should be twice the total resistance of the lamps in circuit 1.

State whether your findings show this to be the case. Justify your answer by reference to your results.

statement ....

....

justification ....

....

.... [2]

(h) The resistance of a lamp is significantly affected by the temperature of its filament.

Explain whether this might have affected the results of the experiment.

....

....

....[1]

(i) An IGCSE student wants to measure the potential difference across the lamp marked **L** in circuit 2.

On the diagram for **circuit 2**, **Fig. 3.2**, show how a voltmeter should be connected to measure this potential difference. [1]

[Total: 10]

Turn over for Question 4

4 In this experiment, you will investigate the oscillations of a pendulum.

(a) Carry out the following instructions, referring to Figs. 4.1 and 4.2. The pendulum has already been set up for you.

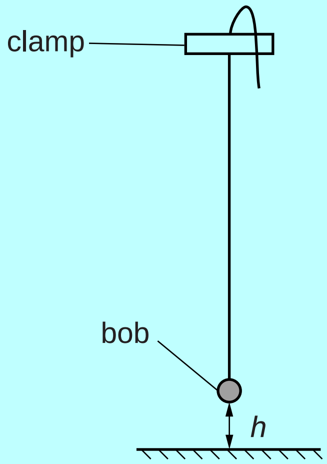


Fig. 4.1

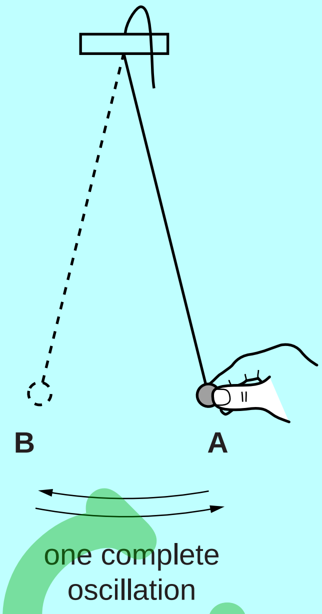


Fig. 4.2

(i) Measure, and record in the first row of Table 4.1, the height h of the pendulum bob above the bench.

(ii) Pull the pendulum bob a small distance to one side, as shown in Fig. 4.2, and release it.

It will oscillate backwards and forwards between **A** and **B**, as shown in Fig. 4.2. One complete oscillation is from **A** to **B** and back to **A**.

Measure the time t for 10 complete oscillations. Record this value in the table.

Table 4.1

h / cm	t / s	T / s	T^2 / s^2

(iii) Without changing the height of the clamp, adjust the string to shorten the pendulum by approximately 10 cm.

Repeat steps **(a)(i)** and **(a)(ii)**.

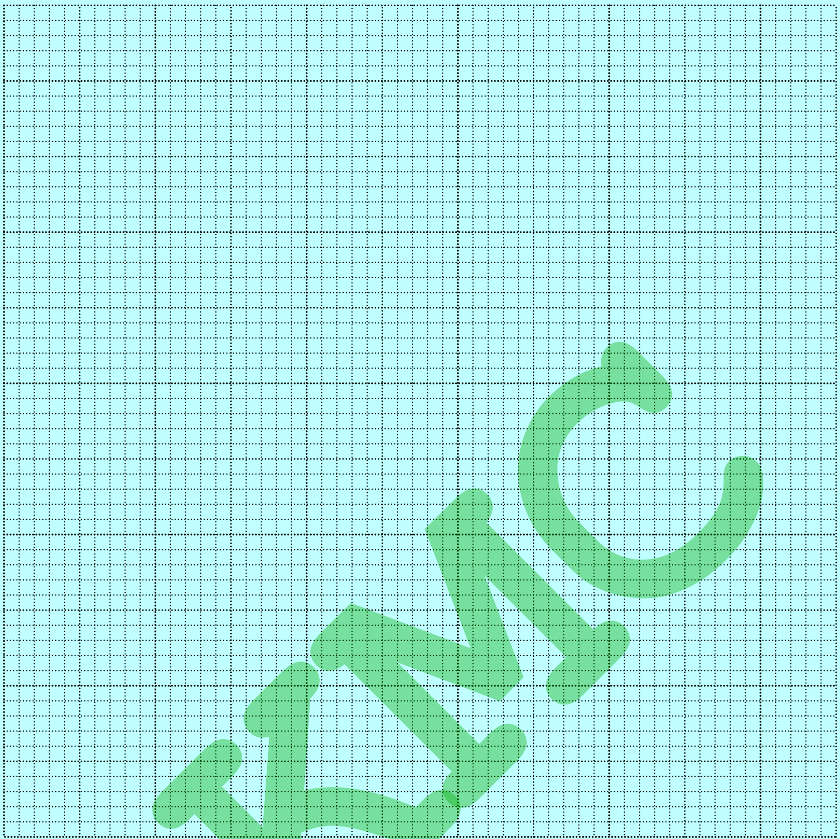
(iv) Repeat step **(a)(iii)** to obtain 3 more sets of readings. [2]

(b) **(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 the table.

(ii) Calculate the values of T^2 and record these in the table. [1]

(c) Plot a graph of T^2/s^2 (y-axis) against h/cm (x-axis).



[4]

(d) Determine the gradient G of the graph.

Show clearly on the graph how you obtained the necessary information.

G = ... [2]

For Examiner's Use

(e) Describe a precaution you took in order to measure *h* as accurately as possible. You may draw a diagram.

....

....

....[1]

[Total: 10]

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

* 7 2 7 0 2 3 3 3 6 3 *

PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2014**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

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The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

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DC (NH/SW) 81258/4

CAMBRIDGE International Examinations

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1 In this experiment, you will investigate the motion of a mass hanging on a spring.

Carry out the following instructions, referring to Figs. 1.1 and 1.2. The spring has been set up for you.

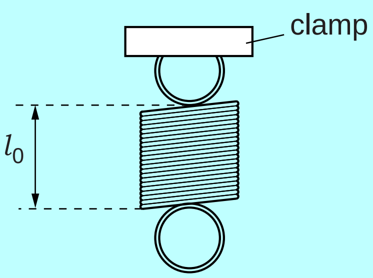


Fig. 1.1

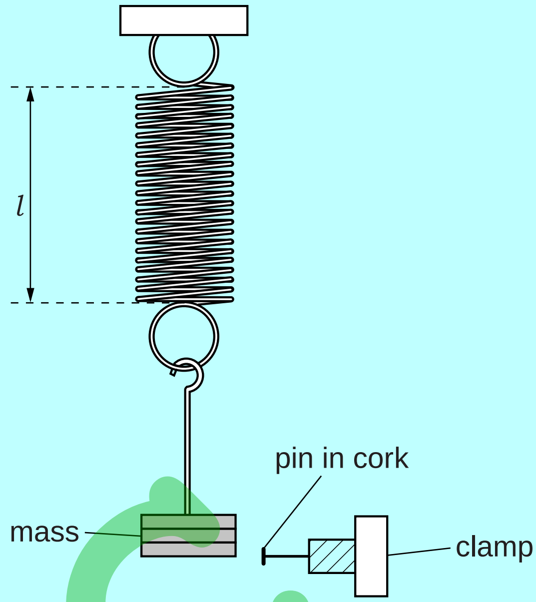


Fig. 1.2

(a) Measure and record the length l_0 of the unstretched spring, in mm.

l_0 = ...mm [1]

(b) Suspend a mass of 300 g from the spring.

(i) Measure and record the new length l of the spring.

l = ...mm [1]

(ii) Calculate the extension e of the spring, using the equation $e = (l - l_0)$.

e = ...mm

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

k = ...
[1]

(c) Adjust the position of the lower clamp so that the pin is level with the bottom of the mass when the mass is not moving. Pull the mass down a short distance and release it so that it oscillates up and down. Fig. 1.3 shows one complete oscillation.

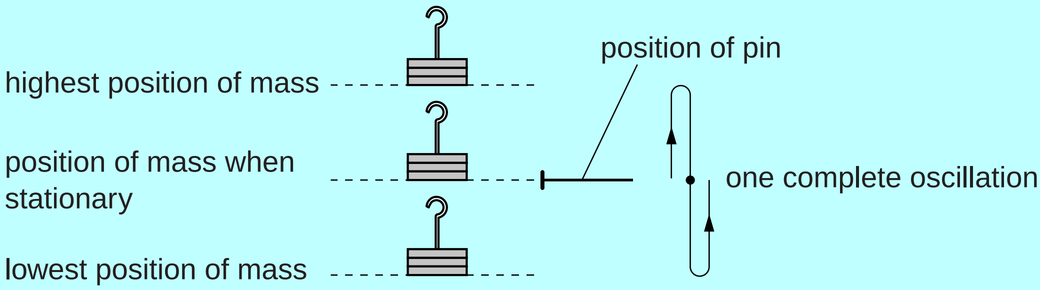


Fig. 1.3

(i) Measure and record the time *t* taken for 10 complete oscillations.

t = ...

(ii) Calculate the time *T* taken for one complete oscillation.

T = ...
[2]

(d) Replace the mass of 300 g with a mass of 500 g. Repeat the steps in part **(c)**.

t = ...

T = ...
[2]

(e) A student suggests that the time T taken for one oscillation should not be affected by the change in mass.

State whether your results support this suggestion. Justify your answer by reference to your results.

statement ....

justification ....

....

....
[2]

(f) Explain briefly how you can avoid a line-of-sight (parallax) error when measuring the length of the spring. You may draw a diagram.

....

....

....[1]

[Total: 10]

2 In this experiment, you will investigate the cooling of a thermometer bulb under different conditions.

Carry out the following instructions, referring to Figs. 2.1 and 2.2.

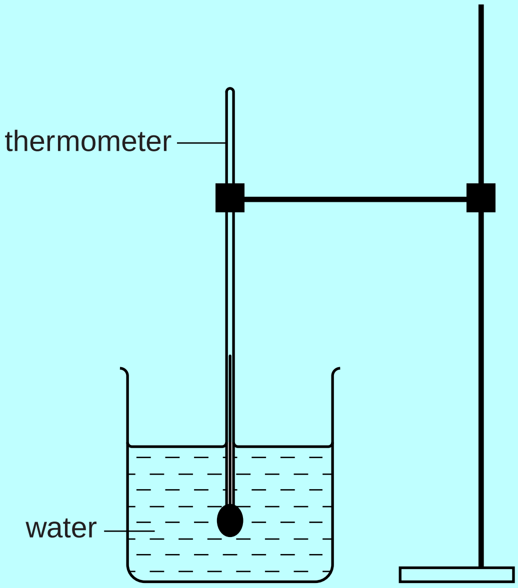


Fig. 2.1

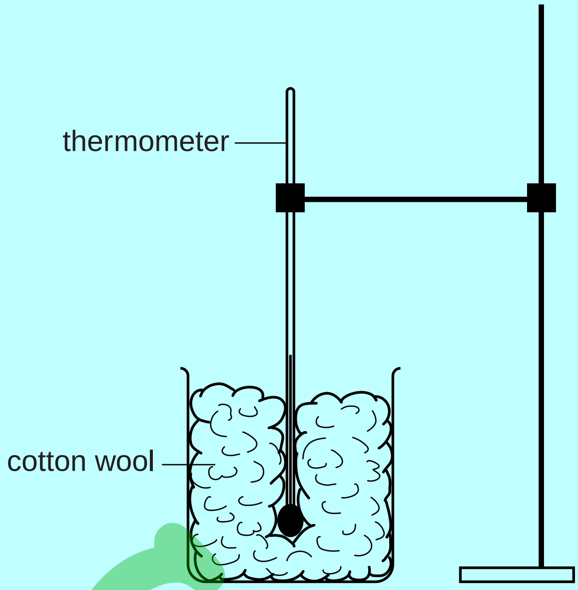


Fig. 2.2

(a) Place the thermometer in the beaker of hot water, as shown in Fig. 2.1.

(i) When the thermometer reading stops rising, record the temperature θ_H of the hot water.

θ_H = ...[1]

(ii) **Remove the thermometer** from the beaker of hot water. Immediately start the stopclock.

(iii) After 30 s, measure the temperature θ shown on the thermometer. Record in Table 2.1 the time t = 30 s and the temperature reading.

(iv) Continue recording the time and temperature readings every 30 s until you have six sets of readings.

Table 2.1

	without insulation	with insulation
t /	θ /	θ /

[5]

(b) Complete the column headings in the table.

(c) Replace the thermometer in the beaker of hot water and record its temperature.

θ_H = ...[1]

(d) **(i)** Remove the thermometer from the beaker of hot water and place it in the beaker containing cotton wool. Immediately start the stopclock. Ensure that the thermometer bulb is completely surrounded by cotton wool as shown in Fig. 2.2.

(ii) After 30 s, measure the temperature θ shown on the thermometer. Record the temperature reading in Table 2.1.

(iii) Continue recording the temperature every 30 s until you have six readings.

(e) State whether the cotton wool insulation increases, decreases, or has no significant effect on the rate of cooling of the thermometer bulb, compared with the rate of cooling with no insulation. Justify your answer by reference to your results.

statement ....

justification ....

....
[2]

(f) Suggest **one** condition that should be kept constant when this experiment is repeated.

....[1]

[Total: 10]

3 In this experiment, you will investigate the resistance of a lamp filament.

Carry out the following instructions, referring to Fig. 3.1.

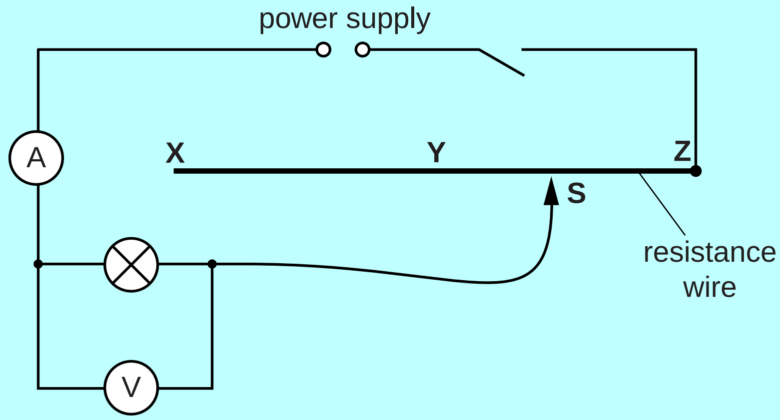


Fig. 3.1

(a) (i) Switch on. Connect the sliding contact **S** to point **X** in the circuit. Measure and record the potential difference V across the lamp and the current I in the circuit. Switch off.

V = ...

I = ...

[2]

(ii) Calculate the resistance R of the lamp filament using the equation $R = \frac{V}{I}$.

R = ...[1]

(b) (i) Switch on. Connect the sliding contact **S** to point **Y** in the circuit. Measure and record the potential difference V across the lamp and the current I in the circuit. Switch off.

V = ...

I = ...

(ii) Calculate the resistance R of the lamp filament using the equation $R = \frac{V}{I}$.

R = ...

[2]

(c) **(i)** Switch on. Connect the sliding contact **S** to point **Z** in the circuit. Measure and record the potential difference V across the lamp and the current I in the circuit. Switch off.

V = ...

I = ...

(ii) Calculate the resistance R of the lamp filament using the equation $R = \frac{V}{I}$.

R = ...[1]

(d) Comment on the effect of increasing the current I on the resistance of the lamp filament.

An increase in the current I in the lamp filament ....

....[1]

(e) Suggest a practical reason why, if you were to repeat this experiment, the repeat measurements might be slightly different from the results you obtained.

....

....[1]

(f) A student carries out this experiment using a different lamp. He takes readings using various lengths of resistance wire in the circuit. He plots a graph of V / V against I / A.

Fig. 3.2 is a sketch of the graph.

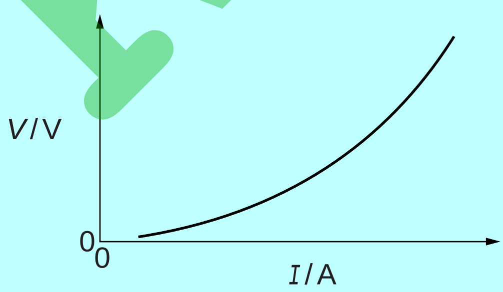


Fig. 3.2

State whether the graph shows that the resistance increases, decreases or remains constant as the current increases. Justify your conclusion by reference to the graph.

The resistance ....

justification ....

....
[2]

[Total: 10]

4 In this experiment, you will investigate reflection using a plane mirror.

Carry out the following instructions, referring to Fig. 4.1.

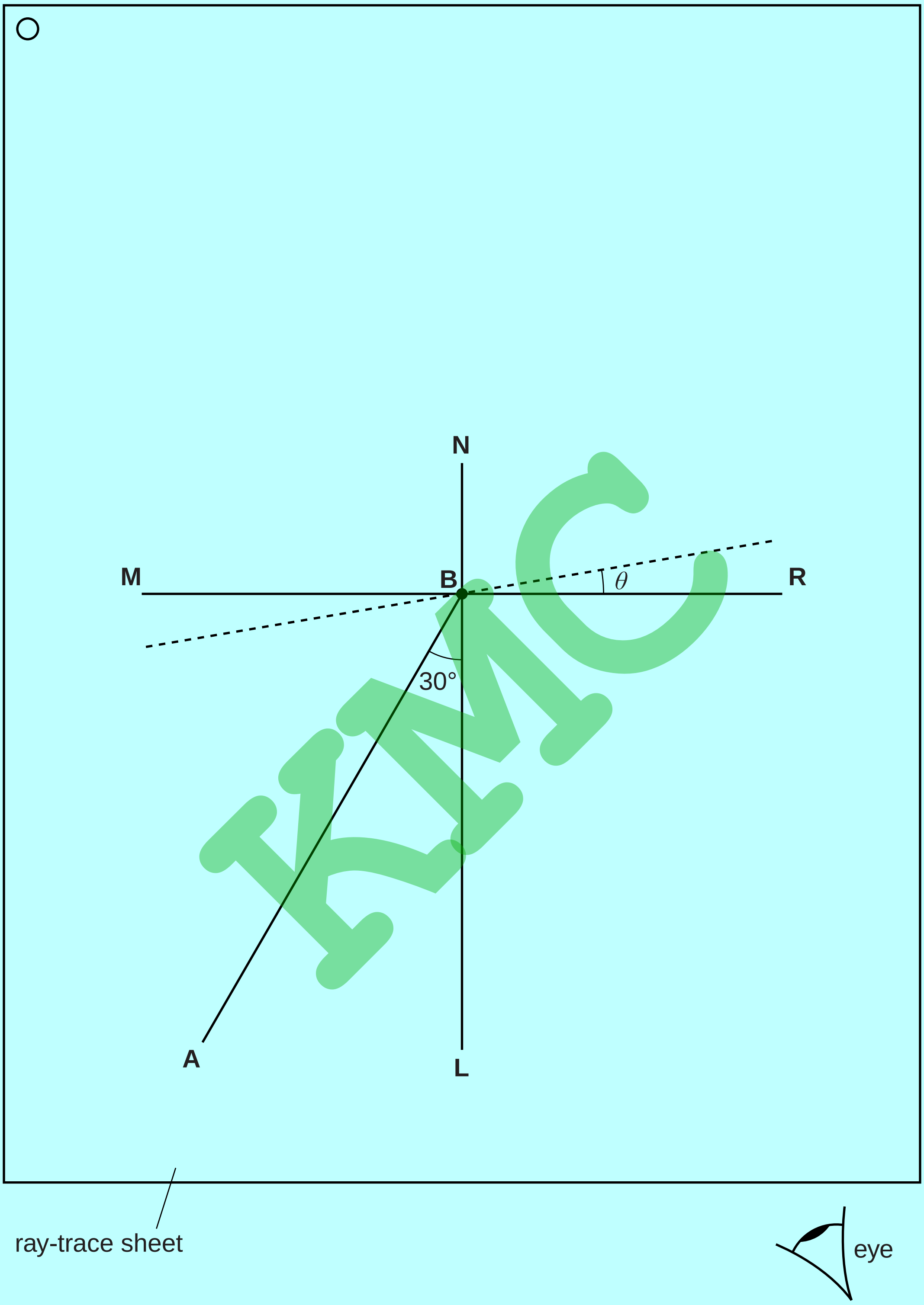


Fig. 4.1

(a) Draw a line 10 cm long near the middle of the ray-trace sheet. Label the line **MR**. Draw a normal to this line that passes through its centre. Label the normal **NL**. Label the point at which **NL** crosses **MR** with the letter **B**.

(b) Draw a line 8 cm long from **B** at an angle of incidence i = 30° to the normal, below **MR** and to the left of the normal. Label the end of this line **A**.

(c) Place two pins P_1 and P_2 on line **AB** a suitable distance apart.

(d) Place the reflecting face of the mirror vertically on the line **MR**.

(e) View the images of pins P_1 and P_2 from the direction indicated by the eye in Fig. 4.1. Place two pins P_3 and P_4 some distance apart, so that pins P_3 and P_4, and the images of P_2 and P_1, all appear exactly one behind the other. Label the positions of P_3 and P_4.

(f) Remove pins P_3 and P_4 and the mirror. Draw the line joining the positions of P_3 and P_4. Extend the line until it meets **NL**.

(g) Measure, and record in Table 4.1, the angle α between **NL** and the line joining the positions of P_3 and P_4. At this stage the angle θ between the mirror and line **MR** is 0° as shown in the table.

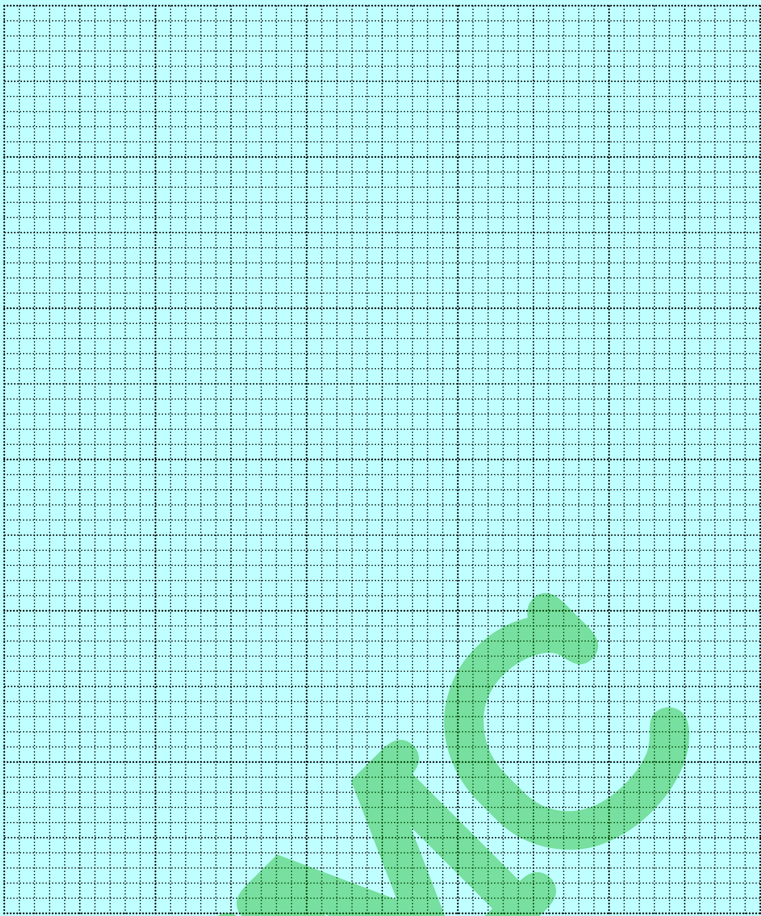
(h) Do not move pins P_1 and P_2. Draw lines at angles θ = 10°, 20°, 30° and 40° to **MR**, one of which is shown in Fig. 4.1. Repeat steps **(d)** to **(g)**, placing the mirror on each of the **new lines** in turn, so that you obtain five sets of readings.

[5]

Table 4.1

θ/°	α/°
0	
10	
20	
30	
40	

(i) Plot a graph of $\alpha/°$ (y-axis) against $\theta/°$ (x-axis).



[5]

Tie your ray-trace sheet into this Booklet between pages 10 and 11.

[Total: 10]

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

PHYSICS **0625/52**

Paper 5 Practical Test **May/June 2014**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

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1	
2	
3	
4	
Total	

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This document consists of **10** printed pages and **2** blank pages.

DC (NH/SW) 81261/4

CAMBRIDGE International Examinations

[Turn over

1 In this experiment, you will take measurements of a pencil.

Carry out the following instructions referring to Fig. 1.1.

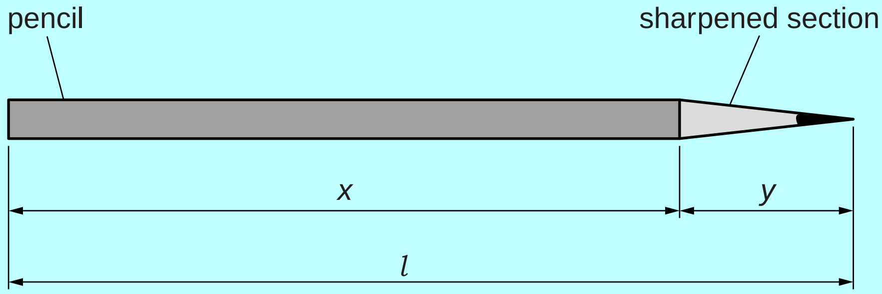

Fig. 1.1

(a) **(i)** Measure, in cm, the total length l of the pencil supplied.

l = ... cm

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

x = ... cm

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

y = ... cm
[2]

(b) Use the string and the ruler to determine the circumference c of the **unsharpened** section of the pencil. Show your working.

c = ... cm [3]

(c) Suggest a source of inaccuracy in determining the circumference of the pencil.

....

....[1]

(d) Calculate the volume V of the unsharpened section of the pencil using the equation $V = \frac{c^2x}{4\pi}$.

V = ... [2]

(e) Estimate the volume V_E of the **sharpened** section of the pencil. Show your working or reasoning.

V_E = ... [2]

[Total: 10]

2 In this experiment, you will investigate the cooling of water.

Carry out the following instructions referring to Fig. 2.1.

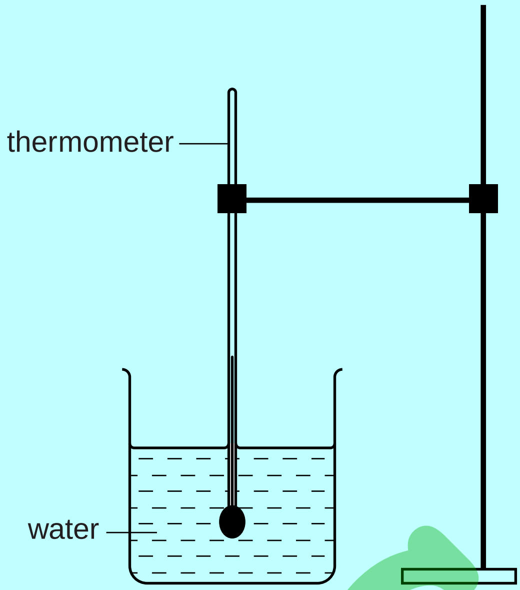

Fig. 2.1

(a) Pour 200 cm^3 of hot water into the beaker. Place the thermometer in the beaker of hot water, as shown in Fig. 2.1.

(i) When the thermometer reading stops rising, record in Table 2.1 the temperature θ_H of the hot water at time t = 0 s. Immediately start the stopclock.

(ii) After 30 s, measure the temperature θ shown on the thermometer. Record the time t = 30 s and the temperature reading in the table.

(iii) Continue recording the time and temperature readings every 30 s until you have six sets of readings.

Table 2.1

t / s	θ / °C
0	

[2]

(b) Plot a graph of θ / °C (y-axis) against t / s (x-axis).

[5]

(c) **(i)** Describe briefly the shape of the best-fit graph line that you have drawn.

....

(ii) State what the shape of the graph line tells you about the change, if any, in the rate of cooling of the water during the experiment.

....

....

[2]

(d) Describe briefly how you would read a measuring cylinder to obtain an accurate value for the volume of water. You may draw a diagram.

....

....

....

....[1]

[Total: 10]

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3 In this experiment, you will investigate the resistance of a resistor.

Carry out the following instructions, referring to Fig. 3.1.

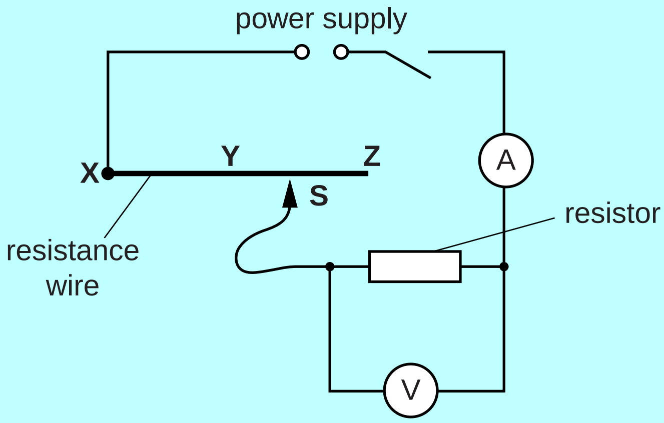

Fig. 3.1

(a) **(i)** Switch on. Connect the sliding contact **S** to point **X** in the circuit. Measure and record the potential difference V across the resistor and the current I in the circuit. Switch off.

V = ...

I = ...
[2]

(ii) Calculate the resistance R of the resistor using the equation $R = \frac{V}{I}$.

R = ...[1]

(b) **(i)** Switch on. Connect the sliding contact **S** to point **Y** in the circuit. Measure and record the potential difference V across the resistor and the current I in the circuit. Switch off.

V = ...

I = ...
[1]

(ii) Calculate the resistance R of the resistor using the equation $R = \frac{V}{I}$.

R = ...

(c) **(i)** Switch on. Connect the sliding contact **S** to point **Z** in the circuit. Measure and record the potential difference V across the resistor and the current I in the circuit. Switch off.

V = ...

I = ...

(ii) Calculate the resistance R of the resistor using the equation $R = \frac{V}{I}$.

R = ...
[2]

(d) State how the value of R changes when I decreases.

....

....[1]

(e) A student carries out this experiment using a different resistor. He takes readings using various lengths of resistance wire in the circuit. He plots a graph of V / V against I / A.

Fig. 3.2 is a sketch of the graph.

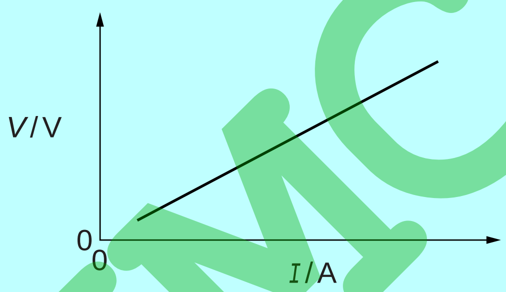

Fig. 3.2

Explain briefly how the student would use the graph to determine the gradient of the line. You may draw on the graph of Fig. 3.2. You are not asked to calculate the value of the gradient.

....

....

....

....[2]

(f) In this experiment, the resistance wire **XYZ** acts as a variable resistor (rheostat).

Draw the standard circuit symbol for a variable resistor.

[1]

[Total: 10]

4 In this experiment, you will determine the focal length of a converging lens.

Carry out the following instructions, referring to Fig. 4.1.

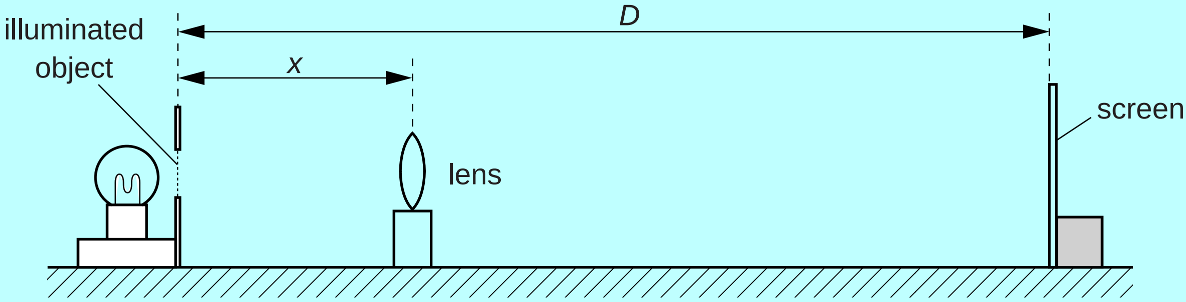

Fig 4.1

(a) Place the screen at a distance D = 80.0 cm from the illuminated object. The screen and the illuminated object must remain in the same positions throughout the experiment.

(b) Place the lens close to the illuminated object. Move the lens until a sharply-focused, enlarged image of the object is seen on the screen.

(i) Measure and record, in cm, the distance x from the illuminated object to the centre of the lens.

x = ... cm

(ii) Measure and record, in cm, the height h from the top to the bottom of the image on the screen.

h = ... cm
[2]

(c) Move the lens towards the screen until a smaller, sharply-focused image of the object is seen on the screen. Measure and record, in cm, the distance y from the illuminated object to the centre of the lens.

y = ... cm [1]

(d) **(i)** Calculate d using the equation $d = (y - x)$.

d = ...

(ii) Calculate d^2.

d^2 = ...
[1]

(e) Calculate the focal length f of the lens, using the equation $f = \dfrac{D^2 - d^2}{4D}$.

f = ...[2]

(f) State two precautions that you could take in this experiment to obtain reliable results.

1. ....

....

2. ....

....
[2]

(g) Sketch a diagram of the image seen in part **(b)**.

[1]

(h) Suggest a variable that could be changed when repeating this experiment to check the accuracy of the value obtained for the focal length f. You are not asked to repeat the experiment.

....[1]

[Total: 10]

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Cambridge International Examinations
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CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

PHYSICS **0625/53**

Paper 5 Practical Test **May/June 2014**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

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[Turn over

1 In this experiment, you will determine the density of water using two methods.

(a) Method 1

Carry out the following instructions, referring to Figs. 1.1 and 1.2.

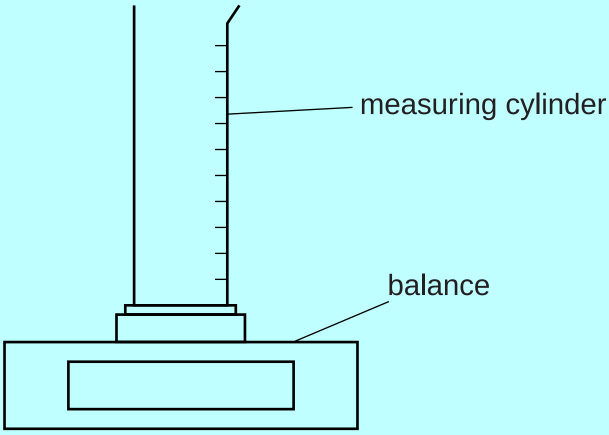

Fig. 1.1

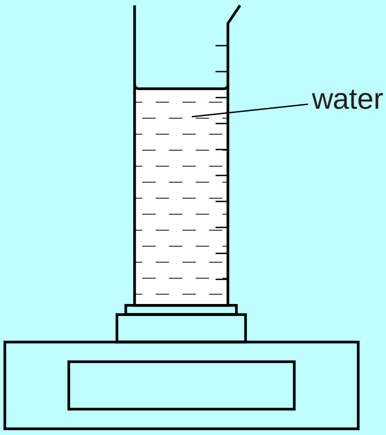

Fig. 1.2

(i) Place the empty measuring cylinder on the balance as shown in Fig. 1.1. Measure and record the mass m_1 of the empty measuring cylinder. Remove the measuring cylinder from the balance.

m_1 = ...g

(ii) Pour approximately 70 cm^3 of water into the measuring cylinder. Measure and record the volume V_1 of the water.

V_1 = ... cm^3

(iii) Place the measuring cylinder containing the water on the balance as shown in Fig. 1.2. Measure and record the mass m_2 of the measuring cylinder and water.

m_2 = ...g
[2]

Leave the water in the measuring cylinder for use in **Method 2**. Remove the measuring cylinder from the balance.

(iv) Calculate a value ρ_1 for the density of water using the equation $\rho_1 = \dfrac{m_2 - m_1}{V_1}$. Give an appropriate unit.

ρ_1 = ...[1]

(b) Method 2

Carry out the following instructions, referring to Figs. 1.3 and 1.4.

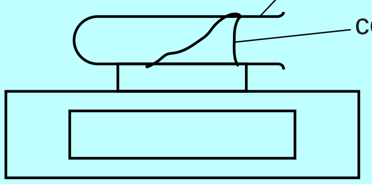

Fig. 1.3

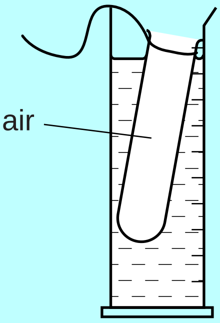

Fig. 1.4

(i) Place the empty test-tube on the balance as shown in Fig. 1.3. Measure and record the mass m_3 of the test-tube.

m_3 = ...g

(ii) Carefully lower the test-tube, by means of the cotton, into the measuring cylinder until it floats as shown in Fig. 1.4. Measure and record the new water level V_2 in the measuring cylinder.

V_2 = ... cm^3

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

V_3 = ... cm^3
[2]

(iv) Calculate and record a value ρ_2 for the density of water using the equation $\rho_2 = \dfrac{m_3}{V_3}$.

ρ_2 = ...[1]

(c) Calculate an average value ρ_{AV} for the density of water using your results from **(a)(iv)** and **(b)(iv)**.

ρ_{AV} = ...[1]

(d) Suggest a precaution that should be taken in **Method 1** to ensure that the volume reading is as accurate as possible. You may draw a diagram.

....

....

....[1]

(e) Suggest a possible source of experimental inaccuracy in **Method 2**, other than with the volume reading.

State and explain the effect that this would have on your value for ρ_2.

suggestion ....

....

effect and explanation..

....
[2]

[Total: 10]

Turn over for Question 2

2 In this experiment, you will investigate the cooling of water.

Carry out the following instructions, referring to Fig. 2.1.
The thermometer must remain in the clamp throughout the experiment, at the same height.

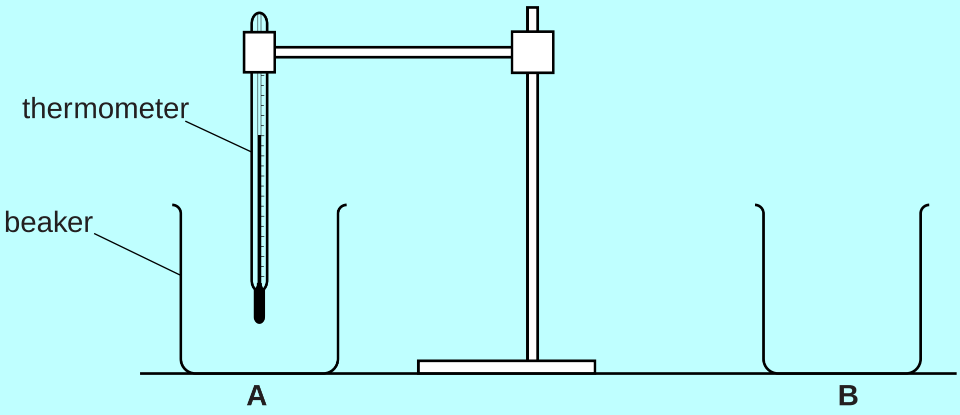

Fig. 2.1

(a) **(i)** Pour approximately 200 cm^3 of hot water into beaker **A**.

(ii) Wait for about 30 seconds before taking any measurements.

(iii) Start the stopclock and read the thermometer.
In the top row of Table 2.1, record this temperature θ at time t = 0.

(iv) In the table, record the temperature θ of the water at times t = 30 s, 60 s, 90 s, 120 s, 150 s and 180 s.

(v) Complete the column headings in the table.

(vi) Carefully remove the thermometer from beaker **A**.
Place the thermometer in beaker **B**.

Table 2.1

	beaker **A** with approximately 200 cm^3 of water	beaker **B** with approximately 100 cm^3 of water
t /	θ /	θ /

[5]

(b) **(i)** Pour approximately 100 cm^3 of hot water into beaker **B**.

(ii) Repeat **(a)(ii)** to **(iv)** for beaker **B**.

(c) Describe a similarity in the patterns of temperature change of the two volumes of water, apart from the fact that the temperature of each decreases.

....

....

....[1]

(d) A student suggests that the rate of cooling is smaller for a larger volume of water than for a smaller volume of water.

State whether your readings support this suggestion. Justify your answer by referring to your readings.

statement ....

justification ....

....

....
[2]

(e) Another IGCSE student wants to repeat your experiment in order to check the results.

Suggest two factors that should be kept the same in order for the comparison to be fair.

1. ....

....

2. ....

....
[2]

[Total: 10]

3 In this experiment, you will investigate resistance using a set of wires.

The circuit in Fig. 3.1 has been set up for you.

Carry out the following instructions, referring to Fig. 3.1.

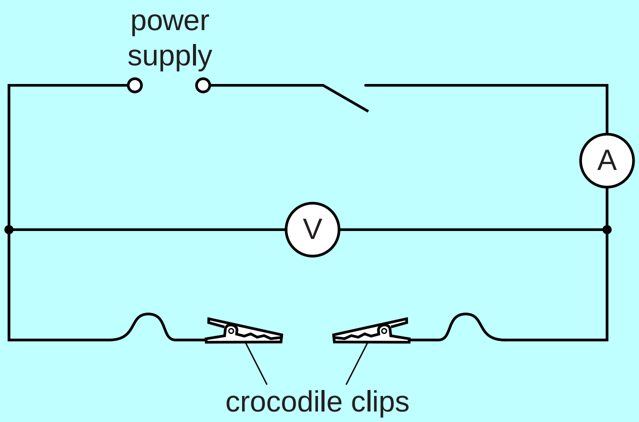

Fig. 3.1

(a) **(i)** Connect the crocodile clips to the ends of wire **A**.

(ii) Switch on. Measure, and record in Table 3.1, the potential difference *V* and the current *I*. Switch off.

Table 3.1

wire	*V* /	*I* /
A		
B		
C		

[3]

(b) **(i)** Disconnect wire **A** and connect the crocodile clips to the ends of wire **B**.

(ii) Repeat step **(a)(ii)**.

(c) **(i)** Disconnect wire **B** and connect the crocodile clips to the ends of wire **C**.

(ii) Repeat step **(a)(ii)**.

(d) Complete the column headings in the table.

(e) **(i)** Calculate and record the resistance *R* of each wire, using your readings from the table and the equation $R = \frac{V}{I}$.

resistance of wire **A**, R_A = ...

resistance of wire **B**, R_B = ...

resistance of wire **C**, R_C = ...
[3]

(ii) A student suggests that R_A should be equal to $R_B + R_C$.

State whether your findings support this suggestion. Justify your answer by reference to your results.

statement ....

....

justification ....

....

....
[1]

(f) One problem encountered in this type of investigation is that resistance can be affected by a rise in temperature of the wire.

Suggest one way in which this effect could be kept to a minimum.

....

....

....[1]

(g) In a variation of this experiment, an IGCSE student wants to change the current in wire **A** using a variable resistor (rheostat).

(i) In the space below, draw the standard circuit symbol for a variable resistor.

(ii) On Fig. 3.1, mark with an **X** where the variable resistor could be connected so that it may be used in this way.

[2]

[Total: 10]

4 In this experiment, you will investigate shadows.

Carry out the following instructions, referring to Fig. 4.1.

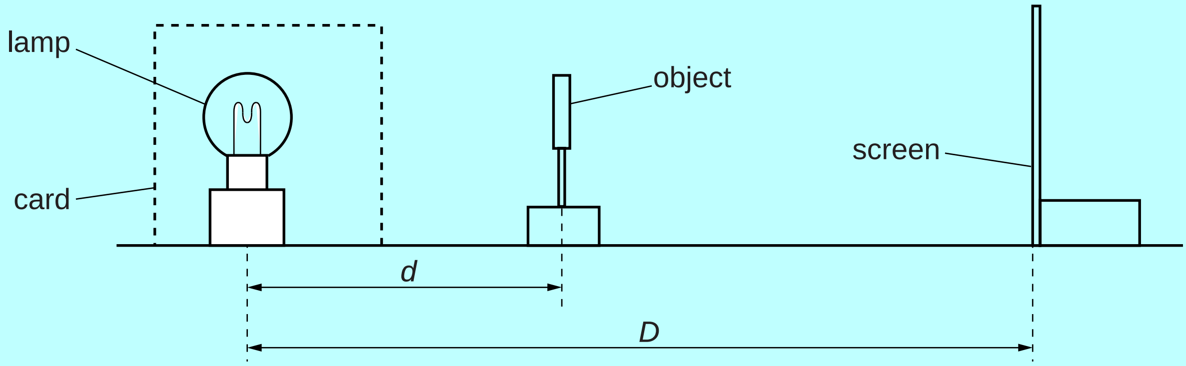

Fig. 4.1

The lamp, card and screen have been set up for you. The card is to protect your eyes from the glare of the lamp and should remain at the side of the lamp.

(a) **(i)** Set the distance *D* between the centre of the lamp and the screen to 60 cm.
Do not change this distance during the experiment.

(ii) Place the object at a distance *d* = 55 cm from the centre of the lamp so that it produces a shadow on the screen.

(iii) Measure, and record in Table 4.1, the width *w* and the height *h* of the shadow of the square object.

Table 4.1

d / cm	*w* / cm	*h* / cm	*s* / cm
55			
45			
35			
25			
20			
15			

[2]

(iv) Repeat **(a)(iii)** for *d* values of 45 cm, 35 cm, 25 cm, 20 cm and 15 cm.

(b) **(i)** For each distance d, calculate, and record in the table, a value for the average side length s, using your readings for w and h and the equation $s = \dfrac{w+h}{2}$.

(ii) The object you are using is square in shape. State a practical reason why it is useful to calculate s rather than just rely on w or h to show the size of the shadow.

....

....[1]

(c) Plot a graph of s/cm (y-axis) against d/cm (x-axis).

[5]

(d) A value of d = 20 cm has been inserted between d = 25 cm and d = 15 cm. This does not follow the pattern of the gaps of 10 cm between the other distances.

Explain why it is useful to have this value when drawing the line on the graph.

....

....[1]

(e) A student suggests that the distance between the lamp and the object in this experiment should be no less than 15 cm.

From your observations, give a reason why this is a sensible suggestion.

....

....[1]

[Total: 10]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2015**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

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DC (LEG/JG) 91116/1

CAMBRIDGE International Examinations

1 In this experiment, you will determine the weight of a metre rule using a balancing method.

Carry out the following instructions, referring to Fig. 1.1.

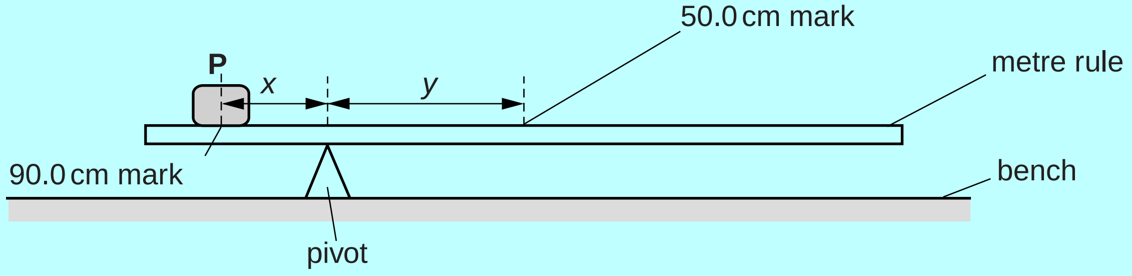

Fig. 1.1

(a) Place the metre rule on the pivot. Place the load **P** on the metre rule at the 90.0 cm mark.

Keeping **P** at the 90.0 cm mark, adjust the position of the metre rule on the pivot so that the metre rule is as near as possible to being balanced.

(i) Write down the reading on the metre rule at the position of the pivot.

The pivot is at the .... cm mark of the metre rule.

(ii) Record the distance x from the 90.0 cm mark to the pivot.

x = ...[1]

(iii) Record the distance y from the pivot to the 50.0 cm mark.

y = ...[1]

(iv) Determine the weight W of the metre rule using the equation $W = \frac{Px}{y}$, where P = 2.0 N. P is the weight of load **P**.

W = ...[1]

(b) Keep the pivot at the same position, as recorded in **(a)(i)**.

Move load **P** to the 95.0 cm mark. Place the load **Q** on the metre rule and adjust its position so that the rule balances.

(i) On Fig. 1.2 mark, with a letter X, the approximate position of **Q**. [1]

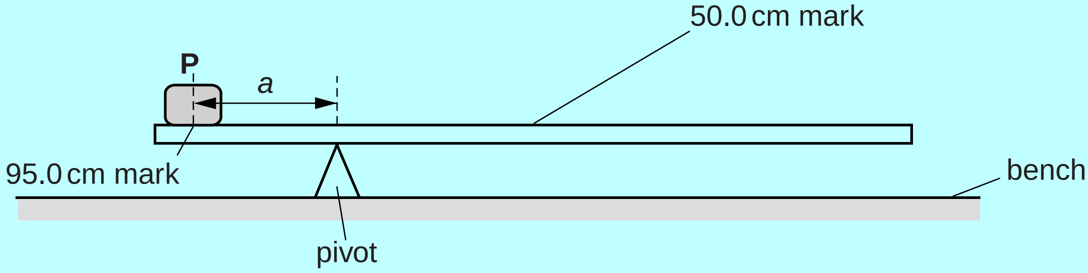

Fig. 1.2

(ii) Record the distance a from the 95.0 cm mark to the pivot.

a = ...

(iii) Record the distance b from **Q** to the pivot.

b = ...

(iv) Record the distance c from the 50.0 cm mark to the pivot.

c = ...
[1]

(v) Calculate the product aP, where P = 2.0 N. Include the unit.

aP = ...

(vi) Calculate the product bQ, where Q = 1.0 N. Q is the weight of load **Q**.

bQ = ...

(vii) Calculate the product cW, using the value of W determined in part **(a)(iv)**.

cW = ...
[2]

(c) A student suggests that aP should be equal to $bQ + cW$.

State whether your results support the suggestion. Justify your answer by reference to the results.

statement ....

justification ....

....
[2]

(d) Suggest one practical reason why it is difficult to obtain exact results with this experiment.

....

....[1]

[Total: 10]

2 In this experiment, you will investigate the cooling of water.

Carry out the following instructions referring to Fig. 2.1. You are provided with a beaker containing hot water and a thermometer.

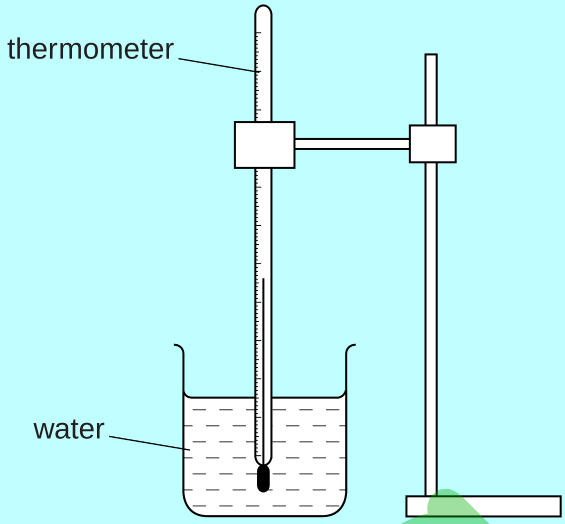

Fig. 2.1

(a) (i) Place the thermometer in the beaker of water. When the thermometer reading stops rising, measure the temperature θ of the water and immediately start the stopclock. Record θ in Table 2.1 at time t = 0 s.

(ii) In Table 2.1, record the temperature of the water at 30 s intervals until you have a total of six values up to time t = 150 s.

Table 2.1

t / s	θ / °C
0	
30	
60	
90	
120	
150	

[3]

(b) Plot a graph of θ / °C (y-axis) against t / s (x-axis).

[5]

(c) **(i)** State whether the rate of cooling of the water in the beaker increases, decreases or stays approximately constant during the period of cooling.

The rate of cooling of the water ....[1]

(ii) Justify your statement by reference to the graph.

....

....

....[1]

[Total: 10]

3 In this experiment, you will investigate the resistance of lamp filaments in series and parallel circuits.

The circuit shown in Fig. 3.1 has been set up for you.

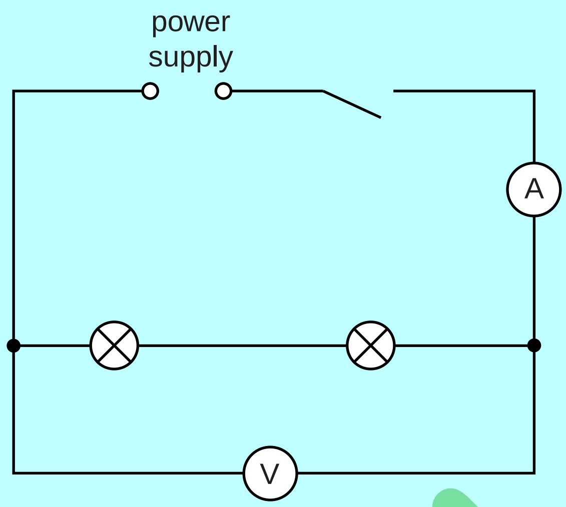

Fig. 3.1

(a) (i) Switch on. Measure and record the potential difference V_S across the lamps and the current I_S in the circuit. Switch off.

V_S = ...

I_S = ...
[2]

(ii) Calculate the resistance R_S of the lamp filaments using the equation $R_S = \frac{V_S}{I_S}$.

R_S = ...[1]

(b) The circuit is to be rearranged so that
- the lamps are in parallel
- the ammeter will measure the total current in the circuit
- the voltmeter will measure the potential difference across the lamps.

Draw a diagram of this circuit using standard circuit symbols.

[2]

(c) Rearrange the circuit as described in **(b)**.

(i) Switch on. Measure and record the potential difference V_P across the lamps and the current I_P in the circuit. Switch off.

V_P = ...

I_P = ...
[1]

(ii) Calculate the resistance R_P of the lamp filaments using the equation $R_P = \frac{V_P}{I_P}$.

R_P = ...

(iii) Calculate the ratio $\frac{R_S}{R_P}$.

$\frac{R_S}{R_P}$ = ...
[2]

(d) A student wishes to investigate whether the ratio $\frac{R_S}{R_P}$ for the two lamps is the same under all conditions.

(i) Suggest a variable that you could change in order to obtain further sets of readings. You are not asked to take any further readings.

....

(ii) Explain briefly how you would change this variable.

....

....
[2]

[Total: 10]

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4 In this experiment, you will investigate the refraction of light passing through a transparent block.

Carry out the following instructions, referring to Fig. 4.1.

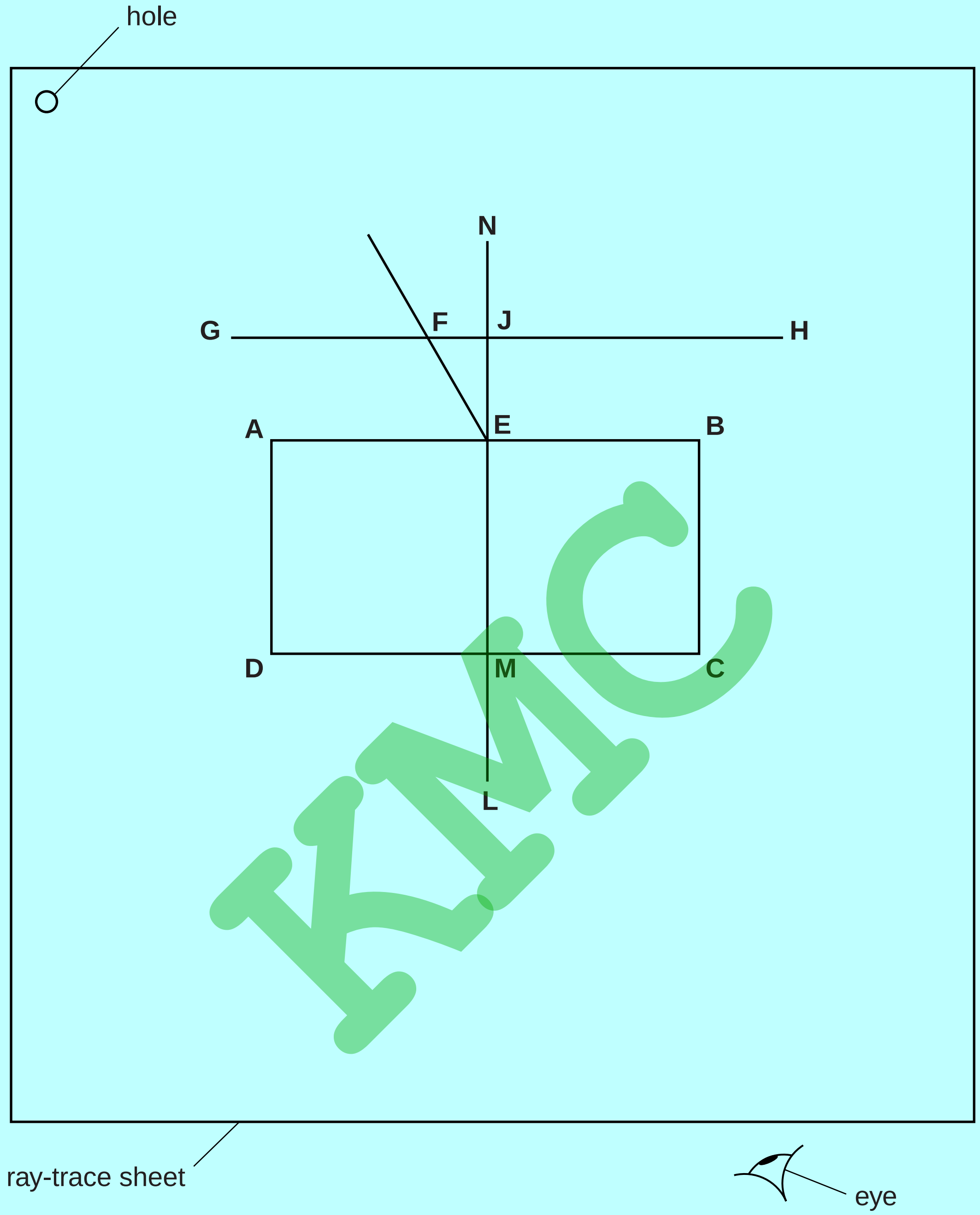

Fig. 4.1

(a) Place the transparent block, largest face down, on the ray-trace sheet supplied. The block should be approximately in the middle of the paper. Draw the outline of the block **ABCD**.

(b) Remove the block and draw a normal **NL** at the centre of side **AB**. Label the point **E** where the normal crosses **AB**. Label the point **M** where the normal crosses **CD**.

(c) Draw a line **GH**, parallel to **AB** and 6.0 cm above **AB**. Label the point **J** where the normal crosses **GH**.

(d) Draw a line, starting at **E**, to the left of the normal and at an angle of incidence $i = 30°$ to the normal as shown in Fig. 4.1. Label the point **F** where the line meets **GH**.

(e) Place two pins P_1 and P_2 on the line **FE**, placing one pin close to **E**. Label the positions of P_1 and P_2.

(f) Replace the block and observe the images of P_1 and P_2 through side **CD** of the block so that the images of P_1 and P_2 appear one behind the other. Place two pins P_3 and P_4 between your eye and the block so that P_3 and P_4, and the images of P_1 and P_2 seen through the block, appear one behind the other. Label the positions of P_3 and P_4. Remove the block.

(g) Draw a line joining the positions of P_3 and P_4. Continue the line until it meets **CD** and label this point **K**. Draw the line **KE**.

(h) **(i)** Measure and record the length *a* between points **F** and **J**.

a = ...

(ii) Measure and record the length *b* between points **F** and **E**.

b = ...

(iii) Measure and record the length *c* between points **E** and **K**.

c = ...

(iv) Measure and record the length *d* between points **M** and **K**.

d = ...
[2]

(i) Calculate *n*, the refractive index of the material of the block, using the equation $n = \dfrac{ac}{bd}$.

n = ... [1]

(j) Repeat steps **(d)** – **(h)** but with the angle of incidence $i = 50°$.

a = ...

b = ...

c = ...

d = ...

n = ...
[2]

(k) Suggest one precaution that you should take with this experiment to obtain reliable results.

....

....

....[1]

Tie your ray-trace sheet into this Booklet between pages 10 and 11. [4]

[Total: 10]

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CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

3908655948

PHYSICS **0625/52**

Paper 5 Practical Test **May/June 2015**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

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CAMBRIDGE International Examinations

1 In this experiment, you will investigate a pendulum.

Carry out the following instructions referring to Figs. 1.1 and 1.2.

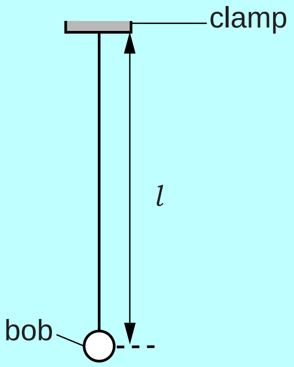

Fig. 1.1

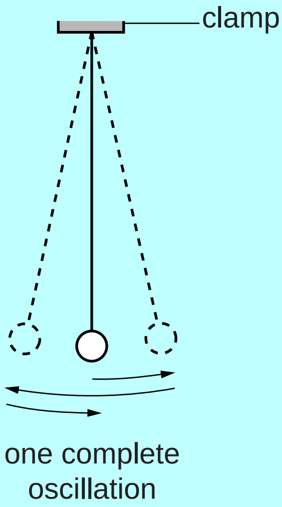

Fig. 1.2

A pendulum has been set up for you.

(a) Adjust the pendulum until its length $l = 50.0\,\text{cm}$. The length l is measured to the centre of the bob.

State one precaution that you took to measure the length l as accurately as possible. You may draw a diagram.

....

....[1]

(b) **(i)** Displace the pendulum bob slightly and release it so that it swings. Measure the time *t* for 20 complete oscillations of the pendulum (see Fig. 1.2).

t = ... [1]

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

T = ...[1]

(iii) Explain why measuring the time for 20 oscillations, rather than for 1 oscillation, gives a more accurate value for *T*.

....

....[1]

(c) Adjust the length of the pendulum until its length l = 100.0 cm. Repeat steps **(b)(i)** and **(b)(ii)**.

t = ...

T = ...
[2]

(d) A student suggests that doubling the length l of the pendulum should double the period *T*.

State whether your results support this suggestion. Justify your answer by reference to the results.

statement ....

justification ....

....
[2]

(e) To continue the investigation of the relationship between the length l of the pendulum and the period *T*, it is necessary to use a range of values of length l.

List additional l values that you would plan to use in the laboratory. You are not asked to make any more measurements.

....[2]

[Total: 10]

2 In this experiment, you will investigate the cooling of water.

Carry out the following instructions referring to Fig. 2.1.

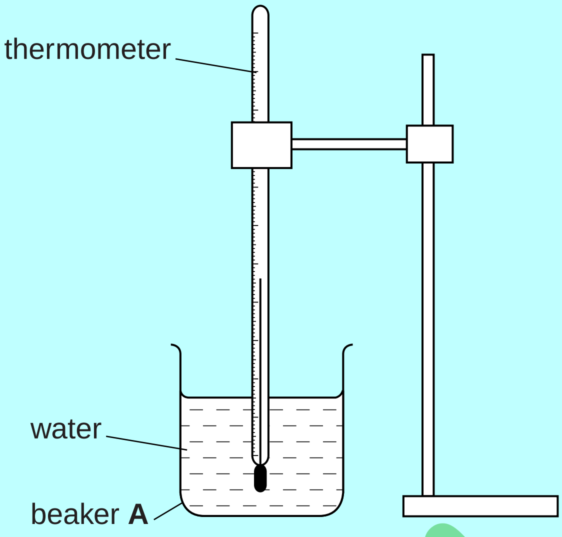

Fig. 2.1

(a) Pour 100 cm^3 of hot water into beaker **A**. Place the thermometer in beaker **A**, as shown in Fig. 2.1.

(i) Record the temperature θ_H of the hot water in beaker **A**.

θ_H = ... [1]

(ii) State one precaution that you took to ensure that the temperature reading for the hot water is as reliable as possible.

....

.... [1]

(b) **(i)** Add 50 cm^3 of cold water to the hot water in beaker **A**. Stir briefly. Record the temperature θ_1.

θ_1 = ...

(ii) Calculate the decrease in temperature θ_A using the equation $\theta_A = (\theta_H - \theta_1)$.

θ_A = ...
[2]

(c) **(i)** Add a further 100 cm^3 of cold water to the water in beaker **A**. Stir briefly. Record the temperature θ_2.

θ_2 = ...

(ii) Calculate the decrease in temperature θ_B using the equation $\theta_B = (\theta_1 - \theta_2)$.

θ_B = ...
[2]

(d) Suggest two factors, other than the volume and temperature of the cold water added, that affect the decrease in temperature of the hot water.

1. ....

....

2. ....

....
[2]

(e) Describe briefly how a measuring cylinder is read to obtain an accurate value for the volume of water. You may draw a diagram.

....

....

....

....[2]

[Total: 10]

3 In this experiment, you will investigate the resistance of lamps.

The circuit shown in Fig. 3.1 has been set up for you.

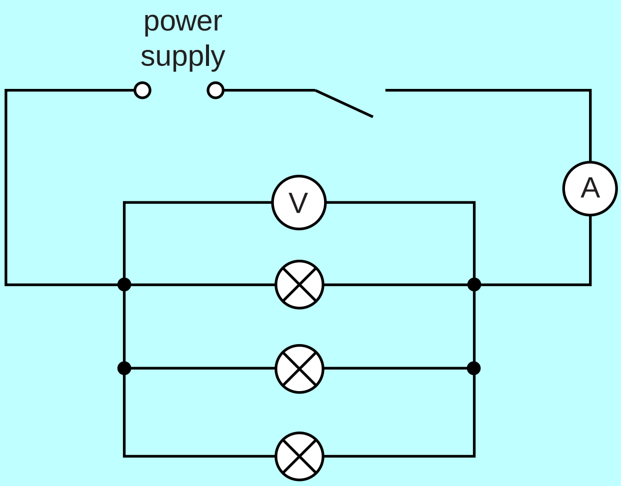

Fig. 3.1

(a) (i) Switch on. Measure and record the potential difference V_P across the lamps and the current I_P in the circuit. Switch off.

V_P = ...

I_P = ...
[2]

(ii) Calculate the combined resistance R_P of the lamps using the equation $R_P = \frac{V_P}{I_P}$.

R_P = ...[1]

(b) Disconnect and remove one of the lamps.

The remaining components are to be arranged to make a circuit in which

- the two lamps are in series
- the ammeter will measure the total current in the circuit
- the voltmeter will measure the potential difference across both lamps.

In the space below, draw a diagram of this circuit using standard circuit symbols.

[2]

(c) Set up the circuit as described in **(b)**.

(i) Switch on. Measure and record the potential difference V_S across the two lamps and the current I_S in the circuit. Switch off.

V_S = ...

I_S = ...
[1]

(ii) Calculate the resistance R_S of the lamps using the equation $R_S = \frac{V_S}{I_S}$.

R_S = ...[2]

(d) **(i)** A student wishes to vary the current in the circuit in Fig. 3.1, using a variable resistor.

In the space below, draw the standard circuit symbol for a variable resistor.

[1]

(ii) On Fig. 3.1, label with X a suitable position in the circuit for a variable resistor used to vary the current in all the lamps. [1]

[Total: 10]

4 In this experiment, you will investigate reflection using a plane mirror.

Carry out the following instructions, referring to Fig. 4.1.

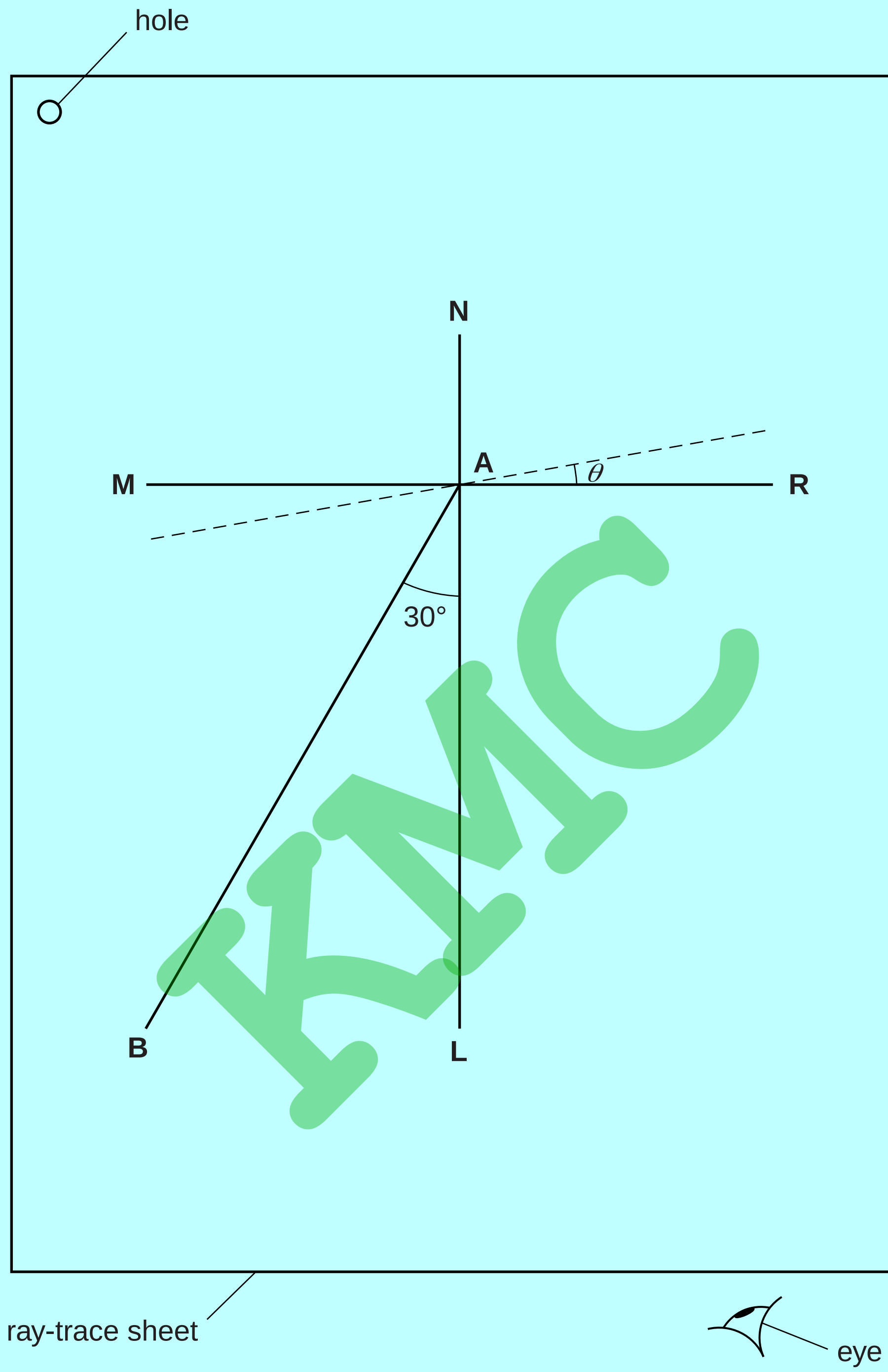

Fig. 4.1

(a) Draw a line 10 cm long near the middle of the blank ray-trace sheet supplied. Label the line **MR**. Draw a normal to this line that passes through its centre. Label the normal **NL**. Label the point at which **NL** crosses **MR** with the letter **A**.

(b) Draw a line 8 cm long from **A** at an angle of incidence $i = 30°$ to the normal, below **MR** and to the left of the normal. Label the end of this line **B**.

(c) Place the reflecting face of the mirror vertically on the line **MR**.

(d) Place two pins P_1 and P_2 on line **AB** a suitable distance apart.

(e) View the images of pins P_1 and P_2 from the direction indicated by the eye in Fig. 4.1. Place two pins P_3 and P_4, some distance apart, so that pins P_3 and P_4, and the images of P_1 and P_2, all appear exactly one behind the other. Label the positions of P_3 and P_4.

(f) Remove pins P_3 and P_4 and the mirror. Draw the line joining the positions of P_3 and P_4. Extend the line until it meets **NL**.

(g) Measure, and record in Table 4.1, the angle α between **NL** and the line joining the positions of P_3 and P_4. At this stage the angle θ between the mirror and line **MR** is 0°, as shown in the table.

(h) Remove pins P_1 and P_2. Draw lines at angles θ = 10°, 20° and 30° to **MR**, one of which is shown in Fig. 4.1. Repeat steps **(d)** to **(g)**, placing the mirror on each of the new lines in turn, so that you obtain four sets of readings.

Table 4.1

θ / °	α / °
0	
10	
20	
30	

[1]

(i) Plot a graph of α / ° (y-axis) against θ / ° (x-axis).

[4]

(j) State whether your graph line shows that the angle α is directly proportional to the angle θ. Justify your statement by reference to your graph line.

statement ....

justification ....

....
[2]

Tie your ray-trace sheet into this Booklet between pages 10 and 11. [3]

[Total: 10]

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Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

6846973442

PHYSICS **0625/53**

Paper 5 Practical Test **May/June 2015**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

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CAMBRIDGE International Examinations

[Turn over

1 In this experiment, you will determine the mass of an object using two strings.

The apparatus has been set up for you. **Do not change** the position of the rule or the distance between the stands. You are also provided with two loops of string labelled **P** and **Q**.

Carry out the following instructions, referring to Figs. 1.1 and 1.2.

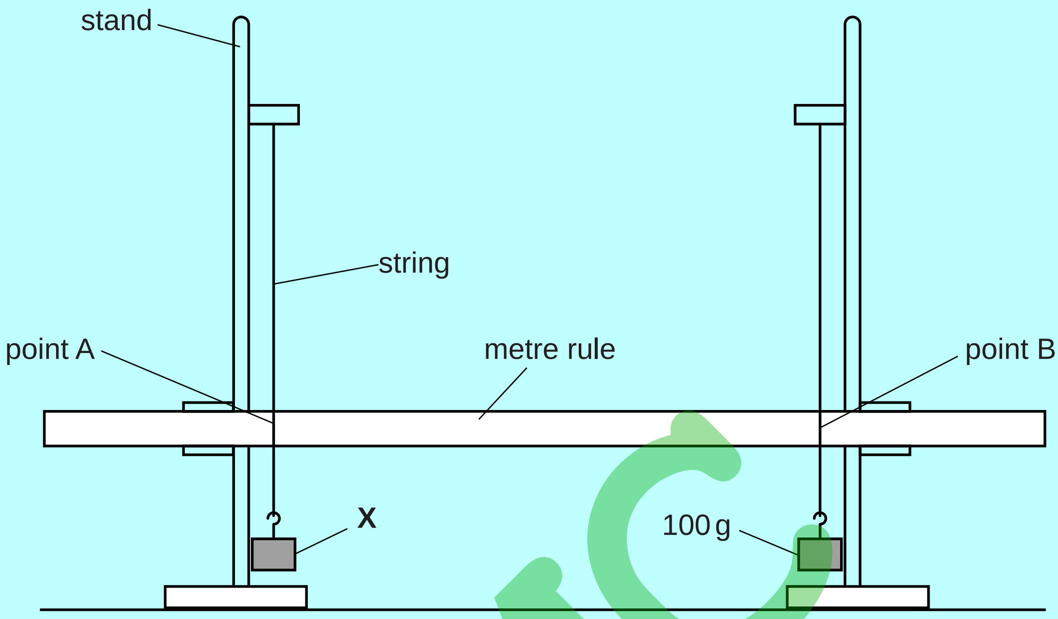

Fig. 1.1

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

a_0 = ...

(ii) Record the scale reading b_0 at point B.

b_0 = ...
[2]

(b) Carefully place loop **P** around the vertical strings so that the strings are pulled closer together as shown in Fig. 1.2. The loop must be horizontal and should be just above the rule.

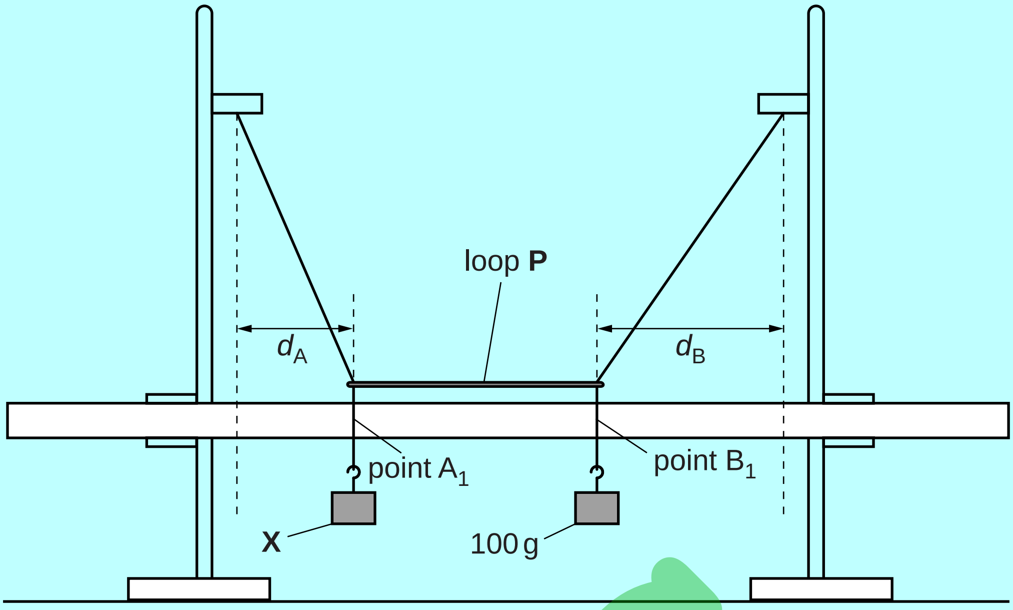

Fig. 1.2

(i) Record in Table 1.1 the scale reading a_1 at point A_1, as indicated in Fig. 1.2.

(ii) Record in Table 1.1 the scale reading b_1 at point B_1.

Table 1.1

loop	a_1 / cm	b_1 / cm	d_A / cm	d_B / cm	M / g
P					
Q					

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

(iv) Calculate and record the distance d_B. Use your results from **(a)(ii)** and from the table. d_B is the difference between b_0 and b_1.

(v) Calculate and record in the table a value for the mass M of object **X**, using your results from the table and the equation $M = \frac{k\,d_B}{d_A}$, where $k = 100\,\text{g}$.

(vi) Remove loop **P** from the vertical strings and replace it with loop **Q**.

(vii) Repeat steps **(b)(i)** to **(b)(v)** for loop **Q**.

[5]

(c) Explain how you made sure that the loops were horizontal. You may draw a diagram.

....

....

....

....[1]

(d) A student suggests that d_A and d_B might be directly proportional to each other.

Briefly describe how this experiment could be extended to investigate the suggestion.

....

....

....[2]

[Total: 10]

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2 In this experiment, you will investigate the cooling of water.

Carry out the following instructions, referring to Fig. 2.1.

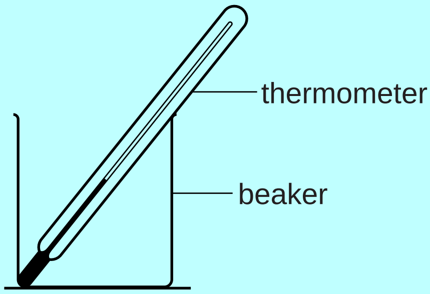

Fig. 2.1

(a) **(i)** Pour approximately 100 cm^3 of hot water into the beaker.

(ii) Read the temperature of the hot water and immediately start the stopclock.

In the first row of Table 2.1, record this temperature θ.

(iii) Record in the table, the temperature θ of the water at times t = 30 s, 60 s, 90 s, 120 s, 150 s, 180 s, 210 s, 240 s and 270 s.

Table 2.1

t / s	θ / °C
0	

[2]

(b) **(i)** Calculate the average cooling rate x_1 for the first 90 s of the experiment. Use your readings from the table and the equation $x_1 = \frac{(\theta_0 - \theta_{90})}{T}$, where T = 90 s and θ_0 and θ_{90} are the temperatures at 0 s and 90 s. Give the unit for the cooling rate.

x_1 = ...[2]

(ii) Calculate the average cooling rate x_2 in the next 90 s of the experiment. Use your readings from the table and the equation $x_2 = \frac{(\theta_{90} - \theta_{180})}{T}$, where T = 90 s and θ_{90} and θ_{180} are the temperatures at 90 s and 180 s.

x_2 = ...[1]

(iii) Calculate the average cooling rate x_3 in the last 90 s of the experiment. Use your readings from the table and the equation $x_3 = \frac{(\theta_{180} - \theta_{270})}{T}$, where T = 90 s and θ_{180} and θ_{270} are the temperatures at 180 s and 270 s.

x_3 = ...[1]

(c) Use your results from **(b)** to predict the average cooling rate x_4 for the next 90 s, if the experiment had been carried on for a longer time. Justify your prediction by reference to your results.

prediction for x_4 = ...

justification ....

....

....
[2]

(d) State **one** precaution which you took to ensure that the temperature readings were as reliable as possible.

....

....[1]

(e) A student wishes to find out if a similar pattern of results might be obtained under different conditions.

State a variable which he could change in your experiment to explore this.

....[1]

[Total: 10]

3 In this experiment, you will determine the resistance per unit length of a wire.

The circuit has been set up for you as shown in Fig. 3.1.

Carry out the following instructions, referring to Fig. 3.1.

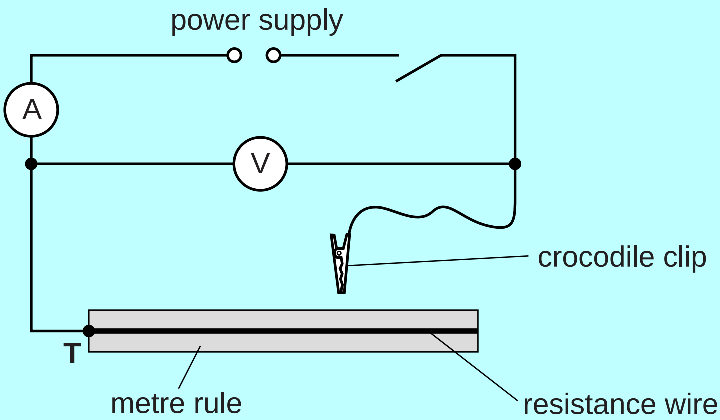

Fig. 3.1

(a) **(i)** Connect the crocodile clip to a length l of the resistance wire where l = 0.900 m measured from the end **T**.

Switch on. Measure, and record in Table 3.1, the potential difference V and the current I. Switch off.

(ii) Repeat **(a)(i)** for l = 0.800 m, 0.700 m, 0.600 m and 0.500 m.

Table 3.1

l/m	V/V	I/A	R/Ω
0.900			
0.800			
0.700			
0.600			
0.500			

[2]

(b) Calculate, and record in the table, the resistance R of each length of the wire, using the equation $R = \frac{V}{I}$. [1]

(c) Plot a graph of R/Ω (y-axis) against l/m (x-axis).

[4]

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

G = ...[1]

(ii) For this experiment and wire, the resistance per unit length r of the wire is numerically equal to G.

Give a value for r, to a suitable number of significant figures for this experiment. Include the unit.

r = ...[2]

[Total: 10]

4 In this experiment, you will determine the focal length of a converging lens by two methods.

Carry out the following instructions, referring to Figs. 4.1 and 4.2.

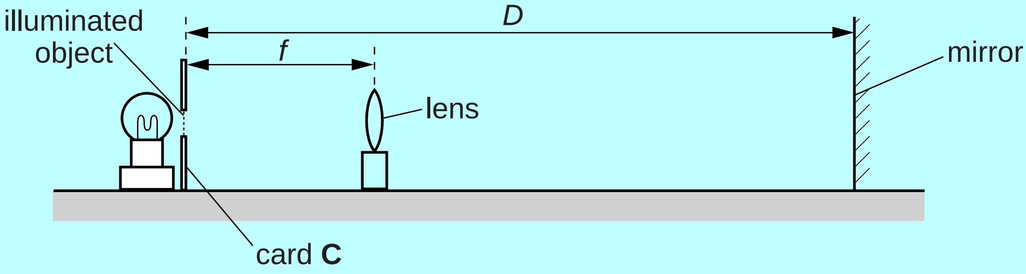

Fig. 4.1

(a) **(i)** Arrange the illuminated object, lens and mirror as shown in Fig. 4.1. Set the distance D between the mirror and the illuminated object to 20 cm.

(ii) Move the lens until a sharp image appears on the front of the card **C** by the side of the illuminated object.

(iii) Measure, and record in Table 4.1, the distance f between the lens and the illuminated object. f is a value for the focal length of the lens in this experiment.

Table 4.1

D / cm	f / cm
20	
40	

[1]

(b) **(i)** Repeat steps **(a)(i)** to **(a)(iii)** for a distance D = 40 cm.

(ii) Use your results from the table to calculate F_1, an average value for f.

F_1 = ...[1]

(c) **(i)** Set up the lens, illuminated object and screen as shown in Fig. 4.2.

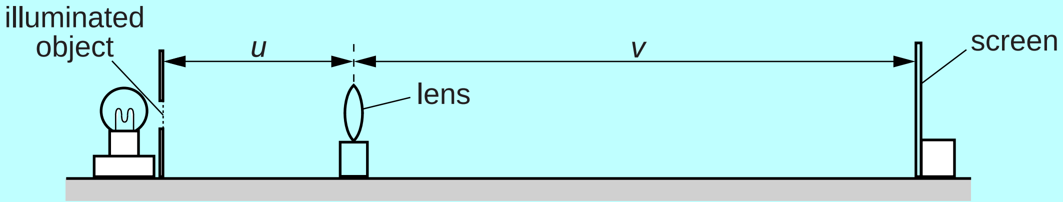

Fig. 4.2

(ii) Set the distance u between the illuminated object and the lens to 20.0 cm.

(iii) Move the screen until a sharp image of the illuminated object appears on the screen.

(iv) Measure, and record in Table 4.2, the distance v between the lens and the screen.

Table 4.2

u / cm	v / cm	f / cm
20.0		
30.0		

[3]

(v) Repeat steps **(c)(ii)** to **(c)(iv)** for a value of u = 30.0 cm.

(vi) For each value of u, calculate and record in the table the focal length f, using your results from the table and the equation $f = \dfrac{uv}{(u + v)}$.

(d) **(i)** Use your results from Table 4.2 to calculate F_2, a second average value for f.

F_2 = ...[1]

(ii) A student suggests that F_1 and F_2 should be equal.

State whether your findings support this suggestion. Justify your statement by reference to your results.

statement ....

justification ....

....
[2]

(e) Describe two precautions you took in order to obtain reliable results in this experiment.

1. ....

....

2. ....

....

[2]

[Total: 10]

Cambridge IGCSE

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Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2016**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

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DC (NF/SW) 107596/4

CAMBRIDGE International Examinations

1 In this experiment, you will determine the weight of a metre rule using a balancing method.

Carry out the following instructions, referring to Fig. 1.1.

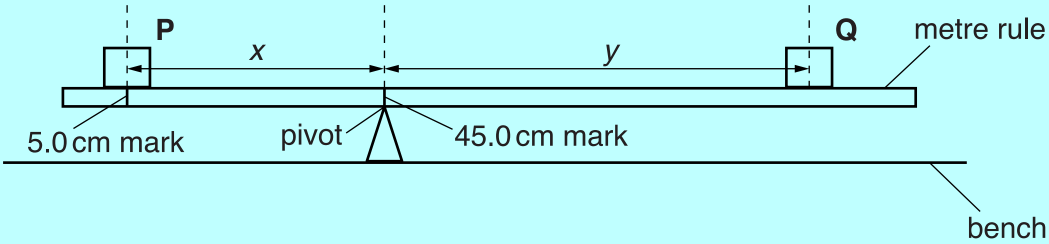

Fig. 1.1

(a)
- Place load **P** on the metre rule at the 5.0 cm mark. Place the metre rule on the pivot at the 45.0 cm mark. Place load **Q** on the rule and adjust its position so that the metre rule is as near as possible to being balanced.
- Record, in Table 1.1, the distance x between the centre of load **P** and the pivot.
- Measure, and record in the table, the distance y from the centre of load **Q** to the pivot.
- Calculate $A = Px$, where $P = 1.00$ N. Record the value in the table. P is the weight of load **P**.
- Calculate $B = Qy$, where $Q = 0.80$ N. Record the value in the table. Q is the weight of load **Q**.
- Repeat the steps above, placing the load **P** at the 10.0 cm mark, 15.0 cm mark, 20.0 cm mark and 25.0 cm mark. **Keep the pivot at the 45.0 cm mark each time.** Record all the readings and values of A and B in the table.

Table 1.1

x / cm	y / cm	A / N cm	B / N cm

[3]

(b) Plot a graph of A / N cm (y-axis) against B / N cm (x-axis). Start both axes at the origin (0,0).

[4]

(c) Use the graph to determine the vertical intercept Y, the value of A when B = 0 N cm. Show clearly on the graph how you obtained this value.

Y = ... [1]

(d) Calculate the weight W of the metre rule using the equation $W = \frac{Y}{z}$, where z = 5.0 cm.

W = ... [1]

(e) Suggest one practical reason why it is difficult to obtain exact results with this experiment.

....

.... [1]

(f) Use the balance provided to measure the mass of the metre rule.

mass = ... [1]

[Total: 11]

2 In this experiment, you will investigate the resistance of a lamp filament.

Carry out the following instructions, referring to Fig. 2.1. The circuit is set up for you.

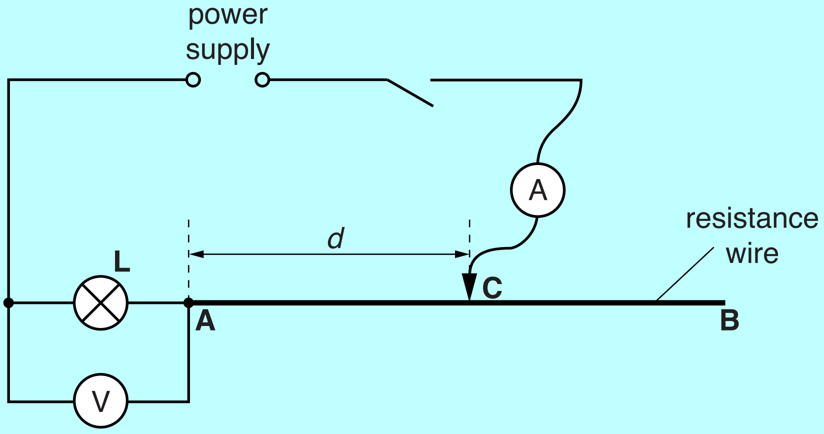

Fig. 2.1

(a)
- Switch on. Place the sliding contact **C** on the resistance wire at a distance d = 0.200 m from point **A**.
- Measure and record in Table 2.1 the current I in the circuit and the p.d. V across the lamp **L**. Switch off.
- Calculate the resistance R of the lamp filament, using the equation $R = \frac{V}{I}$.
- Repeat the procedure using values for d of 0.400 m, 0.600 m and 0.800 m.
- Complete the column headings in the table.

Table 2.1

d /	V /	I /	R /
0.200			
0.400			
0.600			
0.800			

[4]

(b) A student suggests that the resistance *R* of the lamp filament should be constant.

State and explain whether your results show that *R* is constant within the limits of experimental accuracy.

statement ....

explanation ....

....

.... [2]

(c) Suggest, referring to a practical observation, a reason why the resistance *R* may not be constant in this experiment.

....

....

.... [2]

(d) **(i)** Name an electrical component that could be used, in place of the resistance wire **AB** and sliding contact, to vary the current I.

.... [1]

(ii) Draw a diagram of the circuit including this component in place of the resistance wire and sliding contact.

[2]

[Total: 11]

3 In this experiment, you will determine the focal length of a lens by two different methods.

Method 1

(a) Set up the apparatus as shown in Fig. 3.1.

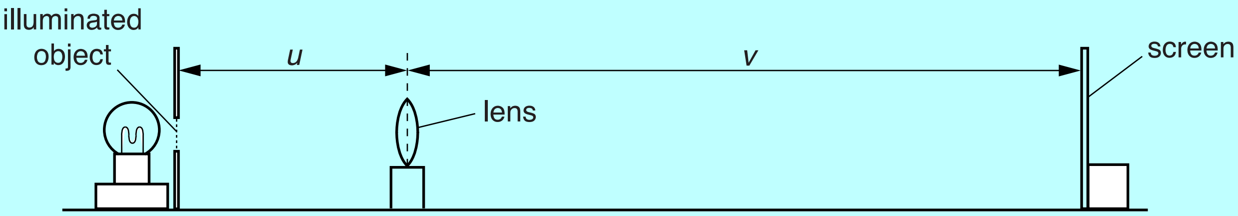

Fig. 3.1

(i)
- Place the lens at a distance $u = 50.0\,\text{cm}$ from the illuminated object.
- Move the screen until a sharply focused image of the object is seen on the screen.
- Measure and record the distance v from the screen to the centre of the lens.

v = ... cm [1]

(ii) Calculate a value f_1 for the focal length of the lens, using the equation $f_1 = \dfrac{uv}{(u+v)}$.

f_1 = ... [1]

(b) (i)
- Place the lens at a distance $u = 60.0\,\text{cm}$ from the illuminated object. Move the screen until a sharply focused image of the object is seen on the screen.
- Measure and record the distance v from the screen to the centre of the lens.

v = ... cm [1]

(ii) Calculate a value f_2 for the focal length of the lens using the equation $f_2 = \dfrac{uv}{(u+v)}$.

f_2 = ... [1]

(c) Calculate the average value f_A for the focal length of the lens. Show your working.

f_A = ... [1]

Method 2

(d) • Remove the screen.

• Place the lens about 25 cm from the object.

• Place the mirror close to the lens, as shown in Fig. 3.2.

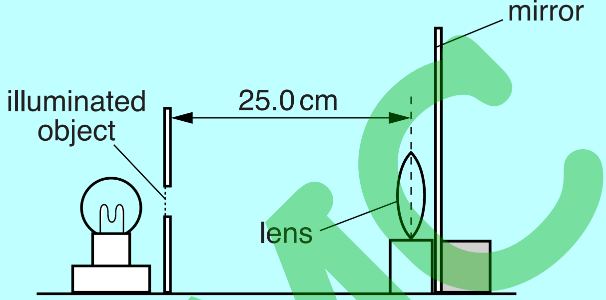

Fig. 3.2

• Move the lens slowly towards the object until a sharply focused image is obtained close to the object, as shown in Fig. 3.3.

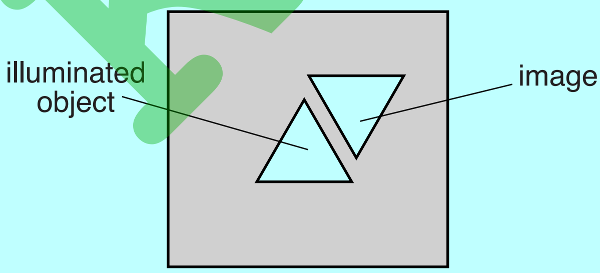

Fig. 3.3

• Measure the distance f_3 between the lens and the object. This is the focal length of the lens.

f_3 = ... [2]

(e) **(i)**
- Remove the mirror.
- Place the lens a distance $x = 2f_3$ from the illuminated object. Record the value of x.

$x =$ ....

- Place the screen the same distance $x = 2f_3$ from the centre of the lens. The lens must be between the illuminated object and the screen.
- Carefully adjust the position of the screen until a sharply focused image of the object is seen on the screen.
- Measure the distance y between the centre of the lens and the screen.

$y =$ ....
[1]

(ii) Calculate the difference $x - y$.

$x - y =$ .... [1]

(f) State two precautions that should be taken in this experiment to obtain reliable results.

1. ....

....

2. ....

....
[2]

[Total: 11]

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4 A student is investigating the effect of insulation on the rate of cooling of hot water in a $250\,cm^3$ container.

The student can choose from the following apparatus:

thermometer
$250\,cm^3$ glass beaker
$250\,cm^3$ plastic beaker
$250\,cm^3$ copper can
$250\,cm^3$ measuring cylinder
three different insulating materials
clamp, boss and stand
stopwatch.

Plan an experiment to investigate the effectiveness of the three insulating materials. You are **not** required to carry out this investigation.

You should

- explain briefly how you would carry out the investigation,
- state the key variables that you would control,
- draw a table or tables, with column headings, to show how you would display your readings. You are not required to enter any readings in the table,
- explain how you would use your readings to reach a conclusion.

A diagram is not required but you may draw a diagram if it helps your explanation.

....

....

[7]

[Total: 7]

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CENTRE NUMBER		CANDIDATE NUMBER	

PHYSICS **0625/52**

Paper 5 Practical Test **May/June 2016**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

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CAMBRIDGE International Examinations

[Turn over

1 In this experiment, you will investigate the stretching of a spring.

Carry out the following instructions, referring to Fig. 1.1.

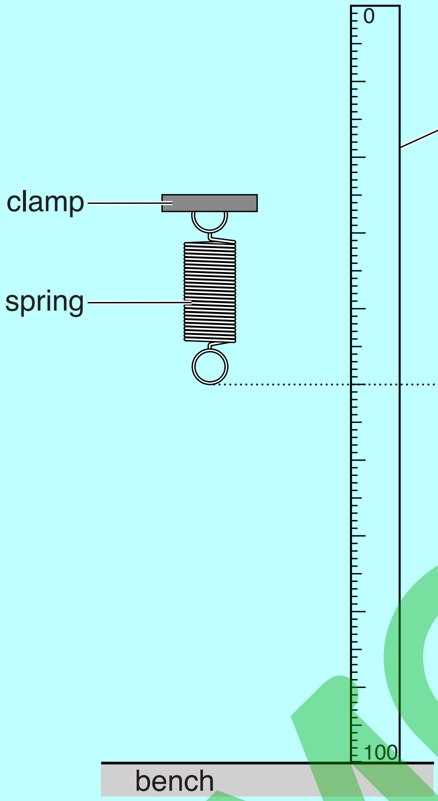

Fig. 1.1

(a)
- Record the scale reading S_0 on the metre rule at the level of the bottom of the spring, as shown in Fig. 1.1.

  S_0 = ... mm

- Hang a load L of 1.0 N on the spring. Record, in Table 1.1, the scale reading S on the metre rule at the level of the bottom of the spring.

- Calculate the extension e of the spring using the equation $e = (S - S_0)$. Record the value of e in the table.

- Repeat the procedure using loads L of 2.0 N, 3.0 N, 4.0 N and 5.0 N. Record all the readings and results in the table.

Table 1.1

L / N	S / mm	e / mm
0.0		0
1.0		
2.0		
3.0		
4.0		
5.0		

[3]

(b) Explain briefly one precaution that you took in order to obtain reliable readings.

....

....[1]

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

[4]

(d) • Remove the loads from the spring. Hang the load **X** on the spring.

• Record the scale reading S_X on the metre rule at the level of the bottom of the spring.

S_X = ... mm

• Calculate the extension e of the spring using the equation $e = (S_X - S_0)$.

e = ... mm

• Use the graph to determine the weight W of the load **X**. Show clearly on the graph how you obtained the necessary information.

W = ...
[3]

[Total: 11]

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2 In this experiment, you will investigate the cooling of water.

Carry out the following instructions, referring to Fig. 2.1.

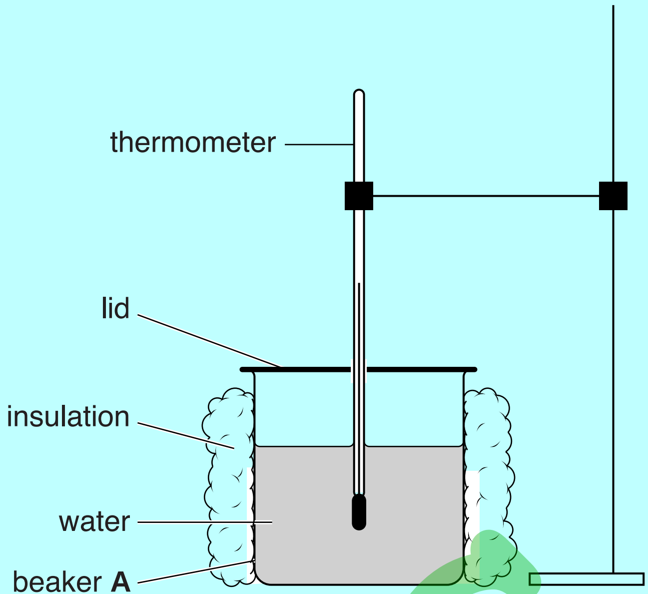

Fig. 2.1

(a)
- Pour 200 cm^3 of hot water into beaker **A**. Place the thermometer in beaker **A**, as shown in Fig. 2.1, with the lid covering the top of the beaker. This beaker is insulated and has a lid.
- Measure the temperature θ of the hot water in beaker **A**. Record this temperature in Table 2.1 at time t = 0 s.
- Immediately start the stopclock.
- After 30 s, measure the temperature θ shown on the thermometer. Record the temperature in the table.
- Continue recording the temperature every 30 s until you have six sets of readings.
- Repeat the procedure using beaker **B**. This beaker is insulated but has no lid.
- Repeat the procedure using beaker **C**. This beaker has a lid but no insulation.

Table 2.1

	beaker **A** insulation and lid	beaker **B** insulation, no lid	beaker **C** lid, no insulation
t / s	θ /	θ /	θ /
0			
30			
60			
90			
120			
150			

[4]

(b) Complete the column headings in the table. [1]

(c) (i) Tick the statement that best describes the results of your experiment.

☐ Removing the lid speeds up the cooling significantly more than removing the insulation.

☐ Removing the insulation speeds up the cooling significantly more than removing the lid.

☐ There is no significant difference between removing the lid and removing the insulation.

[1]

(ii) Justify your answer by reference to your readings.

....

....

....[1]

(d) State two of the conditions that should be kept the same in this experiment in order for the comparison to be fair.

1. ....

....

2. ....

....

[2]

(e) Describe briefly how a measuring cylinder is read to obtain a reliable value for the volume of water. You may draw a diagram.

....

....

....

....[2]

[Total: 11]

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3 In this experiment, you will investigate the magnification of images produced by a lens.

Carry out the following instructions, referring to Fig. 3.1.

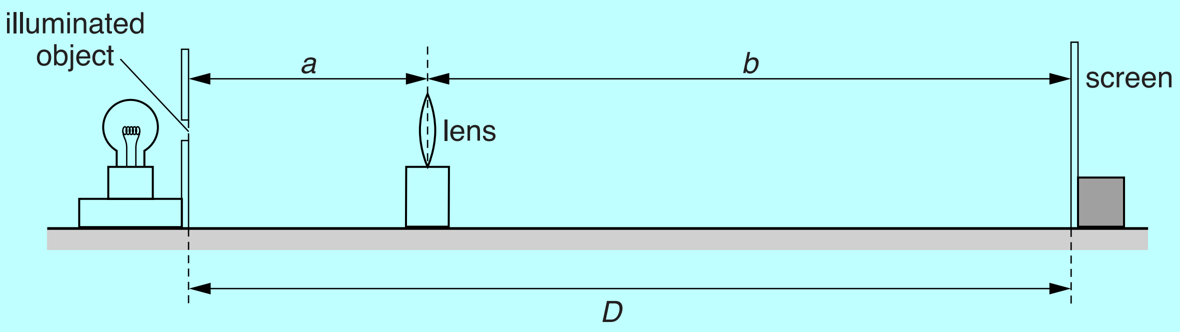

Fig. 3.1

Place the screen at a distance D = 80.0 cm from the illuminated object. **The screen and the illuminated object must remain in the same positions throughout the experiment.**

(a) (i)
- Place the lens close to the illuminated object.
- Move the lens until a sharply focused, **enlarged** image of the object is seen on the screen.
- Measure and record the distance a from the illuminated object to the centre of the lens.

a = ... cm

- Measure and record the distance b from the centre of the lens to the screen.

b = ... cm
[2]

(ii) Calculate the magnification m_1 of the image, using the equation $m_1 = \frac{b}{a}$.

m_1 = ... [1]

(iii) Measure and record the height h_1 from the top to the bottom of the image on the screen.

h_1 = ... cm [1]

(b) **(i)** Move the lens towards the screen until a **smaller**, sharply focused image of the object is seen on the screen.

- Measure and record the distance x from the illuminated object to the centre of the lens.

x = ...cm

- Measure and record the distance y from the centre of the lens to the screen.

y = ... cm
[1]

(ii) • Calculate the magnification m_2 of the image, using the equation $m_2 = \frac{y}{x}$.

m_2 = ...

- Measure and record the height h_2 from the top to the bottom of the image on the screen.

h_2 = ...cm
[2]

(c) A student suggests that $m_1 \times m_2$ should equal 1.

State whether your results support this suggestion. Justify your answer by reference to your results.

statement ....

justification ....

....
[2]

(d) State two precautions that you would take in this experiment to obtain reliable results.

1. ....

....

2. ....

....
[2]

[Total: 11]

4 A student is investigating how the resistance of a wire depends on the length of the wire. The student aims to plot a graph.

The following apparatus is available to the student:

ammeter
voltmeter
power supply
variable resistor
switch
connecting leads
resistance wires of different lengths
metre rule.

Plan an experiment to investigate how the resistance of a wire depends on the length of the wire. You are **not** required to carry out this investigation.

You should

- draw a diagram of the circuit you could use to determine the resistance of each wire
- explain briefly how you would carry out the investigation
- suggest suitable lengths of wire
- state the key variables that you would control
- draw a table, or tables, with column headings to show how you would display your readings. You are not required to enter any readings in the table.

....[7]

[Total: 7]

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CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

5573062538

PHYSICS **0625/53**

Paper 5 Practical Test **May/June 2016**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
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Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

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CAMBRIDGE International Examinations

[Turn over

1 In this experiment, you will investigate the stretching of a spring.

Carry out the following instructions, referring to Fig. 1.1.

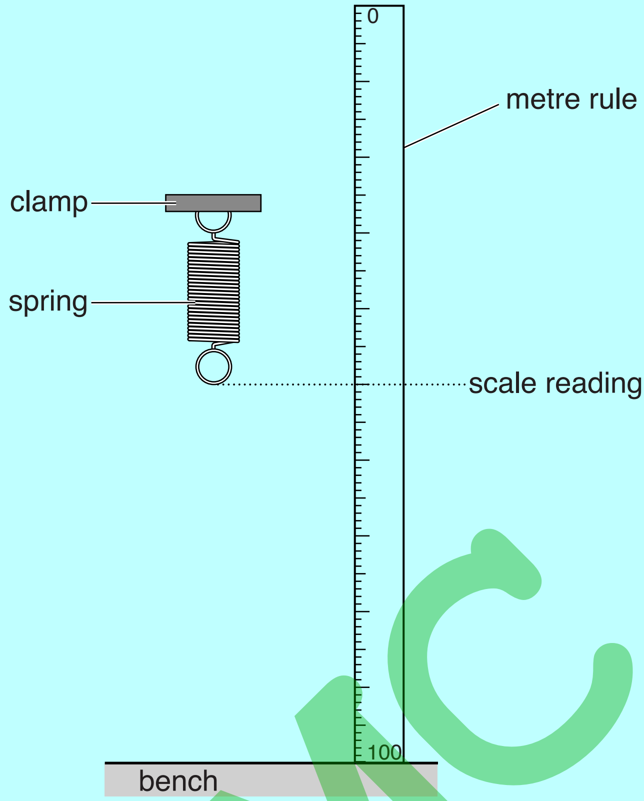


Fig. 1.1

(a)
- Record the scale reading S_0 on the metre rule at the level of the bottom of the spring, as shown in Fig. 1.1.

  S_0 = ... mm

- Hang a load L of 1.0 N on the spring. Record, in Table 1.1, the scale reading S on the metre rule at the level of the bottom of the spring.
- Calculate the extension e of the spring using the equation $e = (S – S_0)$. Record the value of e in the table.
- Repeat the procedure using loads L of 2.0 N, 3.0 N, 4.0 N and 5.0 N. Record all the readings and results in the table.

Table 1.1

L / N	*S* / mm	*e* / mm
0.0		0
1.0		
2.0		
3.0		
4.0		
5.0		

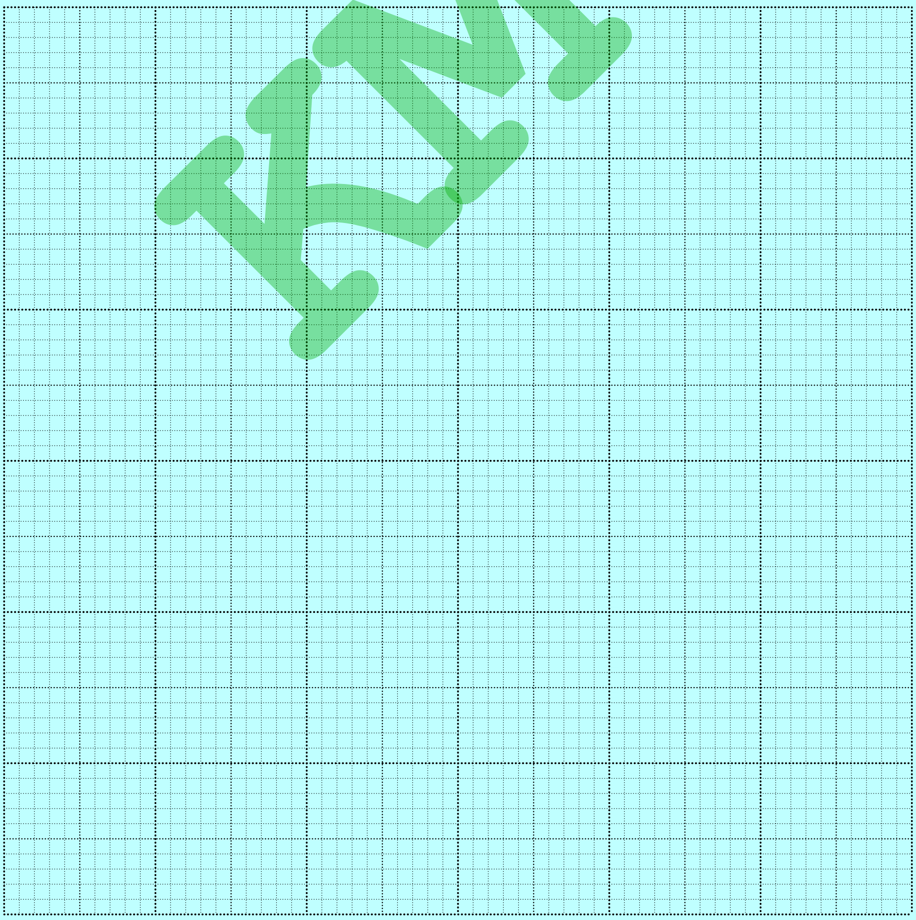
[3]

(b) Explain briefly one precaution that you took in order to obtain reliable readings.

....

....[1]

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



[4]

(d)
- Remove the loads from the spring. Hang the load **X** on the spring.
- Record the scale reading S_X on the metre rule at the level of the bottom of the spring.

S_X = ... mm

- Calculate the extension e of the spring using the equation $e = (S_X - S_0)$.

e = ... mm

- Use the graph to determine the weight W of the load **X**. Show clearly on the graph how you obtained the necessary information.

W = ...

[3]

[Total: 11]

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2 In this experiment, you will investigate the cooling of water.

Carry out the following instructions, referring to Fig. 2.1.

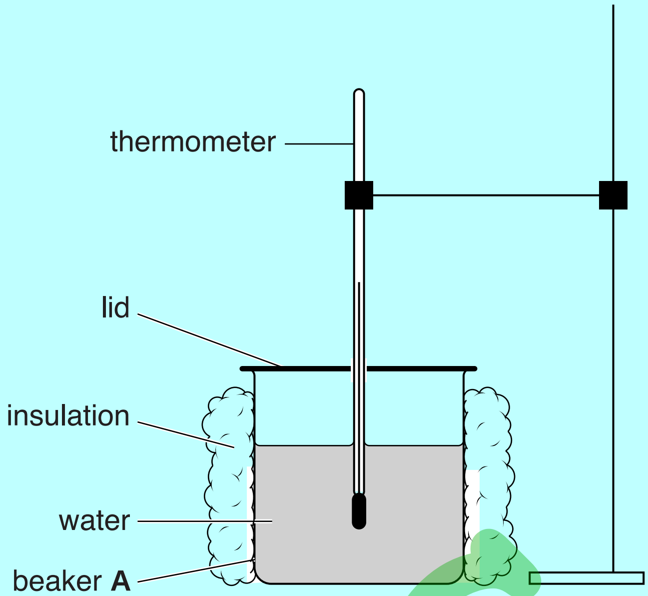

Fig. 2.1

(a)
- Pour 200 cm^3 of hot water into beaker **A**. Place the thermometer in beaker **A**, as shown in Fig. 2.1, with the lid covering the top of the beaker. This beaker is insulated and has a lid.
- Measure the temperature θ of the hot water in beaker **A**. Record this temperature in Table 2.1 at time t = 0 s.
- Immediately start the stopclock.
- After 30 s, measure the temperature θ shown on the thermometer. Record the temperature in the table.
- Continue recording the temperature every 30 s until you have six sets of readings.
- Repeat the procedure using beaker **B**. This beaker is insulated but has no lid.
- Repeat the procedure using beaker **C**. This beaker has a lid but no insulation.

Table 2.1

	beaker **A** insulation and lid	beaker **B** insulation, no lid	beaker **C** lid, no insulation
t / s	θ /	θ /	θ /
0			
30			
60			
90			
120			
150			

[4]

(b) Complete the column headings in the table. [1]

(c) **(i)** Tick the statement that best describes the results of your experiment.

☐ Removing the lid speeds up the cooling significantly more than removing the insulation.

☐ Removing the insulation speeds up the cooling significantly more than removing the lid.

☐ There is no significant difference between removing the lid and removing the insulation.

[1]

(ii) Justify your answer by reference to your readings.

....

....

....[1]

(d) State two of the conditions that should be kept the same in this experiment in order for the comparison to be fair.

1. ....

....

2. ....

....

[2]

(e) Describe briefly how a measuring cylinder is read to obtain a reliable value for the volume of water. You may draw a diagram.

....

....

....

....[2]

[Total: 11]

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3 In this experiment, you will investigate the magnification of images produced by a lens.

Carry out the following instructions, referring to Fig. 3.1.

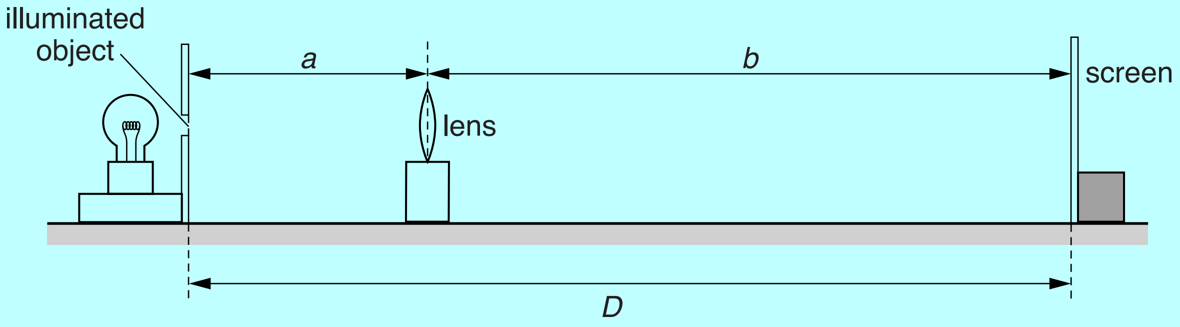

Fig. 3.1

Place the screen at a distance D = 80.0 cm from the illuminated object. **The screen and the illuminated object must remain in the same positions throughout the experiment.**

(a) (i)
- Place the lens close to the illuminated object.
- Move the lens until a sharply focused, **enlarged** image of the object is seen on the screen.
- Measure and record the distance a from the illuminated object to the centre of the lens.

a = ... cm

- Measure and record the distance b from the centre of the lens to the screen.

b = ... cm [2]

(ii) Calculate the magnification m_1 of the image, using the equation $m_1 = \frac{b}{a}$.

m_1 = ... [1]

(iii) Measure and record the height h_1 from the top to the bottom of the image on the screen.

h_1 = ... cm [1]

(b) **(i)** Move the lens towards the screen until a **smaller**, sharply focused image of the object is seen on the screen.

- Measure and record the distance x from the illuminated object to the centre of the lens.

x = ...cm

- Measure and record the distance y from the centre of the lens to the screen.

y = ... cm
[1]

(ii) • Calculate the magnification m_2 of the image, using the equation $m_2 = \frac{y}{x}$.

m_2 = ...

- Measure and record the height h_2 from the top to the bottom of the image on the screen.

h_2 = ...cm
[2]

(c) A student suggests that $m_1 \times m_2$ should equal 1.

State whether your results support this suggestion. Justify your answer by reference to your results.

statement ....

justification ....

....
[2]

(d) State two precautions that you would take in this experiment to obtain reliable results.

1. ....

....

2. ....

....
[2]

[Total: 11]

4 A student is investigating how the resistance of a wire depends on the length of the wire. The student aims to plot a graph.

The following apparatus is available to the student:

ammeter
voltmeter
power supply
variable resistor
switch
connecting leads
resistance wires of different lengths
metre rule.

Plan an experiment to investigate how the resistance of a wire depends on the length of the wire. You are **not** required to carry out this investigation.

You should

- draw a diagram of the circuit you could use to determine the resistance of each wire
- explain briefly how you would carry out the investigation
- suggest suitable lengths of wire
- state the key variables that you would control
- draw a table, or tables, with column headings to show how you would display your readings. You are not required to enter any readings in the table.

[7]

[Total: 7]

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Cambridge IGCSE

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CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

9788788264

PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2017**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

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DC (ST/FC) 126913/6

CAMBRIDGE International Examinations

[Turn over

1 In this experiment, you will investigate the stretching of a spring.

Carry out the following instructions, referring to Fig. 1.1.

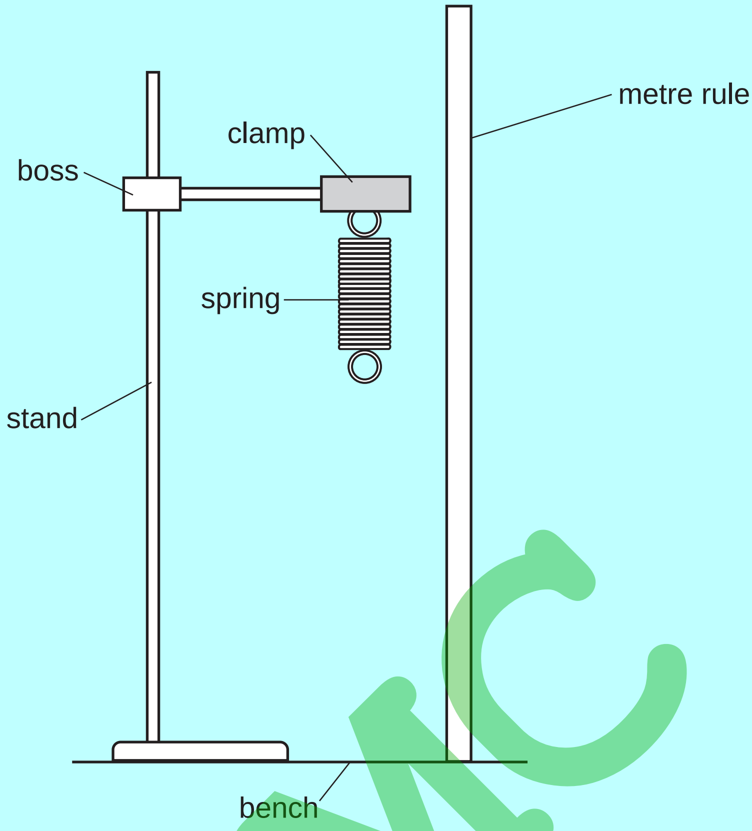

Fig. 1.1 (not to scale)

(a) • Do **not** remove the spring from the clamp. Use the metre rule to measure the length l_0 of the coiled part of the spring.
Record l_0, in Table 1.1 at load L = 0.0 N.

• On Fig. 1.1, show clearly the length l_0. [1]

(b) • Place a load L = 1.0 N on the spring. Record, in Table 1.1, the length l of the coiled part of the spring.

• Repeat this procedure using loads L = 2.0 N, 3.0 N, 4.0 N and 5.0 N.

Table 1.1

L / N	0.0	1.0	2.0	3.0	4.0	5.0
l / mm						

[2]

(c) Describe **one** precaution that you took in order to obtain reliable readings.

....

....

....[1]

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

[4]

(e) A student suggests that the length l of the spring is directly proportional to the load L.

State whether your readings support this suggestion. Justify your answer by reference to the graph line.

....

....

....[1]

(f) Use your results to predict the load L that would give a length l twice the value of l_0. Show clearly how you obtained your answer.

load L = ...[2]

[Total: 11]

2 In this experiment, you will investigate the cooling of water.

(a) Use the thermometer to measure room temperature θ_R.

θ_R = ...[1]

(b)
- Pour 200 cm^3 of hot water into the beaker. Place the thermometer in the beaker.
- Measure the temperature θ of the hot water in the beaker. Record this temperature in Table 2.1 at time t = 0 s.
- Immediately start the stopclock.
- After 180 s, measure the temperature θ shown on the thermometer. Record the time and temperature in the table.
- After a total of 360 s, measure the temperature θ shown on the thermometer. Record the time and temperature in the table.

Table 2.1

t / s	θ / °C
0	

[4]

(c) **(i)**
- Calculate the temperature fall $\Delta\theta_1$ during the first 180 s.

$\Delta\theta_1$ = ...

- Calculate the temperature fall $\Delta\theta_2$ during the next 180 s.

$\Delta\theta_2$ = ...

[1]

(ii) Suggest why $\Delta\theta_1$ is different from $\Delta\theta_2$.

....

....[1]

(d) Suggest **two** changes that you could make to the procedure to obtain a larger difference between the values of $\Delta\theta_1$ and $\Delta\theta_2$.

1. ....

2. ....

[2]

(e) Fig. 2.1 shows a measuring cylinder. **A**, **B**, **C** and **D** are four possible lines of sight that could be used to read the volume of the water.

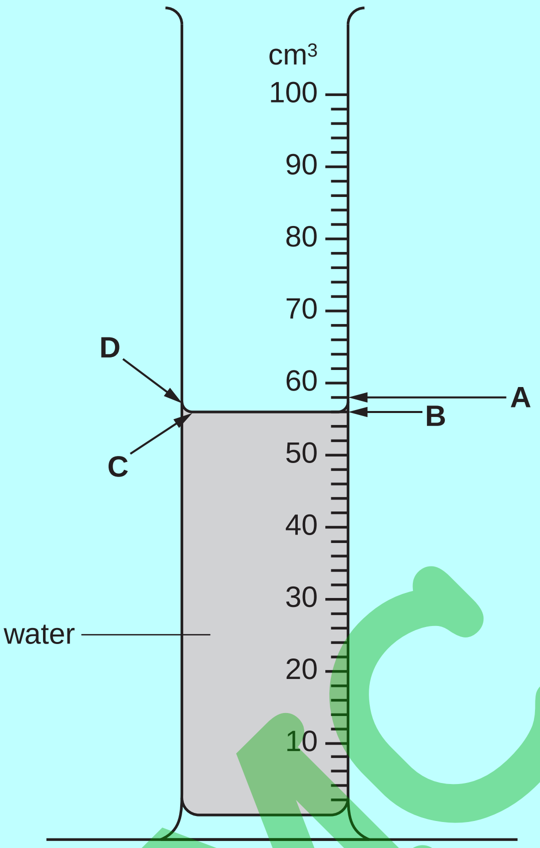

Fig. 2.1

Give **two** reasons why **B** should be used to obtain the most accurate reading.

1. ....

....

2. ....

....

[2]

[Total: 11]

3 In this experiment, you will investigate the refraction of light passing through a transparent block.

Carry out the following instructions, using the separate ray-trace sheet provided. You may refer to Fig. 3.1 for guidance.

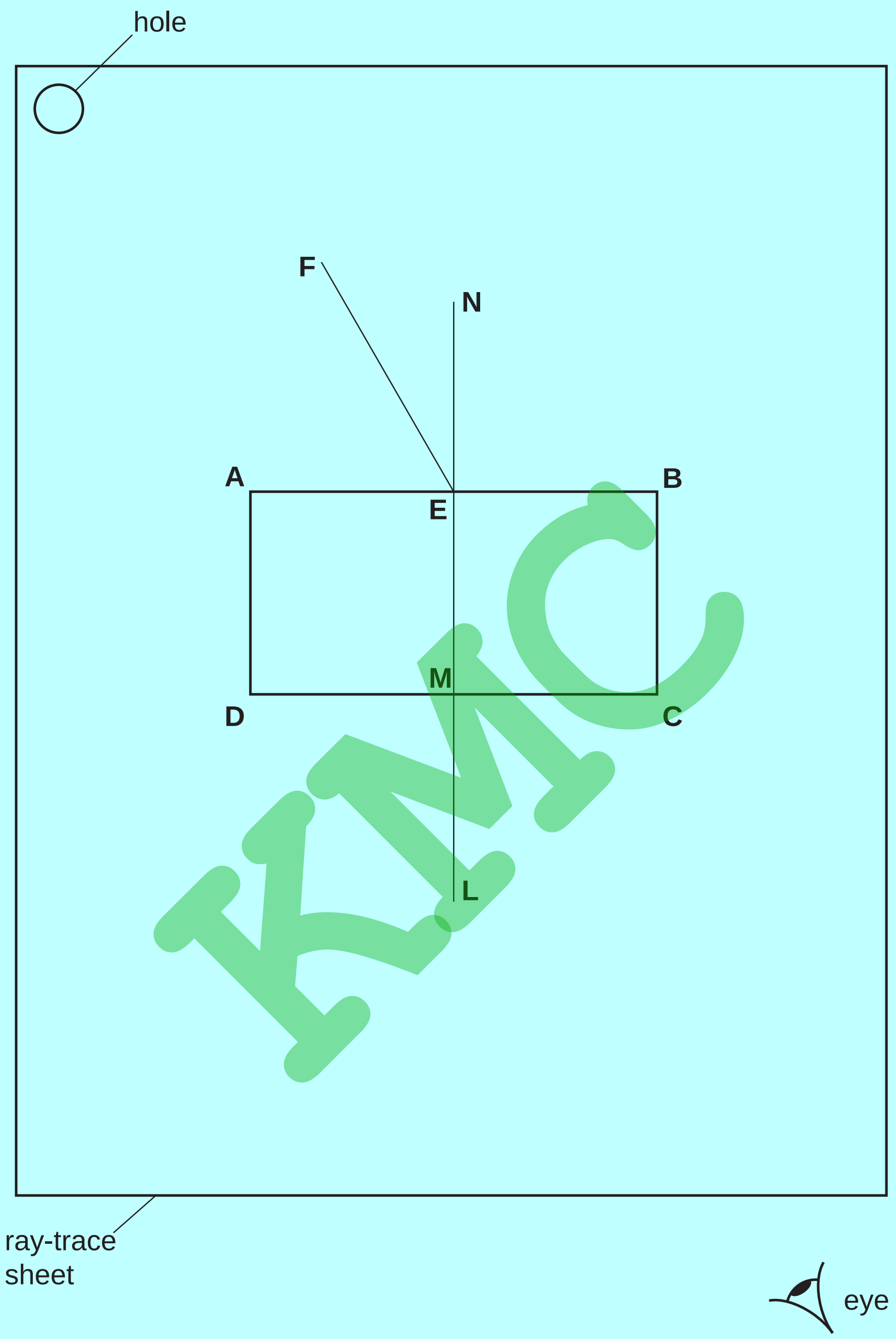

Fig. 3.1

(a) • Place the transparent block, largest face down, on the ray-trace sheet supplied. The block should be approximately in the middle of the paper. Draw the outline of the block **ABCD**.

• Remove the block and draw a normal **NL** at the centre of side **AB**. Label the point **E** where the normal crosses **AB**. Label the point **M** where the normal crosses **CD**.

- Draw a line **FE**, to the left of the normal and at an angle of incidence i = 30° to the normal, as shown in Fig. 3.1.
- Place two pins P_1 and P_2 on the line **FE** placing one pin close to point **E**. Label the positions of P_1 and P_2.
- Replace the block and observe the images of P_1 and P_2 through side **CD** of the block so that the images of P_1 and P_2 appear one behind the other. Place two pins P_3 and P_4 between your eye and the block so that P_3 and P_4, and the images of P_1 and P_2 seen through the block, appear one behind the other. Label the positions of P_3 and P_4.
- Remove the block.
- Draw a line joining the positions of P_3 and P_4. Continue the line until it meets the normal **NL** and label this point **K**. [4]

(b)
- Measure and record the angle α between the line joining the positions of P_3 and P_4 and the line **KL**.

α = ...

- Measure and record the length x between points **M** and **K**.

x = ...

[2]

(c) Repeat steps **(a)** and **(b)** with the angle of incidence i = 50°.

α = ...

x = ...

[2]

(d) A student suggests that the angle α should always be equal to the angle of incidence i.

State whether your results support this suggestion. Justify your answer by reference to the readings.

statement ....

justification ....

....

[2]

(e) Suggest **one** precaution that you should take with this experiment to obtain reliable results.

....

....

....[1]

[Total: 11]

Tie your ray-trace sheet into this Question Paper between pages 6 and 7.

4 A student is investigating whether the resistance of a wire depends on the material from which the wire is made.

Resistance R is given by the equation $R = \frac{V}{I}$.

The following apparatus is available to the student:

ammeter
voltmeter
power supply (0–3 V)
micrometer screw gauge
variable resistor
switch
connecting leads
wires made of different materials.

Plan an experiment to investigate whether the resistance of a wire depends on the material from which the wire is made. You are **not** required to carry out this investigation.

You should:

- draw a diagram of the circuit you would use to determine the resistance of each wire
- explain briefly how you would carry out the investigation, including the measurements you would take
- state the key variables that you would control
- draw a suitable table, with column headings, to show how you would display your readings (you are **not** required to enter any readings in the table).

....

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....

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....

....

....

....

....[7]

[Total: 7]

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CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

5092083713

PHYSICS **0625/52**

Paper 5 Practical Test **May/June 2017**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

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DC (CW/FD) 127040/7

CAMBRIDGE International Examinations

[Turn over

1 In this experiment, you will investigate the resistance of two resistance wires. The circuit has been set up for you.

Carry out the following instructions, referring to Fig. 1.1.

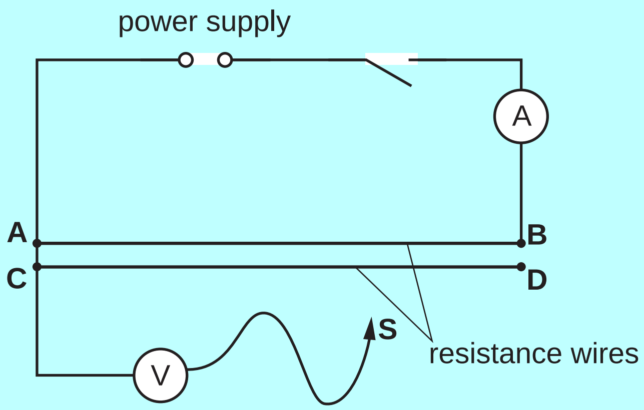

Fig. 1.1

(a) **(i)**
- Switch on. Place the sliding contact **S** on the resistance wire **AB** at a distance $l = 0.200\,\text{m}$ from point **A**.
- Measure and record in Table 1.1 the current I in the circuit and the potential difference (p.d.) V across the length $l = 0.200\,\text{m}$ of resistance wire **AB**.
- Calculate the resistance R of the length $l = 0.200\,\text{m}$ of resistance wire **AB**, using the equation $R = \frac{V}{I}$. Record R in the table.
- Repeat the procedure using the distance $l = 0.400\,\text{m}$. Switch off.
- Complete the column headings in the table.

Table 1.1

l /	V /	I /	R /
0.200			
0.400			

[4]

(ii) Calculate the difference between the two values for R.

difference = ... [1]

(b) **(i)**

- Switch on. Place the sliding contact **S** on the resistance wire **AB** at a distance $l = 0.500\,\text{m}$ from point **A**.
- Measure and record the current I_1 in the circuit and the potential difference V_1.

I_1 = ...

V_1 = ...

- Calculate the resistance R_1 of the length $l = 0.500\,\text{m}$ of resistance wire **AB**, using the equation $R_1 = \dfrac{V_1}{I_1}$.

R_1 = ... [1]

(ii) Use the short connecting lead provided to connect points **B** and **D**.

- Switch on. Place the sliding contact **S** on the resistance wire **AB** at a distance $l = 0.500\,\text{m}$ from point **A**.
- Measure and record the current I_2 in the circuit and the potential difference V_2.

I_2 = ...

V_2 = ...

Calculate the combined resistance R_2 of resistance wires **AB** and **CD**, using the equation $R_2 = \dfrac{V_2}{I_2}$.

R_2 = ... [2]

(c) Use the results in **(b)(i)** and **(b)(ii)** to compare the resistance R_1 of wire **AB** with the resistance R_2 of wires **AB** and **CD** connected together.

Tick **one** box next to the description that most closely matches your results.

☐ $R_1 = R_2$

☐ $R_1 = 2R_2$

☐ $2R_1 = R_2$

☐ There is no simple relationship between R_1 and R_2.

[1]

(d) Suggest **two** reasons why different students all carrying out this experiment carefully, with the same apparatus, may not obtain identical results.

1. ....

....

2. ....

.... [2]

[Total: 11]

2 In this experiment, you will investigate the principle of moments.

Carry out the following instructions, referring to Fig. 2.1.

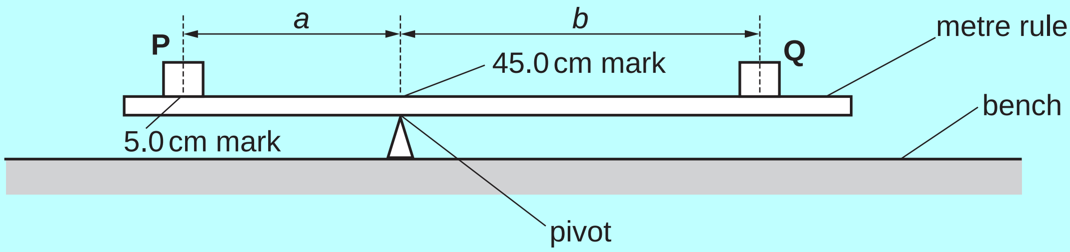

Fig. 2.1

(a) Place the load **P** on the metre rule at the 5.0 cm mark. Place the metre rule on the pivot at the 45.0 cm mark. Place load **Q** on the rule and adjust its position so that the metre rule is as near as possible to being balanced.

- Record, in Table 2.1, the distance *a* between the centre of load **P** and the pivot.
- Measure and record in the table the distance *b* from the centre of load **Q** to the pivot.
- Repeat the steps above, placing the load **P** at the 10.0 cm mark, 15.0 cm mark, 20.0 cm mark and 25.0 cm mark. Keep the pivot at the 45.0 cm mark each time. Record all the readings in the table.

Table 2.1

a / cm	*b* / cm

[2]

(b) Plot a graph of b / cm (y-axis) against a / cm (x-axis). Start both axes at the origin (0,0).

[4]

(c) A student suggests that a is directly proportional to b.

State whether your readings support this suggestion. Justify your answer by reference to the graph line.

....

....

....[1]

(d) **(i)** • Use the balance provided to measure the mass m, in grams, of the metre rule.

m = ... g

• Calculate the value of mX, where X = 0.05 N cm / g.

mX = ... N cm [1]

(ii) • Use the value of a in the first row of Table 2.1 to calculate Pa, where $P = 1.00\,\mathrm{N}$. P is the weight of load **P**. Include the unit.

Pa = ...

• Use the value of b in the first row of Table 2.1 to calculate Qb, where $Q = 0.80\,\mathrm{N}$. Q is the weight of load **Q**. Include the unit.

Qb = ...
[2]

(e) A student states that Pa should be equal to Qb.

Look carefully at Fig. 2.1 and your answers to **(d)** and suggest what the student has not realised.

....

....[1]

[Total: 11]

3 In this experiment, you will investigate the refraction of light passing through a transparent block.

Carry out the following instructions, using the separate ray-trace sheet provided. You may refer to Fig. 3.1 for guidance.

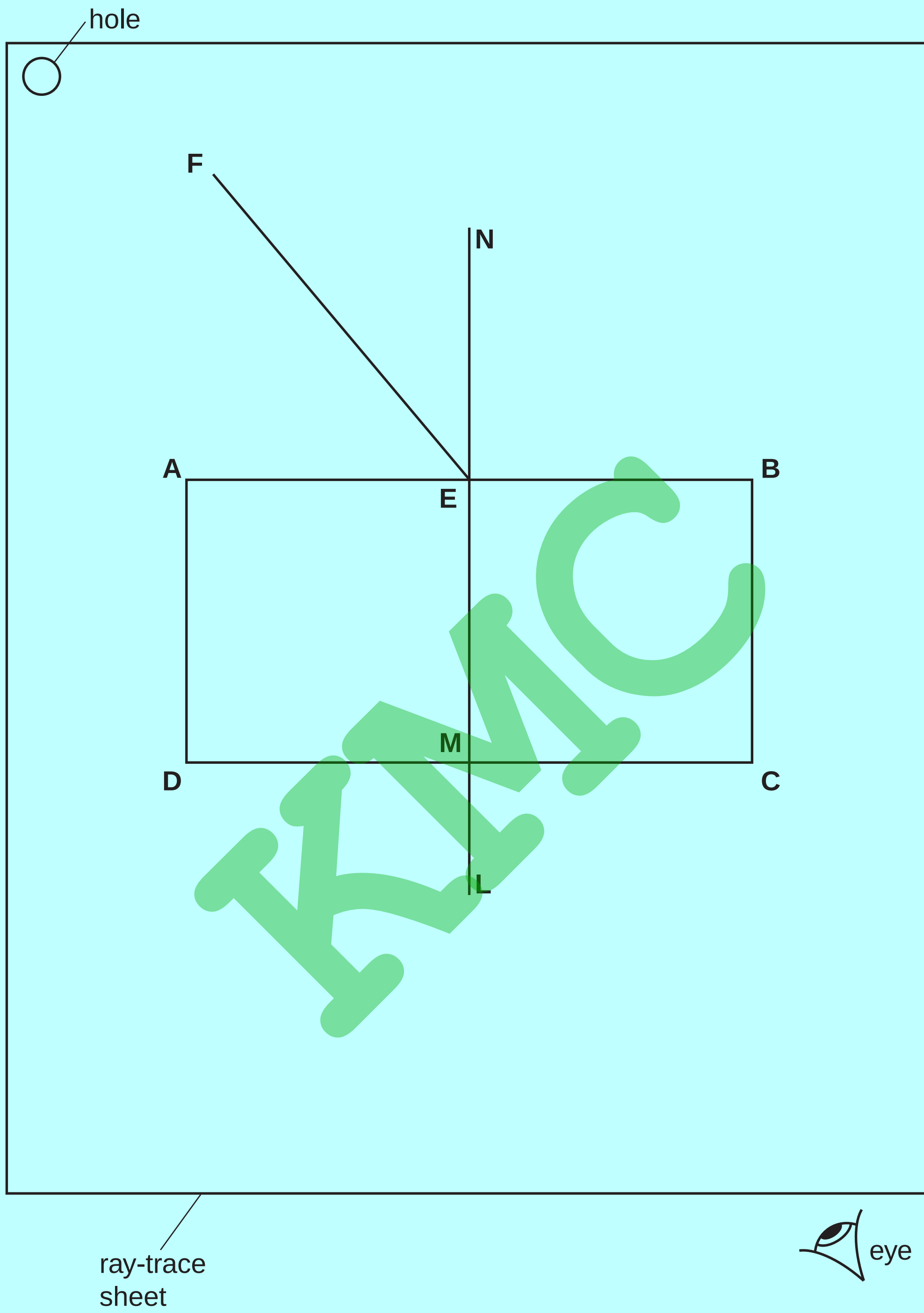

Fig. 3.1

- Place the transparent block, largest face down, on the ray-trace sheet supplied. The block should be approximately in the middle of the paper. Draw the outline of the block **ABCD**.
- Remove the block and draw a normal **NL** at the centre of side **AB**. Label the point **E** where the normal crosses **AB**. Label the point **M** where the normal crosses **CD**.

(a)
- Draw a line **FE** to the left of the normal, and at an angle of incidence $i = 40°$ to the normal, as shown in Fig. 3.1.
- Place two pins P_1 and P_2 on the line **FE**, placing one pin close to **E**. Label the positions of P_1 and P_2.
- Replace the block and observe the images of P_1 and P_2 through side **CD** of the block so that the images of P_1 and P_2 appear one behind the other. Place two pins P_3 and P_4 between your eye and the block so that P_3 and P_4, and the images of P_1 and P_2 seen through the block, appear one behind the other. Label the positions of P_3 and P_4. Remove the block.

[2]

(b)
- Draw a line joining the positions of P_3 and P_4. Continue the line until it meets the normal **NL**. Label the point **K** where this line crosses **CD**.
- Measure and record the angle α between the line joining the positions of P_3 and P_4 and the normal **NL**.

α = ...

- Measure and record the length x between points **M** and **K**.

x = ...

[3]

(c)
- Repeat the steps in **(a)** but with the line **FE** to the right of the normal.
- Draw a line joining the new positions of P_3 and P_4. Continue the line until it meets the normal **NL**. Label the point **Q** where this line crosses **CD**.
- Measure and record the angle β between the line joining the new positions of P_3 and P_4 and the normal **NL**.

β = ...

- Measure and record the length y between points **M** and **Q**.

y = ...

[3]

(d) A student suggests that the results for α and x should be the same as the results for β and y. State whether your results support this suggestion. Justify your answer by reference to the results.

statement ....

justification ....

....

[2]

(e) Suggest **one** precaution that you should take with this experiment to obtain reliable results.

....

....

....[1]

Tie your ray-trace sheet into this Question Paper between pages 8 and 9.

[Total: 11]

4 A student is investigating the effect of draughts (moving air) on the rate of cooling of hot water.

The following apparatus is available:

electric fan with four speed settings
supply of hot water
thermometer
250 cm^3 beaker
250 cm^3 measuring cylinder
stopwatch
clamp, boss and stand.

Plan an experiment to investigate the effect of draughts on the rate of cooling of hot water.
You are **not** required to carry out this investigation.

You should:

- explain briefly how you would carry out the investigation
- state the key variables that you would control
- draw a table, or tables, with column headings, to show how you would display your readings (you are **not** required to enter any readings in the table)
- explain how you would use your readings to reach a conclusion.

You may draw a diagram if it helps your explanation.

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....[7]

[Total: 7]

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CENTRE NUMBER		CANDIDATE NUMBER	

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PHYSICS **0625/53**

Paper 5 Practical Test **May/June 2017**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

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[Turn over

1 In this experiment, you will investigate the resistance of a power supply. The circuit has been set up for you.

Carry out the following instructions, referring to Fig. 1.1.

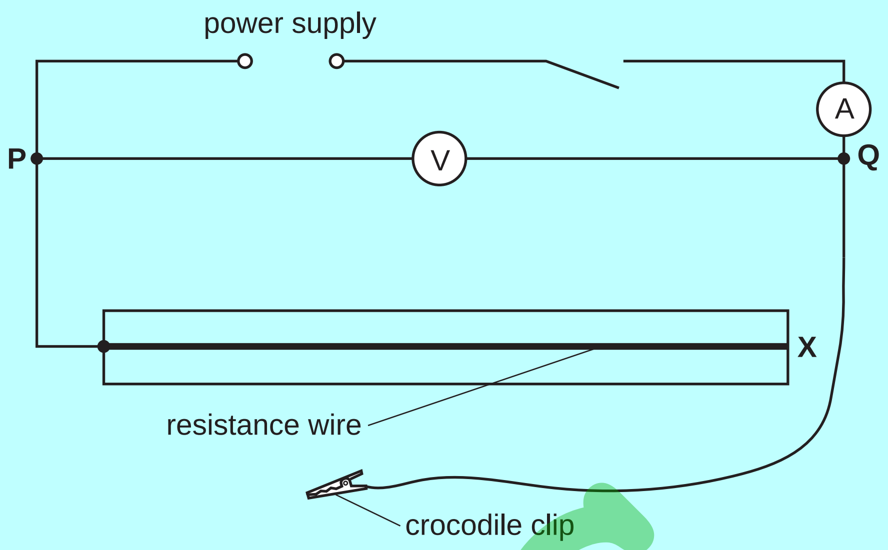


Fig. 1.1

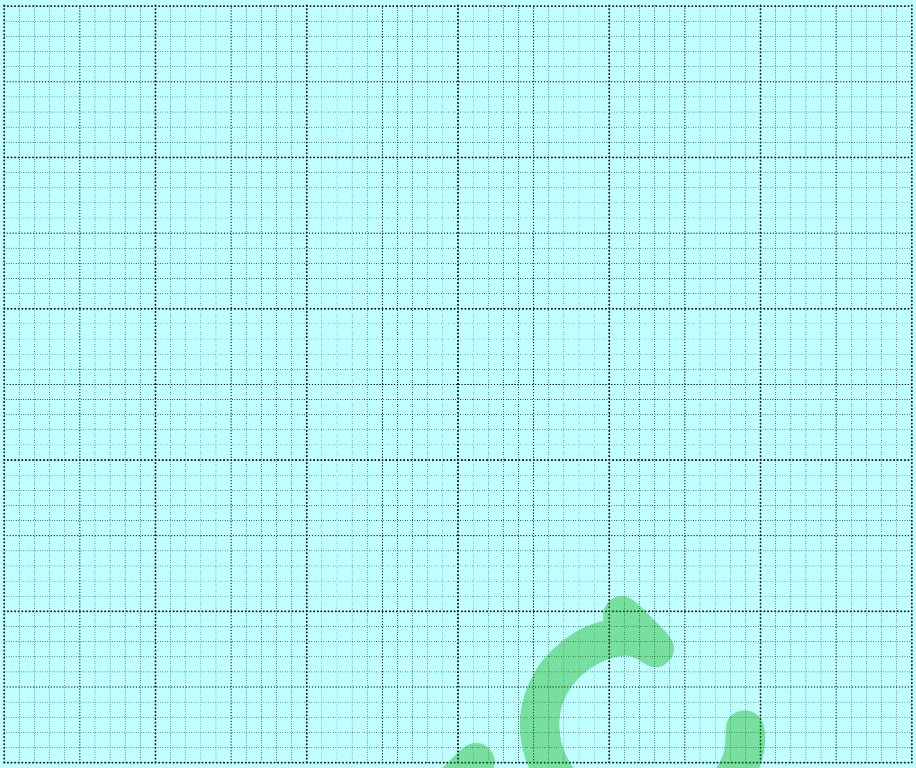
(a)
- Connect the crocodile clip near end **X** of the resistance wire.
- Switch on.
- Adjust the position of the crocodile clip until the potential difference *V* across terminals **P** and **Q** is 2.0 V.
- Record, in Table 1.1, the value of the current *I* shown on the ammeter.
- Move the crocodile clip and record values of *I* for *V* = 1.8 V, 1.6 V, 1.4 V and 1.2 V.
- Switch off.

Table 1.1

I / A	*V* / V
	2.0
	1.8
	1.6
	1.4
	1.2

[2]

(b) Plot a graph of V/V (y-axis) against I/A (x-axis).



[4]

(c) **(i)** Determine the gradient M of the graph.

Show clearly on the graph how you obtained the necessary information.

M = ... [1]

(ii) The gradient M is numerically equal to the resistance R of the power supply.

Write down the resistance R to a suitable number of significant figures for this experiment.

R = ... [2]

(d) Suggest **one** practical reason why the crocodile clip should not be connected to very short lengths of resistance wire in order to obtain smaller potential differences.

....

....

....[1]

(e) In this type of experiment, it is possible to change the potential difference by using a variable resistor rather than using different lengths of a resistance wire.

In the space, draw the standard circuit symbol for a variable resistor.

[1]

[Total: 11]

2 In this experiment, you will determine the density of water by two methods.

Method 1

Carry out the following instructions, referring to Figs. 2.1 and 2.2.

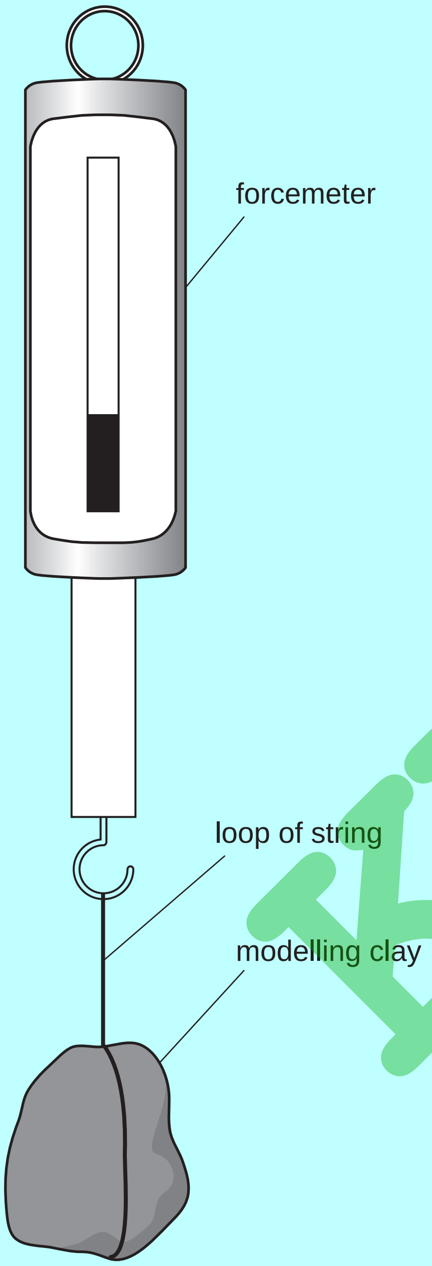


Fig. 2.1

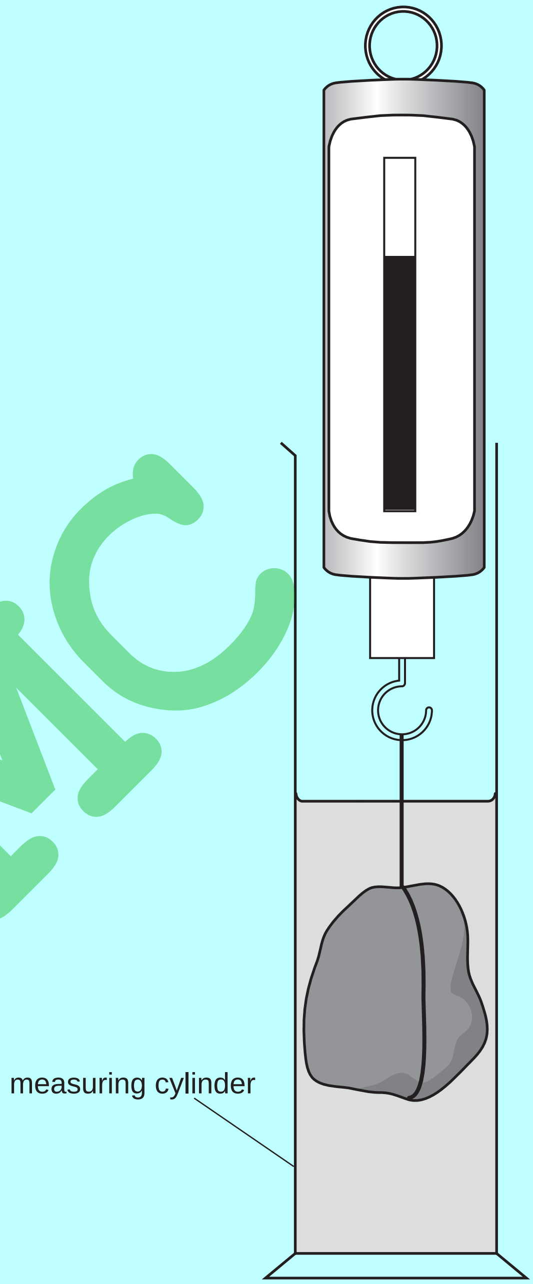


Fig. 2.2

(a) Measure the weight W_1 of the piece of modelling clay, as shown in Fig. 2.1.

W_1 = ... N [1]

(b) **(i)** Pour approximately 150 cm^3 of water into the measuring cylinder.

Record the volume V_1 of the water in the measuring cylinder.

V_1 = ... cm^3 [1]

(ii) Describe briefly how a measuring cylinder is read to obtain an accurate value for the volume of water. You may draw a diagram.

....

....

....[2]

(c) Lower the piece of modelling clay into the water as shown in Fig. 2.2.

- Record the new reading W_2 of the forcemeter.

W_2 = ... N

- Record the new reading V_2 of the measuring cylinder, with the piece of modelling clay in the water.

V_2 = ... cm^3

- Remove the modelling clay from the measuring cylinder.

- **Do not empty the measuring cylinder**. [1]

(d) Calculate a value ρ_1 for the density of water, using your readings from **(a)**, **(b)** and **(c)** and the equation

$$\rho_1 = \frac{(W_1 - W_2)}{(V_2 - V_1)} \times k$$

where k = 100 g / N.

ρ_1 = ...[2]

Method 2

(e) • Measure the mass m_1 of the measuring cylinder, still containing the volume V_1 of water. Use the balance provided.

m_1 = ...

• Empty the measuring cylinder.

• Measure the mass m_2 of the empty measuring cylinder.

m_2 = ...
[1]

(f) Calculate a second value ρ_2 for the density of water, using your readings from **(b)** and **(e)** and the equation

$$\rho_2 = \frac{(m_1 - m_2)}{V_1}.$$

ρ_2 = ... [1]

(g) Suggest a possible source of inaccuracy in either **Method 1** or **Method 2**, even when they are carried out carefully.

Explain how an improvement might be made to reduce this inaccuracy.

suggestion ....

....

explanation of improvement ....

....

....
[2]

[Total: 11]

3 In this experiment, you will investigate the refraction of light by a transparent block.
You will determine a quantity known as the refractive index of the material of the block.

Carry out the following instructions, using the separate ray-trace sheet provided.
You may refer to Fig. 3.1 for guidance.

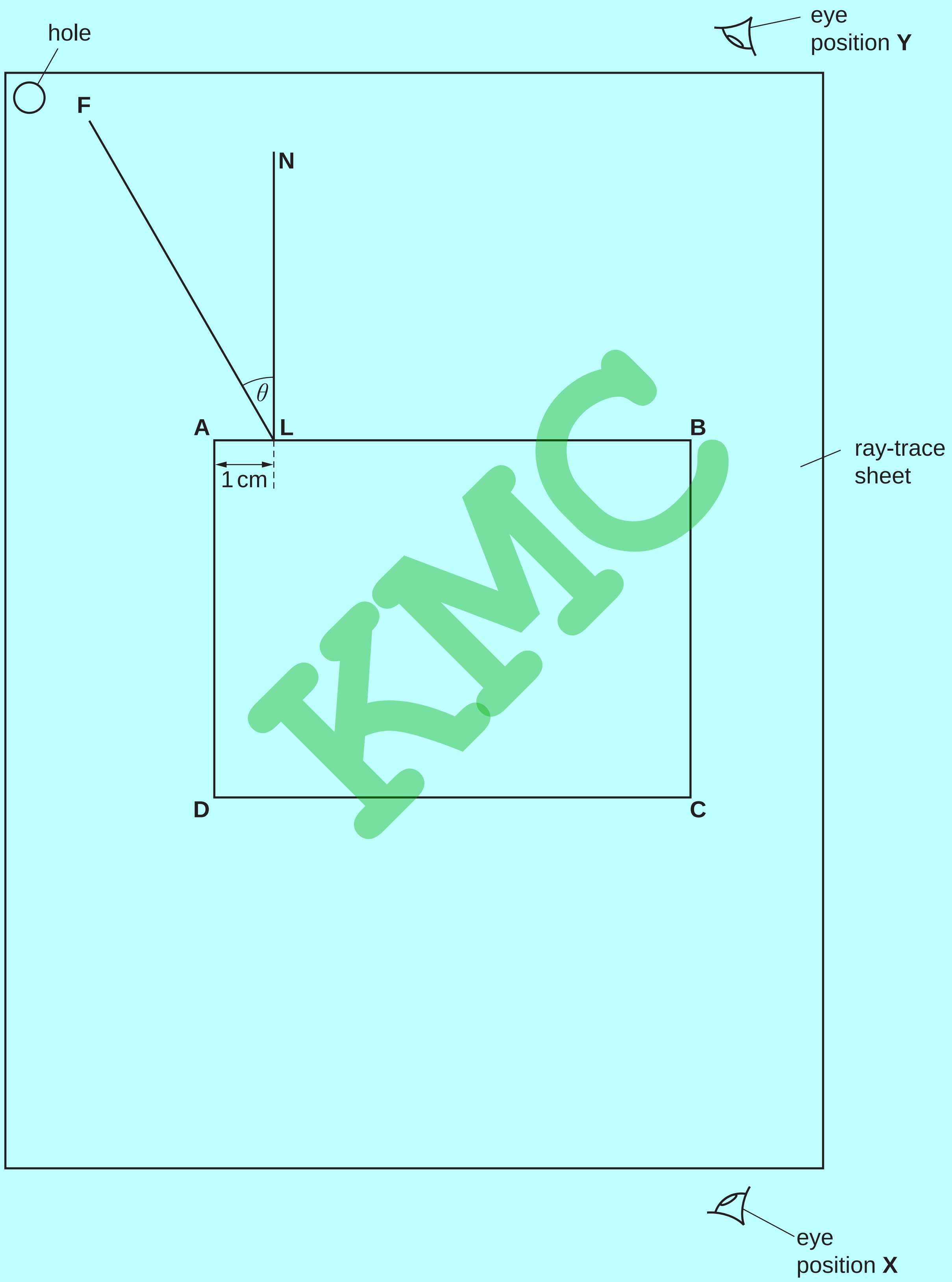


Fig. 3.1

(a)
- Place the block approximately in the centre of the ray-trace sheet. Carefully draw round the block and label the corners **ABCD**, as indicated in Fig. 3.1.
- Remove the block from the ray-trace sheet.
- Draw a normal to line **AB** at a point **L**, 1 cm from **A**. Label the other end of the normal with the letter **N**.
- Draw a line **FL**, 8 cm long and at an angle $\theta = 30°$, as indicated by Fig. 3.1.

[1]

(b)
- Replace the block in exactly the same position as in **(a)**.
- Place two pins P_1 and P_2 on line **FL**, a suitable distance apart for accurate ray tracing.
- Label the positions of P_1 and P_2.
- View the images of P_1 and P_2 through the block, from the direction indicated by the eye in position **X** in Fig. 3.1. Place two pins P_3 and P_4, a suitable distance apart, so that pins P_3 and P_4, and the images of P_1 and P_2, all appear exactly one behind the other.
- Label the positions of P_3 and P_4.
- Remove the block and pins from the ray-trace sheet.

[1]

(c) **(i)**
- Draw a line joining P_3 and P_4. Extend this line until it meets **CD**.
- Label the point at which this line meets **CD** with the letter **G**.
- Draw a line through **G**, at 90° to **CD**. Extend this line until it crosses **AB**.
- Label the point at which this line crosses **AB** with the letter **H**.
- Extend line **FL** until it meets **GH**.
- Label the point at which it meets **GH** with the letter **K**.
- Join points **L** and **G** with a straight line.

[1]

(ii)
- Measure the length *a* of line **LG**.

a = ... cm

- Measure the length *b* of line **LK**.

b = ... cm

- Calculate a value *n* for the refractive index, using the equation $n = \frac{a}{b}$.

n = ...

[3]

(d)
- Replace the block in exactly the same position as in **(a)**.
- Replace the two pins P_1 and P_2 on line **FL**.
- Place the mirror against side **CD**, with the reflecting surface towards the block.
- View the images of P_1 and P_2 from the direction indicated by the eye in position **Y** in Fig. 3.1. Place two pins P_5 and P_6, a suitable distance apart, so that pins P_5 and P_6, and the images of P_1 and P_2, all appear exactly one behind the other.
- Label the positions of P_5 and P_6.
- Remove the block and pins from the ray-trace sheet.

[1]

(e) **(i)**
- Draw a line joining P_5 and P_6. Extend this line until it meets **GH**.
- Label the point at which this line meets **GH** with the letter **M**.
- Label the other end of the line with the letter **R**.
- Measure the angle α, where α is the smaller angle between lines **RM** and **GH**.

α = ... [1]

(ii) A student suggests that angle α and angle θ, measured in part **(a)**, should be equal.

State whether your results support this suggestion. Justify your answer with reference to your results.

statement ....

justification ....

....

[2]

(f) Suggest why different students, all carrying out this experiment carefully, may not obtain identical results.

....

....[1]

[Total: 11]

Tie your ray-trace sheet into this Question Paper between pages 8 and 9.

4 Plan an experiment to investigate how increasing the number of layers of insulation affects the rate of cooling of hot water in a beaker.

You are **not** required to carry out the experiment.

Write a plan for the experiment, including:

- the apparatus needed
- what you would measure
- the variables you would keep the same to ensure the comparison is a fair test
- instructions for carrying out the experiment
- how you would present your results
- how you would use your readings to reach a conclusion.

You may draw a diagram if it helps to explain your plan.

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....[7]

[Total: 7]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education (9–1)

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

5243502340

PHYSICS **0972/51**

Paper 5 Practical Test **May/June 2018**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

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This document consists of **10** printed pages and **2** blank pages.

DC (KN) 165709

CAMBRIDGE International Examinations

[Turn over

1 In this experiment, you will determine the acceleration of free fall g using a pendulum. Carry out the following instructions, referring to Fig. 1.1 and Fig. 1.2.

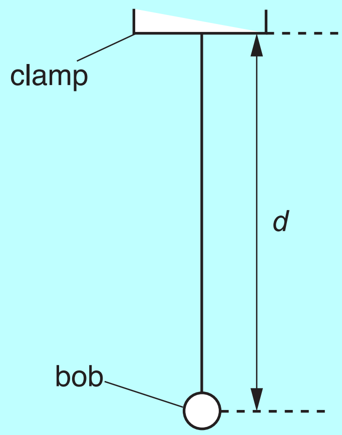

Fig. 1.1

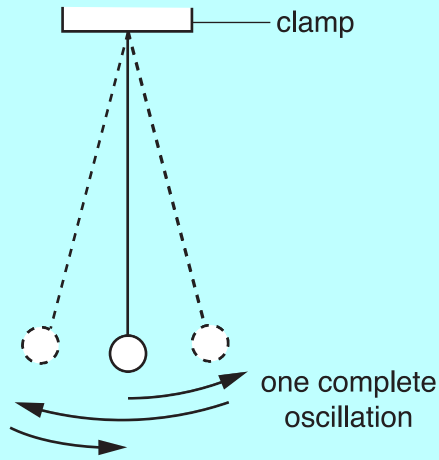

Fig. 1.2

A pendulum has been set up for you as shown in Fig. 1.1.

(a) Adjust the length of the pendulum until the distance d measured to the centre of the bob is 50.0 cm.

Displace the bob slightly and release it so that it swings. Fig. 1.2 shows one complete oscillation of the pendulum.

(i) Measure the time t for 10 complete oscillations.

t = ... [1]

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

T = ... [1]

(iii) Calculate T^2.

T^2 = ... [2]

(iv) Calculate the acceleration of free fall g using the equation $g = \frac{20}{T^2}$.

g = ... [1]

(b) Adjust the pendulum until the distance d measured to the centre of the bob is 100.0 cm.

(i) Repeat the procedure in **(a)(i)**, **(a)(ii)** and **(a)(iii)**.

t = ...

T = ...

T^2 = ...
[1]

(ii) Calculate the acceleration of free fall g using the equation $g = \frac{40}{T^2}$.

g = ...
[2]

(c) A student states that repeating the experiment improves the reliability of the value obtained for g.

Suggest **two** changes that you would make to improve the reliability. The stopwatch cannot be changed.

1. ....

....

2. ....

....

[2]

(d) State **one** precaution that you took in this experiment in order to obtain accurate readings.

....

....[1]

[Total: 11]

2 In this experiment, you will investigate resistance.

The circuit shown in Fig. 2.1 has been set up for you.

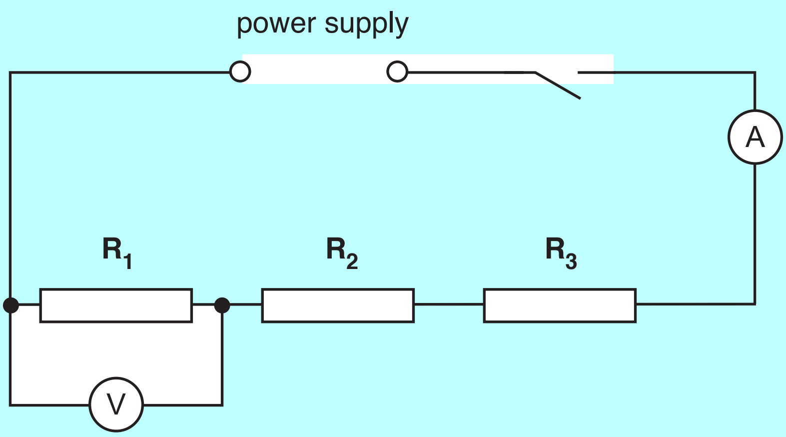

Fig. 2.1

(a) **(i)** Switch on. Measure and record the potential difference V_1 across the resistor $\mathbf{R_1}$ and the current I in the circuit. Switch off.

V_1 = ...

I = ... [2]

(ii) Calculate the resistance of the resistor $\mathbf{R_1}$ using the equation $R_1 = \frac{V_1}{I}$.

R_1 = ... [1]

(b) Disconnect the voltmeter.

Connect the voltmeter across the resistor $\mathbf{R_2}$. Switch on.

(i) Measure and record the potential difference V_2 across the resistor $\mathbf{R_2}$. Switch off.

V_2 = ...

(ii) Calculate the resistance of the resistor $\mathbf{R_2}$ using the equation $R_2 = \frac{V_2}{I}$.

R_2 = ... [1]

(c) Disconnect the voltmeter.

Connect the voltmeter across the resistor $\mathbf{R_3}$. Switch on.

(i) Measure and record the potential difference V_3 across the resistor $\mathbf{R_3}$. Switch off.

V_3 = ...

(ii) Calculate the resistance of the resistor $\mathbf{R_3}$ using the equation $R_3 = \frac{V_3}{I}$.

R_3 = ... [1]

(iii) Calculate the resistance R of resistors $\mathbf{R_1}$, $\mathbf{R_2}$ and $\mathbf{R_3}$ connected in series, using the equation $R = R_1 + R_2 + R_3$. Give your answer to a suitable number of significant figures for this experiment.

R = ... [1]

(d) State whether your results suggest that the three resistors have the same value of resistance. Justify your statement by reference to your results.

statement ....

justification ....

....

....
[2]

(e) Complete the circuit diagram in Fig. 2.2 to show:

- the three resistors connected in parallel
- the voltmeter connected to measure the potential difference across the resistors
- a variable resistor connected to control the current in all three resistors.

You are **not** required to set up this circuit.

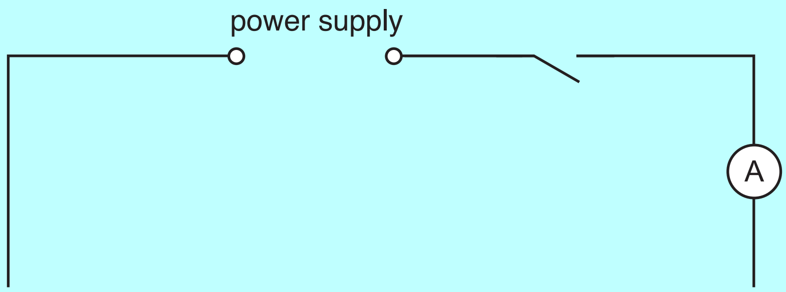

Fig. 2.2

[3]

[Total: 11]

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3 In this experiment, you will determine the focal length *f* of a lens.

Carry out the following instructions referring to Fig. 3.1.

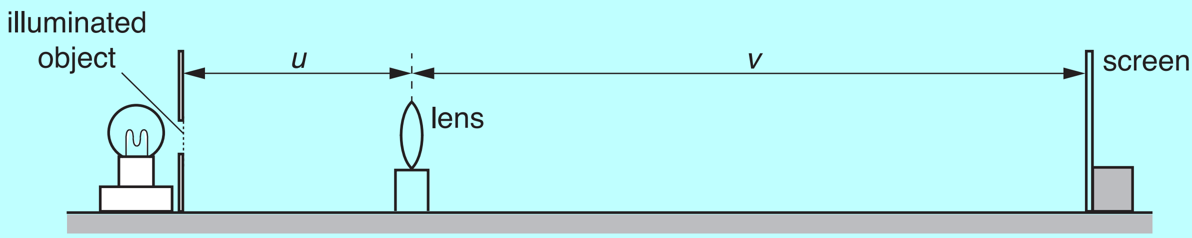


Fig. 3.1

(a) • Place the screen a distance $D = 70.0$ cm from the illuminated object.

• Place the lens between the object and the screen so that the lens is very close to the screen.

• Move the lens slowly away from the screen until a clearly focused image is formed on the screen.

(i) • Measure, and record in Table 3.1, the distance *u* between the centre of the lens and the illuminated object.

• Measure, and record in the table, the distance *v* between the centre of the lens and the screen.

(ii) Calculate the product *uv*. Record your answer in the table.

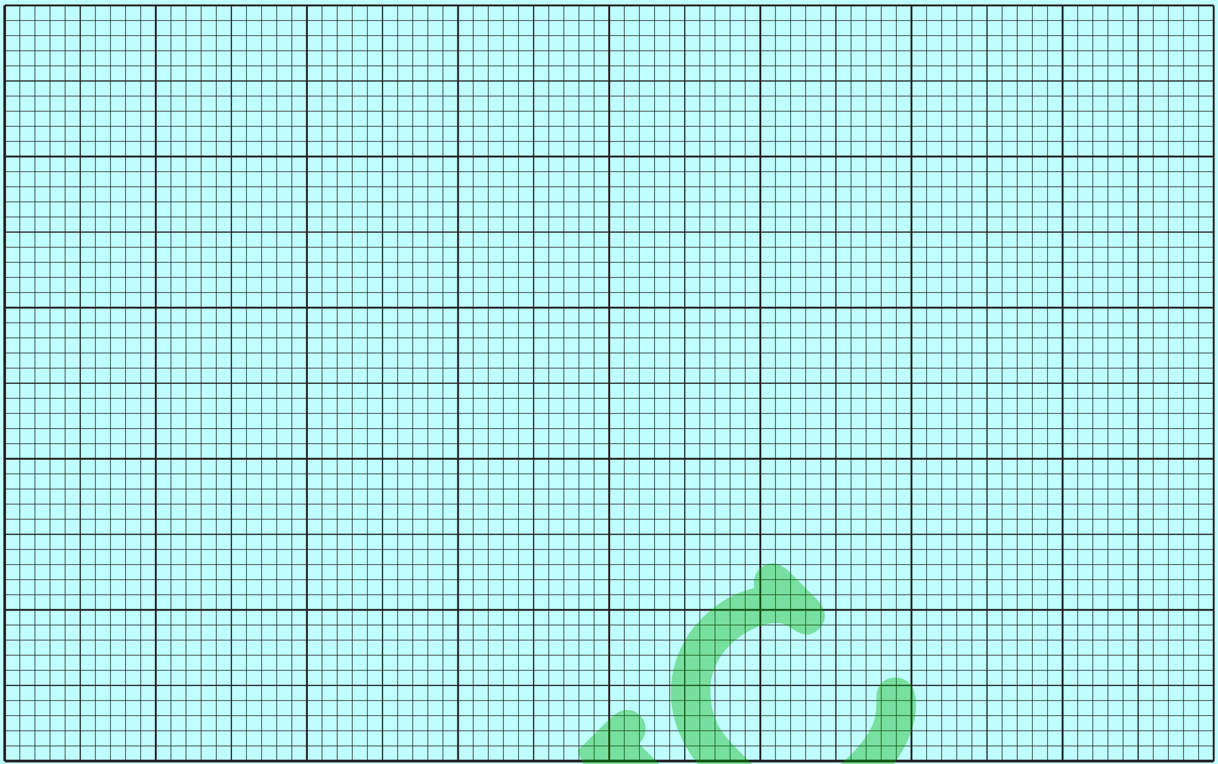
(iii) Repeat the procedure using values for *D* of 75.0 cm, 80.0 cm, 85.0 cm and 90.0 cm.

Table 3.1

D/cm	u/cm	v/cm	uv/cm^2
70.0			
75.0			
80.0			
85.0			
90.0			

[3]

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



[4]

(c) The focal length f of the lens is numerically equal to the gradient of the line.

Determine the gradient G of the line. Show clearly on the graph how you obtained the necessary information.

G = ... [2]

(d) Suggest **two** difficulties in this experiment when trying to obtain accurate readings.

1. ....

....

2. ....

....

[2]

[Total: 11]

4 A student is investigating the effect of double-walled insulation on the rate of cooling of hot water in a copper container. The student places the copper container inside a larger metal container. He is investigating the effect of the size of the air gap between the copper container and larger metal containers.

Plan an experiment to investigate the effect of the size of the air gap between the copper container and larger metal containers on the rate of cooling of hot water.

The following apparatus is available:

a copper container

a number of metal containers of different diameters (all larger than the copper container)

a thermometer

a stopwatch

a measuring cylinder

a supply of hot water.

You can also use other apparatus and materials that are usually available in a school laboratory.

You are **not** required to carry out this investigation.

In your plan, you should:

- explain briefly how you would carry out the investigation
- state the key variables that you would control
- draw a table, or tables, with column headings, to show how you would display your readings (you are not required to enter any readings in the table)
- explain how you would use your readings to reach a conclusion.

You may draw a diagram if it helps your explanation.

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[Total: 7]

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Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2018**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

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This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

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DC (ST/CT) 150765/5

CAMBRIDGE International Examinations

[Turn over

1 In this experiment, you will determine the acceleration of free fall g using a pendulum. Carry out the following instructions, referring to Fig. 1.1 and Fig. 1.2.

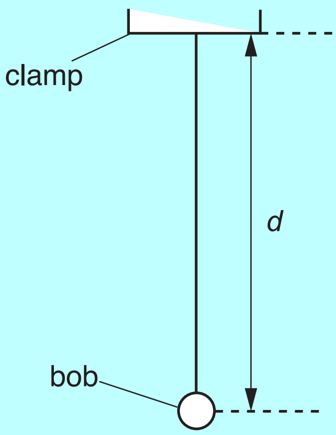

Fig. 1.1

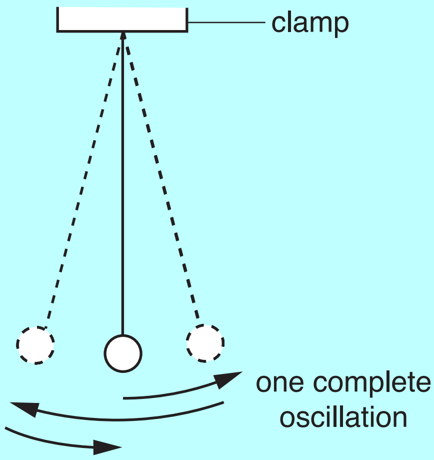

Fig. 1.2

A pendulum has been set up for you as shown in Fig. 1.1.

(a) Adjust the length of the pendulum until the distance d measured to the centre of the bob is 50.0 cm.

Displace the bob slightly and release it so that it swings. Fig. 1.2 shows one complete oscillation of the pendulum.

(i) Measure the time t for 10 complete oscillations.

t = ... [1]

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

T = ... [1]

(iii) Calculate T^2.

T^2 = ... [2]

(iv) Calculate the acceleration of free fall g using the equation $g = \frac{20}{T^2}$.

g = ... [1]

(b) Adjust the pendulum until the distance d measured to the centre of the bob is 100.0 cm.

(i) Repeat the procedure in **(a)(i)**, **(a)(ii)** and **(a)(iii)**.

t = ...

T = ...

T^2 = ...
[1]

(ii) Calculate the acceleration of free fall g using the equation $g = \frac{40}{T^2}$.

g = ...
[2]

(c) A student states that repeating the experiment improves the reliability of the value obtained for g.

Suggest **two** changes that you would make to improve the reliability. The stopwatch cannot be changed.

1. ....

....

2. ....

....

[2]

(d) State **one** precaution that you took in this experiment in order to obtain accurate readings.

....

....[1]

[Total: 11]

2 In this experiment, you will investigate resistance.

The circuit shown in Fig. 2.1 has been set up for you.

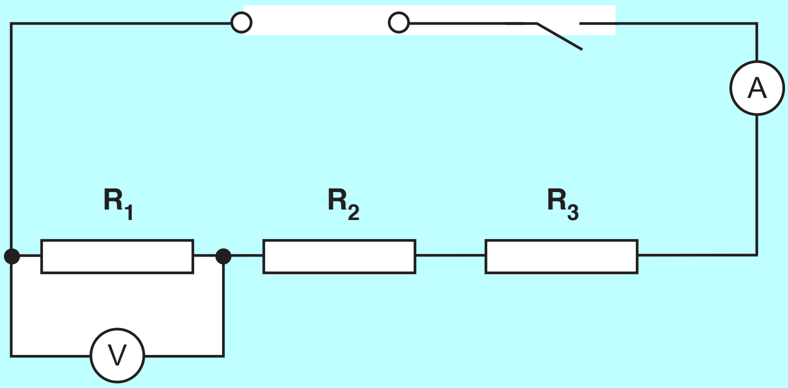

Fig. 2.1

(a) **(i)** Switch on. Measure and record the potential difference V_1 across the resistor $\mathbf{R_1}$ and the current I in the circuit. Switch off.

V_1 = ...

I = ... [2]

(ii) Calculate the resistance of the resistor $\mathbf{R_1}$ using the equation $R_1 = \frac{V_1}{I}$.

R_1 = ... [1]

(b) Disconnect the voltmeter.

Connect the voltmeter across the resistor $\mathbf{R_2}$. Switch on.

(i) Measure and record the potential difference V_2 across the resistor $\mathbf{R_2}$. Switch off.

V_2 = ...

(ii) Calculate the resistance of the resistor $\mathbf{R_2}$ using the equation $R_2 = \frac{V_2}{I}$.

R_2 = ... [1]

(c) Disconnect the voltmeter.

Connect the voltmeter across the resistor $\mathbf{R_3}$. Switch on.

(i) Measure and record the potential difference V_3 across the resistor $\mathbf{R_3}$. Switch off.

V_3 = ...

(ii) Calculate the resistance of the resistor $\mathbf{R_3}$ using the equation $R_3 = \dfrac{V_3}{I}$.

R_3 = ... [1]

(iii) Calculate the resistance R of resistors $\mathbf{R_1}$, $\mathbf{R_2}$ and $\mathbf{R_3}$ connected in series, using the equation $R = R_1 + R_2 + R_3$. Give your answer to a suitable number of significant figures for this experiment.

R = ... [1]

(d) State whether your results suggest that the three resistors have the same value of resistance. Justify your statement by reference to your results.

statement ....

justification ....

....

....

[2]

(e) Complete the circuit diagram in Fig. 2.2 to show:

- the three resistors connected in parallel
- the voltmeter connected to measure the potential difference across the resistors
- a variable resistor connected to control the current in all three resistors.

You are **not** required to set up this circuit.

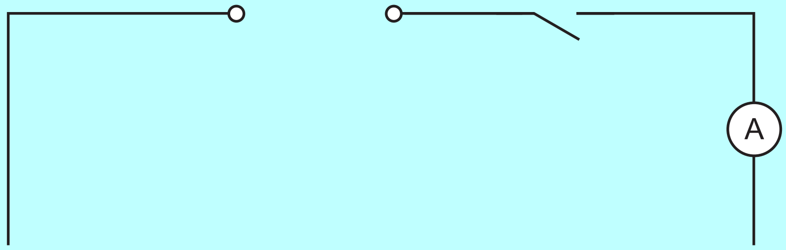

Fig. 2.2

[3]

[Total: 11]

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3 In this experiment, you will determine the focal length f of a lens.

Carry out the following instructions referring to Fig. 3.1.

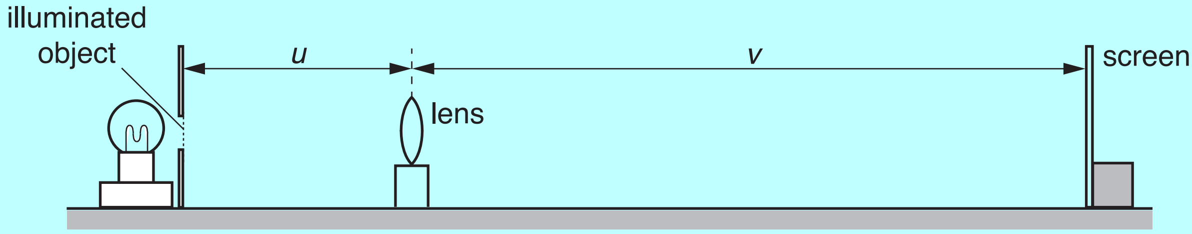

Fig. 3.1

(a)
- Place the screen a distance D = 70.0 cm from the illuminated object.
- Place the lens between the object and the screen so that the lens is very close to the screen.
- Move the lens slowly away from the screen until a clearly focused image is formed on the screen.

(i)
- Measure, and record in Table 3.1, the distance u between the centre of the lens and the illuminated object.
- Measure, and record in the table, the distance v between the centre of the lens and the screen.

(ii) Calculate the product uv. Record your answer in the table.

(iii) Repeat the procedure using values for D of 75.0 cm, 80.0 cm, 85.0 cm and 90.0 cm.

Table 3.1

D/cm	u/cm	v/cm	uv/cm^2
70.0			
75.0			
80.0			
85.0			
90.0			

[3]

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

[4]

(c) The focal length f of the lens is numerically equal to the gradient of the line.

Determine the gradient G of the line. Show clearly on the graph how you obtained the necessary information.

G = ...[2]

(d) Suggest **two** difficulties in this experiment when trying to obtain accurate readings.

1. ....

....

2. ....

....

[2]

[Total: 11]

4 A student is investigating the effect of double-walled insulation on the rate of cooling of hot water in a copper container. The student places the copper container inside a larger metal container. He is investigating the effect of the size of the air gap between the copper container and larger metal containers.

Plan an experiment to investigate the effect of the size of the air gap between the copper container and larger metal containers on the rate of cooling of hot water.

The following apparatus is available:

a copper container

a number of metal containers of different diameters (all larger than the copper container)

a thermometer

a stopwatch

a measuring cylinder

a supply of hot water.

You can also use other apparatus and materials that are usually available in a school laboratory.

You are **not** required to carry out this investigation.

In your plan, you should:

- explain briefly how you would carry out the investigation
- state the key variables that you would control
- draw a table, or tables, with column headings, to show how you would display your readings (you are not required to enter any readings in the table)
- explain how you would use your readings to reach a conclusion.

You may draw a diagram if it helps your explanation.

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Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education (9–1)

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

4161033181

PHYSICS **0972/51**

Paper 5 Practical Test **May/June 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

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Cambridge Assessment International Education

[Turn over

1 In this experiment, you will determine the weight of a metre rule using a balancing method.

Carry out the following instructions, referring to Fig. 1.1.

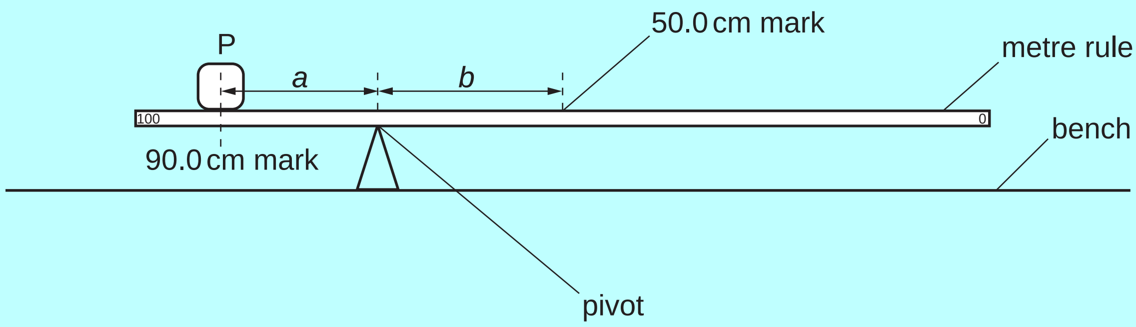

Fig. 1.1

(a) Place the metre rule on the pivot. Place the load P with its centre on the metre rule at the 90.0 cm mark. Keeping the load P at the 90.0 cm mark, adjust the position of the metre rule on the pivot so that the metre rule is as near as possible to being balanced.

Measure, and record in the first row of Table 1.1, the distance *a* from the 90.0 cm mark to the pivot.

Measure, and record in the first row of Table 1.1, the distance *b* from the pivot to the 50.0 cm mark.

Repeat the steps above, placing the centre of the load P at the 85.0 cm, 80.0 cm, 75.0 cm and 70.0 cm marks. Record all values of *a* and *b* in Table 1.1.

Table 1.1

a / cm	*b* / cm

[3]

(b) Plot a graph of a / cm (y-axis) against b / cm (x-axis). You do **not** need to begin your axes at the origin (0, 0).

[4]

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

G = ... [1]

(d) Calculate the weight W of the metre rule using the equation $W = G \times P$, where $P = 1.0\,\text{N}$.

W = ... [1]

(e) Suggest **one** practical reason why it is difficult to obtain accurate readings for a and b in this type of experiment.

....

.... [1]

(f) Use the balance provided to measure the mass of the metre rule.

mass = ... [1]

[Total: 11]

2 In this experiment, you will determine the resistance of a resistance wire.

Carry out the following instructions, referring to Fig. 2.1.

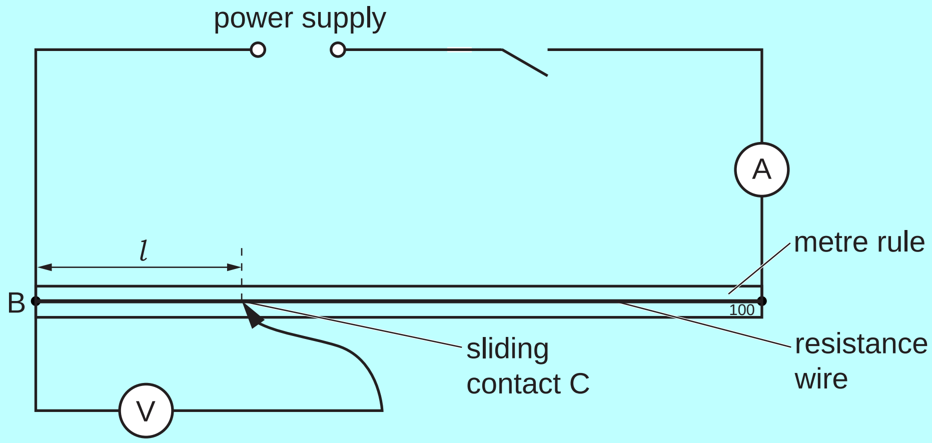

Fig. 2.1

(a) (i) Switch on.

Measure the current I in the circuit.

I = ... [1]

(ii) Place the sliding contact C at a distance l = 20.0 cm from B.

Measure, and record in Table 2.1, the potential difference V across the length l of the resistance wire.

Calculate, and record in Table 2.1, $\frac{V}{l}$.

Repeat the procedure using l values of 40.0 cm, 60.0 cm, 80.0 cm and 100.0 cm.

Switch off.

Table 2.1

l / cm	V / V	$\frac{V}{l} \Big/ \frac{\text{V}}{\text{cm}}$
20.0		
40.0		
60.0		
80.0		
100.0		

[4]

(b) Look carefully at the values of $\frac{V}{I}$ in Table 2.1.

(i) Tick the box to show your conclusion from the results.

☐ $\frac{V}{I}$ is approximately constant.

☐ $\frac{V}{I}$ is decreasing as V increases.

☐ $\frac{V}{I}$ is increasing as V increases.

☐ There is no simple pattern for $\frac{V}{I}$ in the results.

[1]

(ii) Justify your conclusion by reference to your results.

....

.... [1]

(c) Calculate the resistance of 100 cm of the resistance wire using the equation $R = \frac{V}{I}$, where V is the potential difference across 100 cm of the resistance wire. Use the value of current I from part **(a)(i)**. Give your answer to a suitable number of significant figures for this experiment and include the unit.

R = ... [3]

(d) In this type of experiment, it is sensible to keep the temperature of the resistance wire as close to room temperature as possible. Suggest **one** way to minimise the rise in temperature of the resistance wire.

....

.... [1]

[Total: 11]

3 In this experiment, you will investigate the rate of cooling of water under different conditions. A greater rate of cooling occurs if there is a greater change in the temperature during the same period of time.

Carry out the following instructions referring to Fig. 3.1. You are provided with a beaker labelled A and a can labelled B.

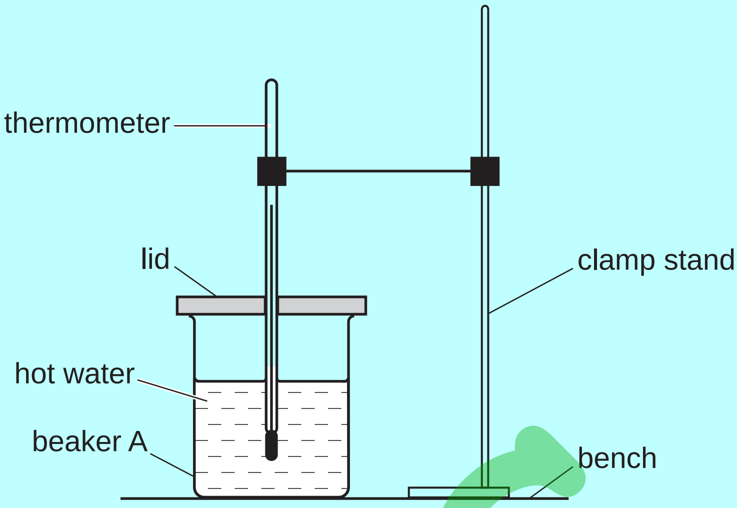

Fig. 3.1

(a) Use the thermometer to measure room temperature θ_R.

θ_R = ... [1]

(b) Pour 200 cm^3 of hot water into beaker A. Place the lid on the beaker and place the thermometer in the beaker, as shown in Fig. 3.1.

Record in Table 3.1 the temperature θ of the hot water at time t = 0. Immediately start the stopclock.

After 30 s, measure the temperature θ shown on the thermometer. Record the time t = 30 s and the temperature reading in Table 3.1.

Continue recording the time and the temperature readings every 30 s until you have six sets of readings.

[3]

Table 3.1

beaker A

t / s	θ / °C

Table 3.2

can B

t / s	θ / °C

(c) Pour 200 cm^3 of hot water into can B. Place the lid on the can and place the thermometer in the can.

Record in Table 3.2 the temperature θ of the hot water at time t = 0. Immediately start the stopclock.

After 30 s, measure the temperature θ shown on the thermometer. Record the time t = 30 s and the temperature reading in Table 3.2.

Continue recording the time and temperature readings every 30 s until you have six sets of readings.

[2]

(d) Look carefully at the readings in Table 3.1 and in Table 3.2.

(i) Tick the box to show your conclusion from the readings.

☐ The water in the beaker has a greater rate of cooling than the water in the can.

☐ The water in the beaker has a smaller rate of cooling than the water in the can.

☐ There is no significant difference between the rates of cooling of the water in the beaker and the can.

[1]

(ii) Justify your conclusion by reference to your readings.

....

....

....

.... [2]

(e) A student in another school carries out the experiment and reports that the rate of cooling of the water in the can is different from the rate of cooling of the water in the beaker. He plans a change to the experiment to find out whether this difference in the rates of cooling is caused by

- the matt black surface of the can being a better radiator of thermal energy than the shiny surface of the beaker
- the metal of the can being a better conductor of thermal energy than the material of the beaker.

Suggest **two** suitable changes to the apparatus that the student could make.

1. ....

....

2. ....

....

[2]

[Total: 11]

4 A student is investigating the work required to pull a box containing some masses up a sloping wooden board. Fig. 4.1 shows the board and the box.

Plan an experiment to investigate how the work required to pull the box up the slope depends on the mass of the box and its contents.

Work done is calculated using the equation:

work done = force × distance moved in the direction of the force.

You are **not** required to carry out this experiment.

The following apparatus is available to the students:

a wooden board
a box with a length of string attached
a selection of masses that fit in the box
a metre rule
an electronic balance.

In your plan, you should:

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

You may add to the diagram if it helps your explanation.

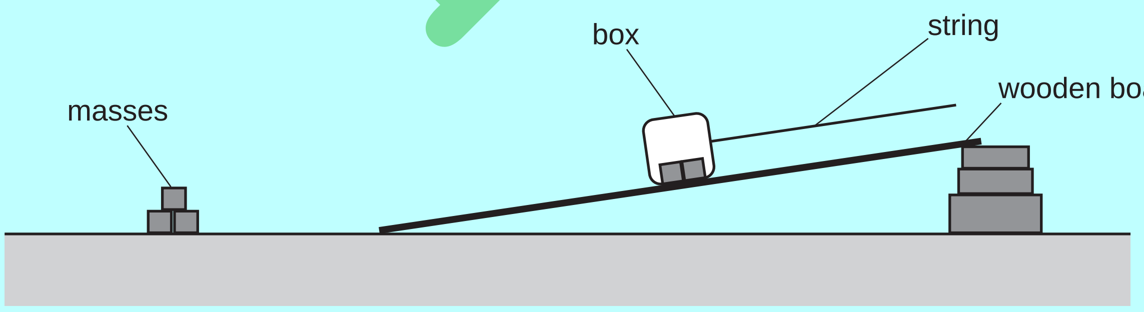

Fig. 4.1

[7]

[Total: 7]

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Cambridge Assessment International Education

Cambridge IGCSE™ (9–1)

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

6238026078

PHYSICS **0972/51**

Paper 5 Practical Test **May/June 2020**

1 hour 15 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

For Examiner's Use	
1	
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Total	

This document has **12** pages. Blank pages are indicated.

DC (DH) 199540

1 In this experiment, you will investigate the balancing of a metre rule.

Carry out the following instructions, referring to Fig. 1.1.

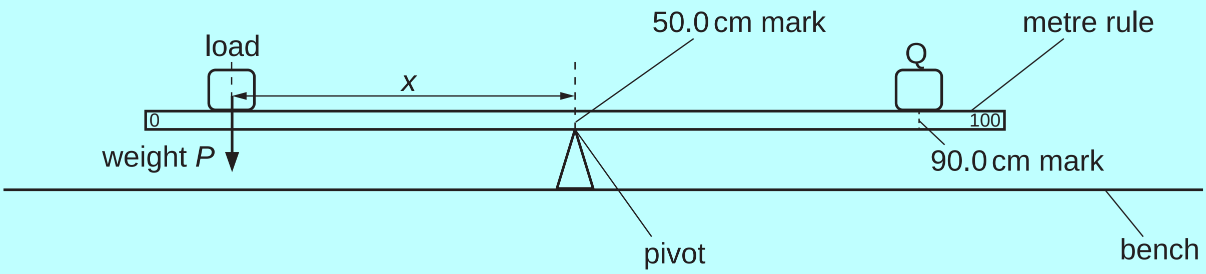

Fig. 1.1

(a)

- Place the metre rule on the pivot at the 50.0 cm mark.
- Place the object Q with its centre on the metre rule at the 90.0 cm mark.
- Place a load of weight P = 2.0 N on the metre rule.
- Adjust the position of the load so that the metre rule is as near as possible to being balanced and horizontal.

(i) Measure, and record in Table 1.1, the distance x from the centre of the load to the pivot.

Record also the weight of the load. [1]

(ii) Calculate, and record in Table 1.1, the value of $\frac{1}{x}$. [1]

(iii) Repeat the steps above, using loads of weight P = 3.0 N, 4.0 N, 5.0 N and 6.0 N. Record all the values of P, x and $\frac{1}{x}$ in Table 1.1. [3]

Table 1.1

P / N	x / cm	$\frac{1}{x} \Big/ \frac{1}{\text{cm}}$

(b) Plot a graph of P/N (y-axis) against $\frac{1}{x} \Big/ \frac{1}{\text{cm}}$ (x-axis). Start both axes at the origin (0,0).

[4]

(c) In this experiment, x_{max}, the maximum possible value for x is 50.0 cm. Calculate $\frac{1}{x_{max}}$.

$\frac{1}{x_{max}}$ = ... $\frac{1}{\text{cm}}$

Use the graph to determine the minimum value of P required to balance the metre rule in this experiment. Show clearly on the graph how you determined this value.

minimum value of P = ...

[2]

[Total: 11]

2 In this experiment, you will determine the resistances of filament lamps.

Carry out the following instructions, referring to Fig. 2.1.

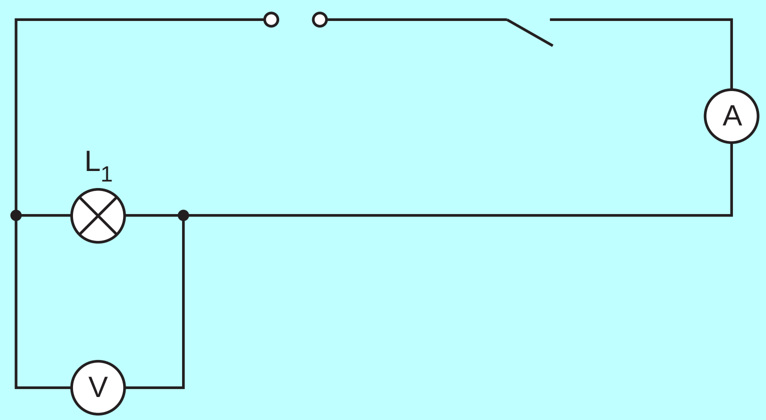

Fig. 2.1

(a) Switch on.

(i) Measure the current I_1 in the circuit.

I_1 = ... A [1]

(ii) Measure the potential difference V_1 across lamp L_1.

V_1 = ... V [1]

Switch off.

(iii) Calculate the resistance R_1 of the filament of lamp L_1. Use the equation $R_1 = \frac{V_1}{I_1}$. Include the unit.

R_1 = ... [2]

(b) Disconnect the voltmeter. Connect lamp L_2 in series with lamp L_1. Connect the voltmeter across lamp L_2. Switch on.

Measure the current I_2 in the circuit.

I_2 = ... A

Measure the potential difference V_2 across lamp L_2.

V_2 = ... V

Switch off.

Calculate the resistance R_2 of the filament of lamp L_2. Use the equation $R_2 = \frac{V_2}{I_2}$.

R_2 = ...
[1]

(c) Disconnect the voltmeter. Connect lamp L_3 in series with lamps L_1 and L_2. Connect the voltmeter across lamp L_3. Switch on.

Measure the current I_3 in the circuit.

I_3 = ... A

Measure the potential difference V_3 across lamp L_3.

V_3 = ... V

Switch off.

Calculate the resistance R_3 of the filament of lamp L_3. Use the equation $R_3 = \frac{V_3}{I_3}$.

R_3 = ...
[1]

(d) Calculate $R_1 + R_2 + R_3$. Give your answer to a suitable number of significant figures for this experiment.

$R_1 + R_2 + R_3$ = ... [1]

(e) Some students make suggestions about the results of the experiment.

Suggestion **A**: $R_1 + R_2 + R_3$ should be equal to $3 \times R_1$.

Suggestion **B**: $R_1 + R_2 + R_3$ should be less than $3 \times R_1$.

Suggestion **C**: $R_1 + R_2 + R_3$ should be greater than $3 \times R_1$.

State which suggestion, **A**, **B** or **C**, agrees with your results. Justify your answer by reference to your results.

statement ....

justification ....

....

[2]

(f) A student investigates whether the statement in **(e)** is always true for the same three lamps connected in series.
State a variable that he changes and how he changes the variable. You are **not** required to do this extra experiment.

variable to change ....

method of changing the variable ....

....

....

[2]

[Total: 11]

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3 In this experiment you will investigate the position of the image in a plane mirror.

Carry out the following instructions, using the separate ray-trace sheet provided. You may refer to Fig. 3.1 for guidance.

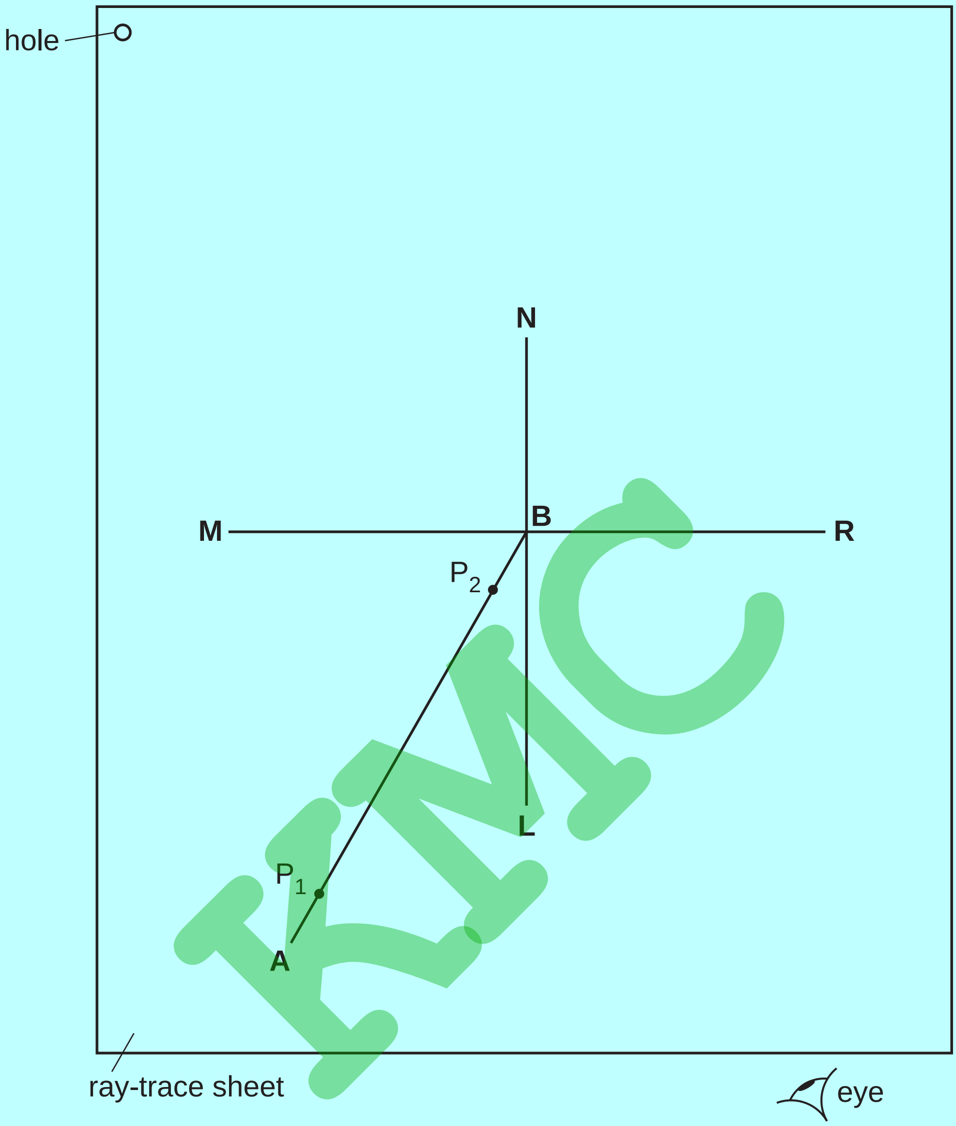

Fig. 3.1

(a) **(i)** Draw a line 10 cm long near the middle of the ray-trace sheet. Label the line **MR**. Draw a normal to this line that passes through the centre of **MR**. Label the normal **NL**. Label the point at which **NL** crosses **MR** with the letter **B**. [1]

(ii) Draw a line 7.0 cm long from **B** at an angle of incidence $i = 30°$ to the normal below **MR** and to the left of the normal. Label the end of this line **A**. [1]

(iii) Place a pin P_1 on line **AB** at a distance 6.0 cm from **B**.

Place a pin P_2 on line **AB** close to **MR**. [1]

(b) **(i)** Place the reflecting face of the mirror vertically on the line **MR**.

View the images of pins P_1 and P_2 from the direction indicated by the eye in Fig. 3.1.

Place two pins P_3 and P_4 some distance apart so that pin P_3 and the images of P_2 and P_1 all appear exactly behind pin P_4. Label the positions of P_3 and P_4.

Remove the pins and the mirror and draw the line joining the positions of P_3 and P_4. [1]

(ii) Continue the line until it extends at least 7.0 cm beyond **MR**. [1]

(c) Replace pin P_1 on line **AB** at a distance 6.0 cm from **B**.

Place pin P_2 1.0 cm to the right of its position in part **(a)**.

Repeat the steps in part **(b)**.

Label with the letter **Y** the point where the two lines cross beyond **MR**.

(i) Draw a line from P_1 to **MR** that meets **MR** at a right angle. Measure and record the length *a* of this line.

a = ... [1]

(ii) Draw a line from the point labelled **Y** to **MR** that meets **MR** at a right angle. Measure and record the length *b* of this line.

b = ... [1]

(d) **(i)** Replace the mirror on **MR**. Place pin P_1 on the normal at a distance 6.0 cm from the front of the mirror.

View the image of P_1 in the mirror.

Place pin P_2 on the normal behind the mirror.

Adjust the position of P_2 along the normal so that the image of the bottom of the pin P_1 seen in the mirror and the top of pin P_2 seen over the mirror appear as one pin when viewed from all angles in front of the mirror.

Label the position of P_2.

[1]

(ii) Remove the pins and the mirror.

Measure the distance x along the normal between P_2 and the mirror.

x = ... [2]

(e) A student carries out this experiment with care.
Suggest a practical reason why the results may not be accurate.

....

.... [1]

Tie your ray-trace sheet into this booklet between pages 8 and 9.

[Total: 11]

4 A student investigates the effect of the colour of the surface of a metal container on the rate of loss of heat from the container. She knows that black surfaces are better radiators of thermal energy than white surfaces and wants to investigate the effect of other colours.

The following apparatus is available:

metal containers each with the outer surface painted a different colour
a thermometer
a stop-watch
a supply of hot water.

She can also use other apparatus and materials that are usually available in a school laboratory.

Plan an experiment to investigate the effect of the colour of the surface of a metal container on the rate of loss of heat from the container. You are **not** required to carry out this investigation.

You should:

- draw a diagram of the apparatus used
- explain briefly how you would carry out the investigation
- state the key variables that you would control
- draw a table, or tables, with column headings, to show how you would display your readings (you are **not** required to enter any readings in the table)
- explain how you would use your readings to reach a conclusion.

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[Total: 7]

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CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

* 2 6 6 2 3 3 7 5 3 5 *

PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2020**

1 hour 15 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

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This document has **12** pages. Blank pages are indicated.

DC (LK/SW) 195012/3

[Turn over

1 In this experiment, you will investigate the balancing of a metre rule.

Carry out the following instructions, referring to Fig. 1.1.

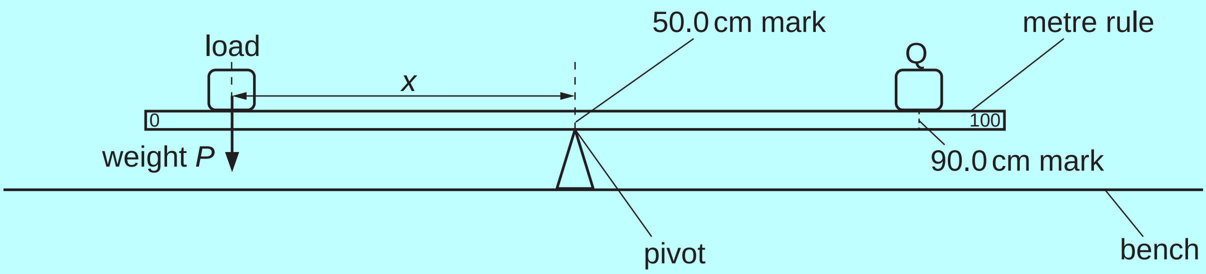


Fig. 1.1

(a)

- Place the metre rule on the pivot at the 50.0 cm mark.
- Place the object Q with its centre on the metre rule at the 90.0 cm mark.
- Place a load of weight P = 2.0 N on the metre rule.
- Adjust the position of the load so that the metre rule is as near as possible to being balanced and horizontal.

(i) Measure, and record in Table 1.1, the distance x from the centre of the load to the pivot.

Record also the weight of the load. [1]

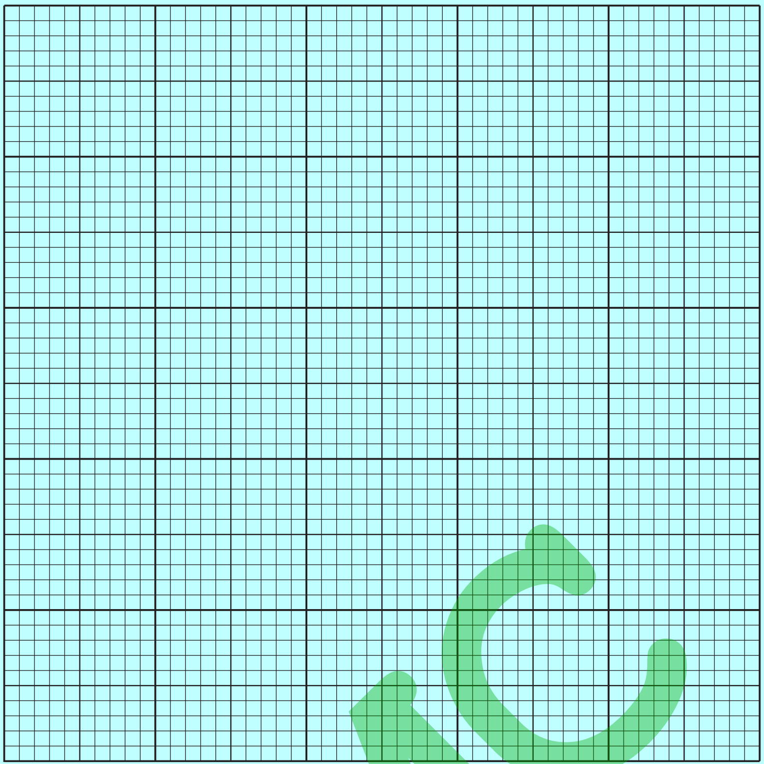
(ii) Calculate, and record in Table 1.1, the value of $\frac{1}{x}$. [1]

(iii) Repeat the steps above, using loads of weight P = 3.0 N, 4.0 N, 5.0 N and 6.0 N. Record all the values of P, x and $\frac{1}{x}$ in Table 1.1. [3]

Table 1.1

P / N	x / cm	$\frac{1}{x} \Big/ \frac{1}{\text{cm}}$

(b) Plot a graph of P/N (y-axis) against $\frac{1}{x} \Big/ \frac{1}{\text{cm}}$ (x-axis). Start both axes at the origin (0,0).



[4]

(c) In this experiment, x_{max}, the maximum possible value for x is 50.0 cm. Calculate $\frac{1}{x_{max}}$.

$\frac{1}{x_{max}}$ = ... $\frac{1}{\text{cm}}$

Use the graph to determine the minimum value of P required to balance the metre rule in this experiment. Show clearly on the graph how you determined this value.

minimum value of P = ...
[2]

[Total: 11]

2 In this experiment, you will determine the resistances of filament lamps.

Carry out the following instructions, referring to Fig. 2.1.

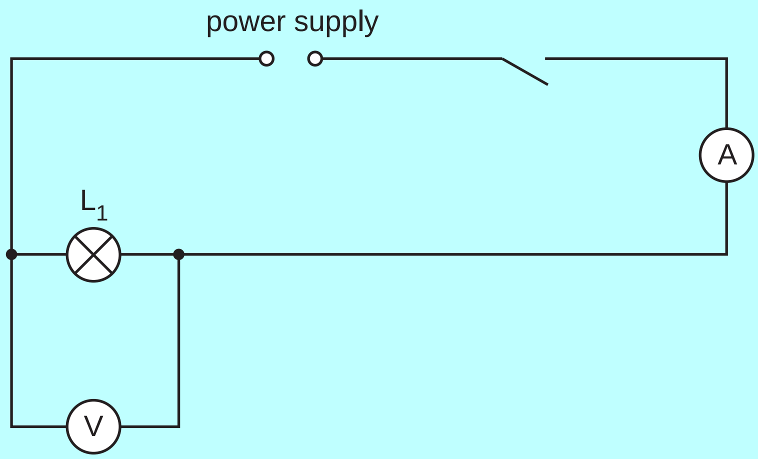


Fig. 2.1

(a) Switch on.

(i) Measure the current I_1 in the circuit.

I_1 = ... A [1]

(ii) Measure the potential difference V_1 across lamp L_1.

V_1 = ... V [1]

Switch off.

(iii) Calculate the resistance R_1 of the filament of lamp L_1. Use the equation $R_1 = \frac{V_1}{I_1}$. Include the unit.

R_1 = ... [2]

(b) Disconnect the voltmeter. Connect lamp L_2 in series with lamp L_1. Connect the voltmeter across lamp L_2. Switch on.

Measure the current I_2 in the circuit.

I_2 = ... A

Measure the potential difference V_2 across lamp L_2.

V_2 = ... V

Switch off.

Calculate the resistance R_2 of the filament of lamp L_2. Use the equation $R_2 = \frac{V_2}{I_2}$.

R_2 = ...

[1]

(c) Disconnect the voltmeter. Connect lamp L_3 in series with lamps L_1 and L_2. Connect the voltmeter across lamp L_3. Switch on.

Measure the current I_3 in the circuit.

I_3 = ... A

Measure the potential difference V_3 across lamp L_3.

V_3 = ... V

Switch off.

Calculate the resistance R_3 of the filament of lamp L_3. Use the equation $R_3 = \frac{V_3}{I_3}$.

R_3 = ...

[1]

(d) Calculate $R_1 + R_2 + R_3$. Give your answer to a suitable number of significant figures for this experiment.

$R_1 + R_2 + R_3$ = ... [1]

(e) Some students make suggestions about the results of the experiment.

Suggestion **A**: $R_1 + R_2 + R_3$ should be equal to $3 \times R_1$.

Suggestion **B**: $R_1 + R_2 + R_3$ should be less than $3 \times R_1$.

Suggestion **C**: $R_1 + R_2 + R_3$ should be greater than $3 \times R_1$.

State which suggestion, **A**, **B** or **C**, agrees with your results. Justify your answer by reference to your results.

statement ....

justification ....

.... [2]

(f) A student investigates whether the statement in **(e)** is always true for the same three lamps connected in series.
State a variable that he changes and how he changes the variable. You are **not** required to do this extra experiment.

variable to change ....

method of changing the variable ....

....

.... [2]

[Total: 11]

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3 In this experiment you will investigate the position of the image in a plane mirror.

Carry out the following instructions, using the separate ray-trace sheet provided. You may refer to Fig. 3.1 for guidance.

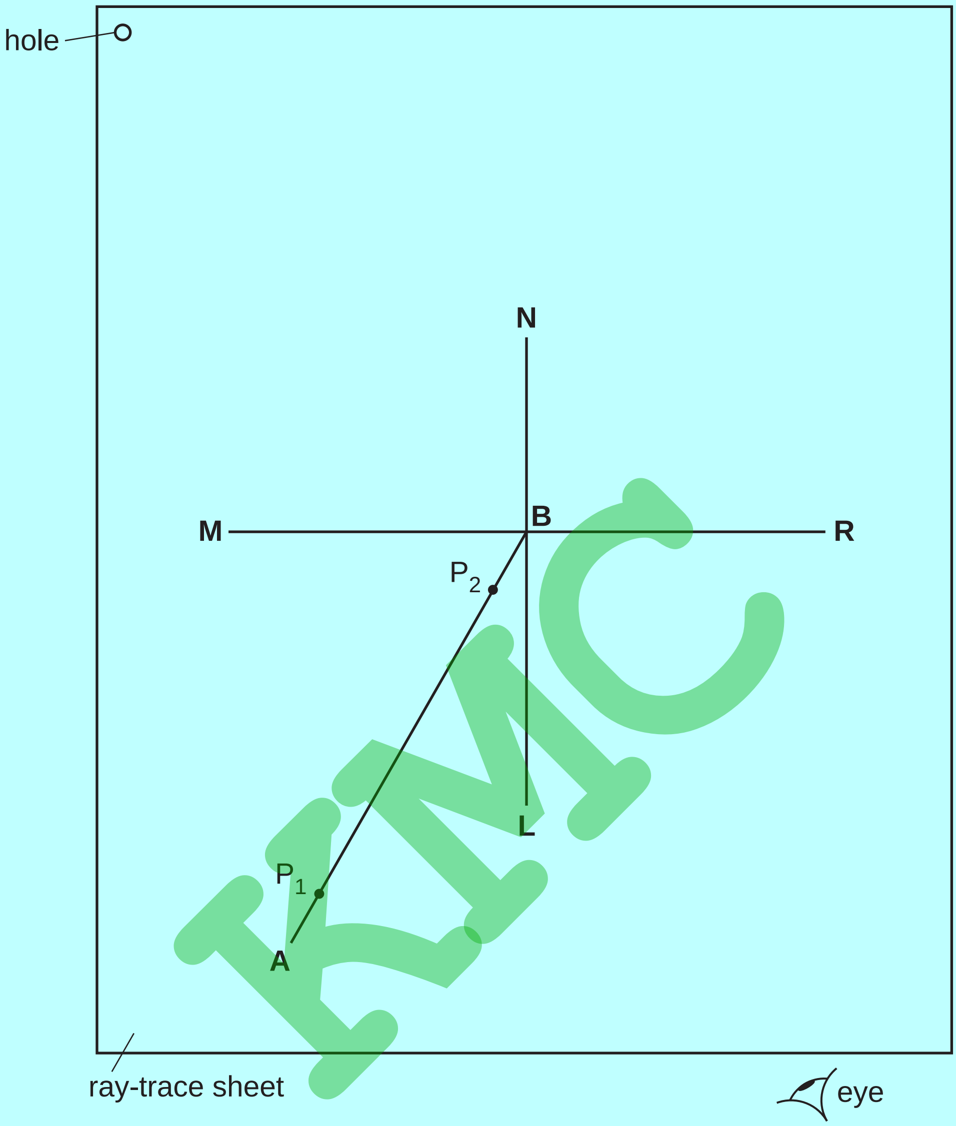

Fig. 3.1

(a) **(i)** Draw a line 10 cm long near the middle of the ray-trace sheet. Label the line **MR**. Draw a normal to this line that passes through the centre of **MR**. Label the normal **NL**. Label the point at which **NL** crosses **MR** with the letter **B**. [1]

(ii) Draw a line 7.0 cm long from **B** at an angle of incidence *i* = 30° to the normal below **MR** and to the left of the normal. Label the end of this line **A**. [1]

(iii) Place a pin P_1 on line **AB** at a distance 6.0 cm from **B**.

Place a pin P_2 on line **AB** close to **MR**. [1]

(b) **(i)** Place the reflecting face of the mirror vertically on the line **MR**.

View the images of pins P_1 and P_2 from the direction indicated by the eye in Fig. 3.1.

Place two pins P_3 and P_4 some distance apart so that pin P_3 and the images of P_2 and P_1 all appear exactly behind pin P_4. Label the positions of P_3 and P_4.

Remove the pins and the mirror and draw the line joining the positions of P_3 and P_4. [1]

(ii) Continue the line until it extends at least 7.0 cm beyond **MR**. [1]

(c) Replace pin P_1 on line **AB** at a distance 6.0 cm from **B**.

Place pin P_2 1.0 cm to the right of its position in part **(a)**.

Repeat the steps in part **(b)**.

Label with the letter **Y** the point where the two lines cross beyond **MR**.

(i) Draw a line from P_1 to **MR** that meets **MR** at a right angle. Measure and record the length *a* of this line.

a = ... [1]

(ii) Draw a line from the point labelled **Y** to **MR** that meets **MR** at a right angle. Measure and record the length *b* of this line.

b = ... [1]

(d) **(i)** Replace the mirror on **MR**. Place pin P_1 on the normal at a distance 6.0 cm from the front of the mirror.

View the image of P_1 in the mirror.

Place pin P_2 on the normal behind the mirror.

Adjust the position of P_2 along the normal so that the image of the bottom of the pin P_1 seen in the mirror and the top of pin P_2 seen over the mirror appear as one pin when viewed from all angles in front of the mirror.

Label the position of P_2.

[1]

(ii) Remove the pins and the mirror.

Measure the distance x along the normal between P_2 and the mirror.

x = ... [2]

(e) A student carries out this experiment with care.
Suggest a practical reason why the results may not be accurate.

....

.... [1]

Tie your ray-trace sheet into this booklet between pages 8 and 9.

[Total: 11]

4 A student investigates the effect of the colour of the surface of a metal container on the rate of loss of heat from the container. She knows that black surfaces are better radiators of thermal energy than white surfaces and wants to investigate the effect of other colours.

The following apparatus is available:

metal containers each with the outer surface painted a different colour
a thermometer
a stop-watch
a supply of hot water.

She can also use other apparatus and materials that are usually available in a school laboratory.

Plan an experiment to investigate the effect of the colour of the surface of a metal container on the rate of loss of heat from the container. You are **not** required to carry out this investigation.

You should:

- draw a diagram of the apparatus used
- explain briefly how you would carry out the investigation
- state the key variables that you would control
- draw a table, or tables, with column headings, to show how you would display your readings (you are **not** required to enter any readings in the table)
- explain how you would use your readings to reach a conclusion.

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[Total: 7]

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CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

PHYSICS **0625/52**

Paper 5 Practical Test **May/June 2020**

1 hour 15 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION
- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

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DC (LK/SW) 195014/2

1 In this experiment, you will investigate the period of a pendulum. Carry out the following instructions, referring to Fig. 1.1 and Fig. 1.2.

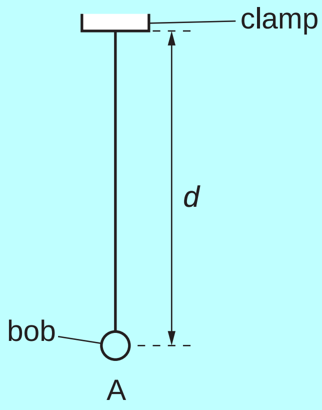

Fig. 1.1

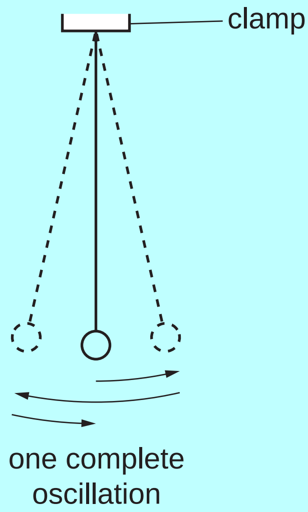

Fig. 1.2

A pendulum labelled A has been set up for you as shown in Fig. 1.1.

(a) Adjust the length of the pendulum until the distance *d* measured from the bottom of the clamp to the centre of the bob is 50.0 cm.

Explain how you used the metre rule and set square to measure the length *d* as accurately as possible. You may draw a diagram.

....

.... [1]

(b) Displace the bob slightly and release it so that it swings. Fig. 1.2 shows one complete oscillation of the pendulum.

(i) Measure the time t_1 for 10 complete oscillations.

t_1 = ... [1]

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

T_1 = ... [1]

(c) Adjust the pendulum until the distance d is 100.0 cm.

Repeat the procedure in **(b)**.

t_2 = ...

T_2 = ...
[2]

(d) Remove the pendulum from the clamp. Using the balance provided, measure the mass m_A of the pendulum. The mass includes the pendulum bob and the thread.

m_A = ... g [1]

(e) Using the balance, measure the mass m_B of pendulum B.

m_B = ... g [1]

(f) Hang pendulum B from the clamp. Adjust the length of the pendulum until the distance d is 50.0 cm.

(i) Repeat the procedure in **(b)** and **(c)**.

Distance d = 50.0 cm:

t_3 = ...

T_3 = ...

Distance d = 100.0 cm:

t_4 = ...

T_4 = ...
[1]

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

....

.... [1]

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

☐ the period T is affected by d only

☐ the period T is affected by both d and m

☐ the period T is affected by m only

☐ the period T is not affected by d or m

[1]

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

....

.... [1]

[Total: 11]

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2 In this experiment, you will investigate how the potential difference across a resistance wire varies with the length of the wire.

Carry out the following instructions, referring to Fig. 2.1.

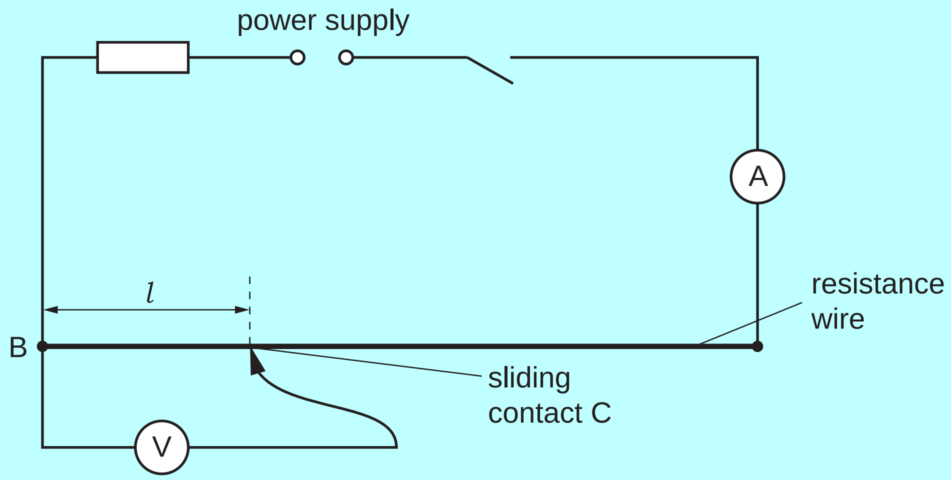


Fig. 2.1

(a)

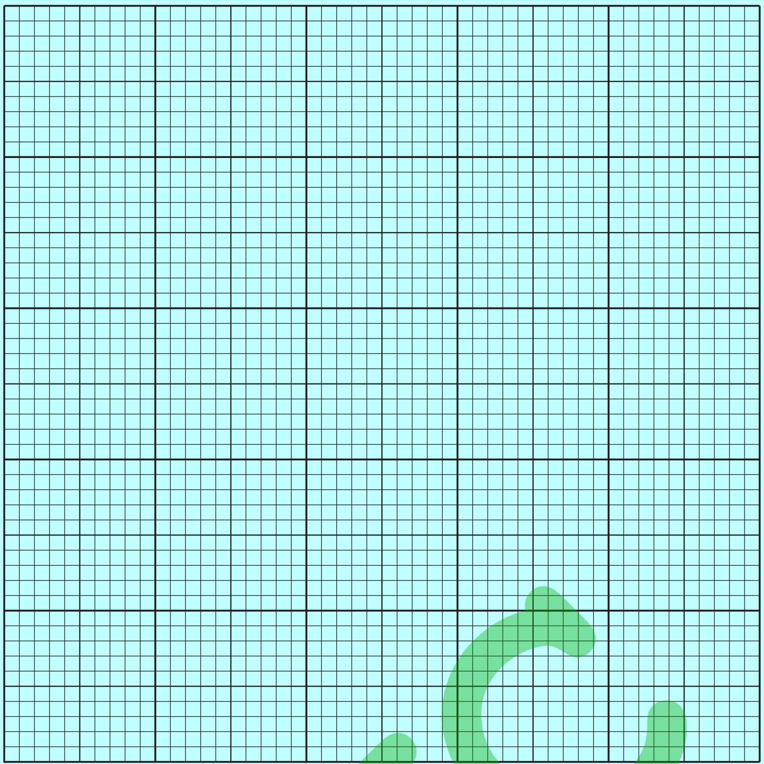
- Switch on.
- Place the sliding contact C on the resistance wire at a distance l = 10.0 cm from B.
- Measure, and record in Table 2.1, the potential difference V across the length l of the resistance wire.
- Measure, and record in Table 2.1, the current I in the circuit.
- Repeat the procedure using l = 30.0 cm, 50.0 cm, 70.0 cm and 90.0 cm.
- Switch off.

Table 2.1

l/cm	V/V	I/A
10.0		
30.0		
50.0		
70.0		
90.0		

[3]

(b) Plot a graph of V / V (y-axis) against l / cm (x-axis). Start both axes at the origin (0,0).



[4]

(c) **(i)** Write a conclusion about the value of the current I in the circuit as the position of the sliding contact C is changed.

....

.... [1]

(ii) Justify your conclusion by reference to your results.

....

.... [1]

(d) Using the graph, determine the potential difference V_L when the length l = 60.0 cm.

Show clearly on the graph how you obtained your result.

V_L = ... [2]

[Total: 11]

3 In this experiment, you will investigate some thermal properties of sand and water.

Carry out the following instructions referring to Fig. 3.1.

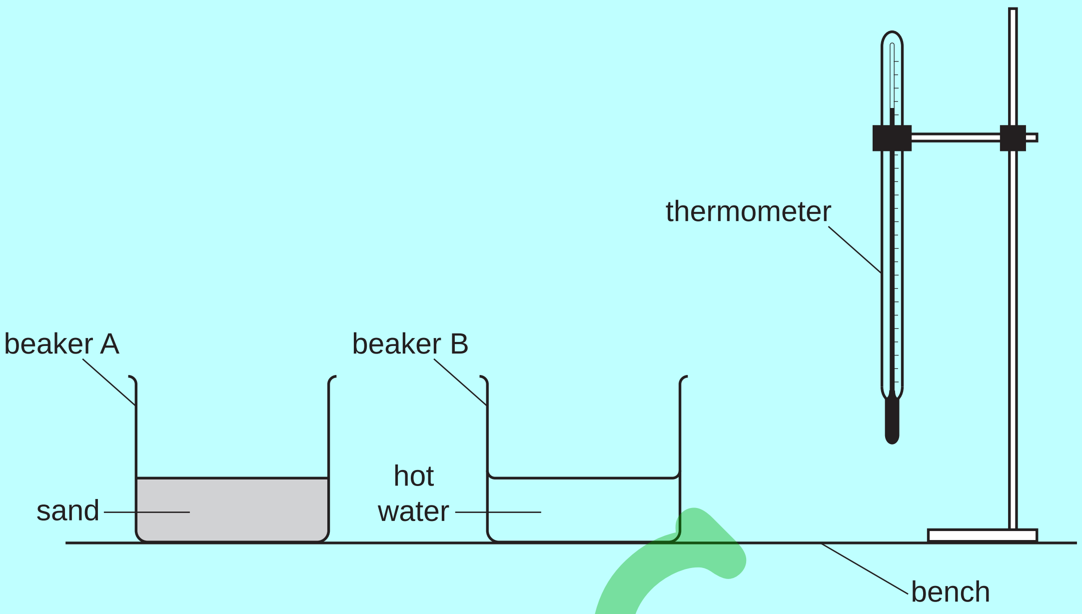


Fig. 3.1

(a) Use the thermometer to measure room temperature θ_S.

θ_S = ...

Use the thermometer to measure the temperature θ_H of the hot water in beaker B.

θ_H = ...
[1]

(b) Beaker A contains sand. Pour 100 cm^3 of hot water from beaker B into beaker A. Carefully stir the water and sand mixture.

Record the highest temperature θ_M of the mixture.

θ_M = ... [1]

(c) **(i)** Calculate the rise in temperature θ_R of the sand using the equation $\theta_R = (\theta_M - \theta_S)$.

θ_R = ...

Calculate the fall in temperature θ_F of the hot water using the equation $\theta_F = (\theta_H - \theta_M)$.

θ_F = ... [1]

(ii) Calculate the ratio S using the equation $S = \dfrac{\theta_R}{\theta_F}$.

S = ... [1]

(d) Measure the new temperature θ_H of the hot water supplied.

θ_H = ... [1]

(e) Beaker C contains water at room temperature. Pour $100\,cm^3$ of the hot water into beaker C. Carefully stir the water.

Record the highest temperature θ_M of the mixture.

θ_M = ... [1]

(f) Calculate the rise in temperature θ_R of the cold water using the equation $\theta_R = (\theta_M - \theta_S)$. Use the value of room temperature θ_S recorded in **(a)** and the value of θ_M recorded in **(e)**.

θ_R = ...

Calculate the fall in temperature θ_F of the hot water using the equation $\theta_F = (\theta_H - \theta_M)$. Use the value of θ_H from **(d)** and θ_M from **(e)**.

θ_F = ...

Calculate the ratio W using the equation $W = \dfrac{\theta_R}{\theta_F}$.

W = ...
[1]

(g) A student studies the thermal properties of sand and water. He predicts that S should be equal to $6 \times W$.

State whether your results support the prediction. Justify your answer by reference to your readings.

statement ....

justification ....

....

....
[2]

(h) Suggest **two** temperatures that it would be sensible to keep constant when carrying out the experiments.

1. ....

2. ....

[2]

[Total: 11]

4 A student investigates the bending of 1 m length strips of different materials. She compares how far they bend when loaded at one end.

Plan an experiment to investigate how the material from which the strips are made affects the bending of the strips when loaded at one end.

You are **not** required to carry out this experiment.

The following apparatus is available to the student:

strips of wood, plastic, steel and aluminium, all 1 m long
a set of slotted masses
a metre rule
a G-clamp (used to hold the strips to the laboratory bench).

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

In your plan, you should:

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

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[Total: 7]

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CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 4 4 7 8 5 8 5 6 0 9 *

PHYSICS **0625/53**

Paper 5 Practical Test **May/June 2020**

1 hour 15 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

For Examiner's Use	
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2	
3	
4	
Total	

This document has **12** pages. Blank pages are indicated.

DC (CJ/CGW) 195056/3

[Turn over

1 In this experiment, you will determine the weight of a metre rule.
Carry out the following instructions, referring to Fig. 1.1.

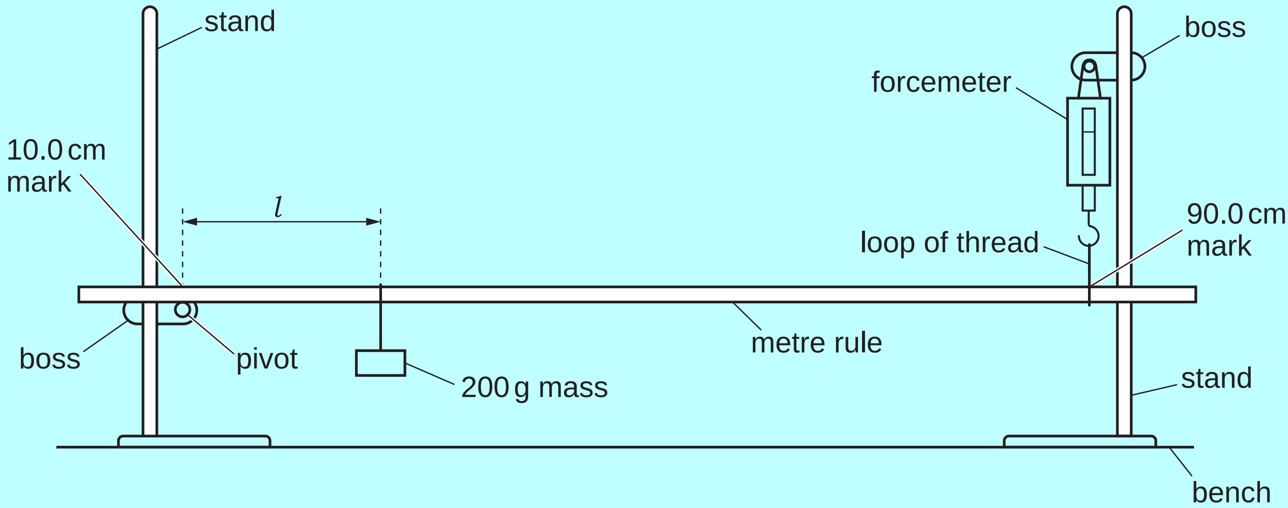

Fig. 1.1

(a) (i) Ensure that the 10.0 cm mark on the metre rule is immediately above the pivot and that the metre rule is suspended from the forcemeter at the 90.0 cm mark.
The metre rule should always be in this position before taking a reading.

Move the 200 g mass to a distance l = 20.0 cm from the pivot as shown in Fig. 1.1.
Adjust the height of the clamp holding the pivot so that the metre rule is horizontal.

Read, and record in Table 1.1, the forcemeter reading *F*.

Repeat this procedure for values of l = 30.0 cm, 40.0 cm, 50.0 cm and 60.0 cm.

Table 1.1

l / cm	*F* / N
20.0	
30.0	
40.0	
50.0	
60.0	

[2]

(ii) Explain how you made sure that the metre rule was horizontal before each reading was taken.
You may draw a diagram.

....

....

.... [1]

(b) Plot a graph of F / N (y-axis) against l / cm (x-axis).
Start your axes from the origin (0,0).

[4]

(c) **(i)** From your graph determine F_0, the value of F when $l = 0$.

F_0 = ... [1]

(ii) Calculate the weight W_R of the metre rule, using the equation $W_R = 2 \times F_0$.
Give W_R to a suitable number of significant figures for this experiment.

W_R = ... [2]

(d) A student carrying out this experiment places the 200 g mass on the metre rule instead of hanging it from the loop of thread.

Suggest which of these is likely to be the more accurate method.
Explain your answer by reference to the procedure.

....

....

.... [1]

[Total: 11]

2 In this experiment, you will investigate a circuit containing different combinations of resistors.
The circuit has been set up for you.
Carry out the following instructions, referring to Fig. 2.1.

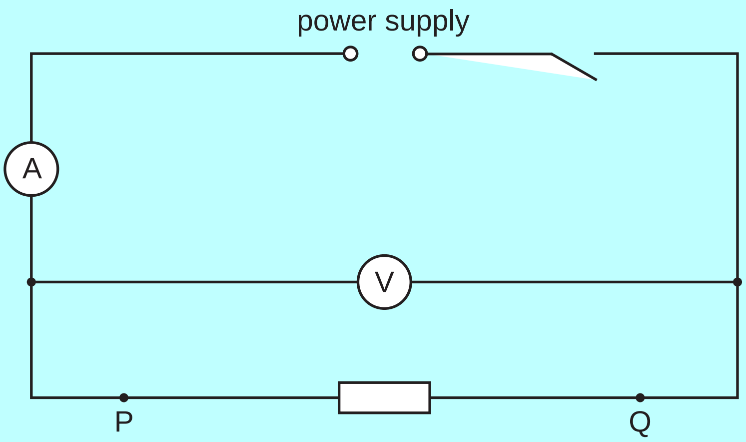

Fig. 2.1

(a) (i) Switch on.

Measure the potential difference V_1 and the current I_1 in the circuit.

V_1 = ...

I_1 = ... [1]

Switch off.

(ii) Calculate a resistance R_1 using your values from **(a)(i)** and the equation $R_1 = \frac{V_1}{I_1}$.

R_1 = ... [1]

(b) (i) Connect both resistors in series between terminals P and Q as shown in Fig. 2.2.

Fig. 2.2

Switch on.

Measure the potential difference V_2 and the current I_2 in the circuit.

V_2 = ...

I_2 = ... [1]

Switch off.

(ii) Calculate a resistance R_2 using your values from **(b)(i)** and the equation $R_2 = \dfrac{V_2}{(I_2 \times 2)}$.

R_2 = ... [1]

(c) (i) Connect both resistors in **parallel** between terminals P and Q as shown in Fig. 2.3.

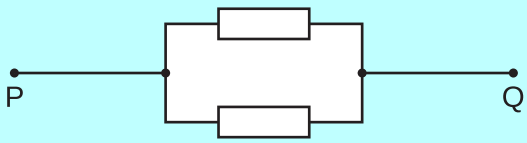

Fig. 2.3

Switch on.

Measure the potential difference V_3 and the current I_3 in the circuit.

V_3 = ...

I_3 = ... [1]

Switch off.

(ii) Calculate a resistance R_3 using your values from **(c)(i)** and the equation $R_3 = \dfrac{(V_3 \times 2)}{I_3}$.

R_3 = ... [1]

(d) A student suggests that R_1, R_2 and R_3 should be equal.
State whether your results support this suggestion. Justify your statement with reference to your results.

statement ....

justification ....

.... [2]

(e) **(i)** A student wants to determine R_1 by using a variable resistor to control the current in the circuit. Complete the circuit in Fig. 2.4 to show a variable resistor connected for this purpose. You are **not** required to do this experiment.

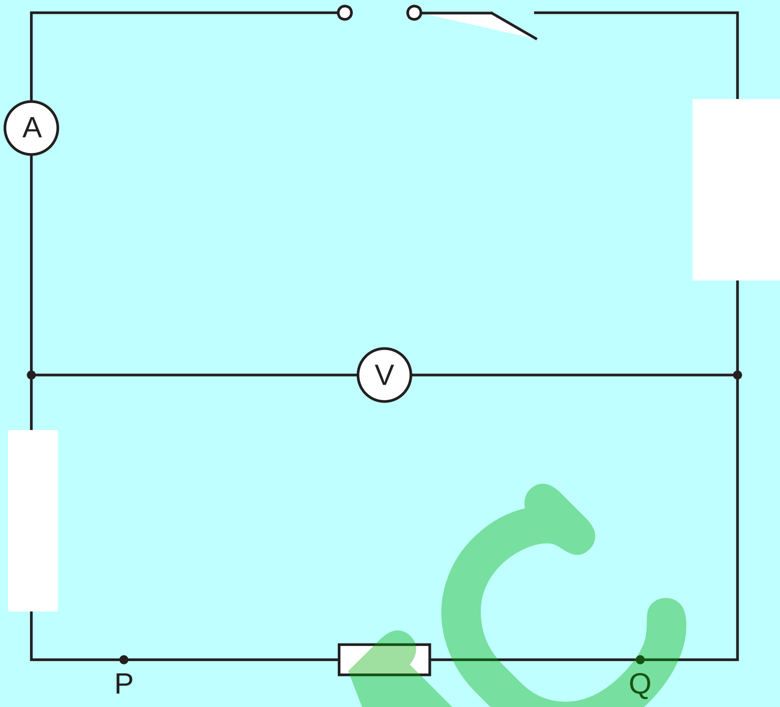

Fig. 2.4

[2]

(ii) Briefly explain how using the circuit in Fig. 2.4 will give a more reliable value for R_1 than using the procedure you were asked to carry out in **(a)**.

....

....

.... [1]

[Total: 11]

3 In this experiment you will determine the focal length of a converging lens.
Carry out the following instructions, referring to Fig. 3.1.

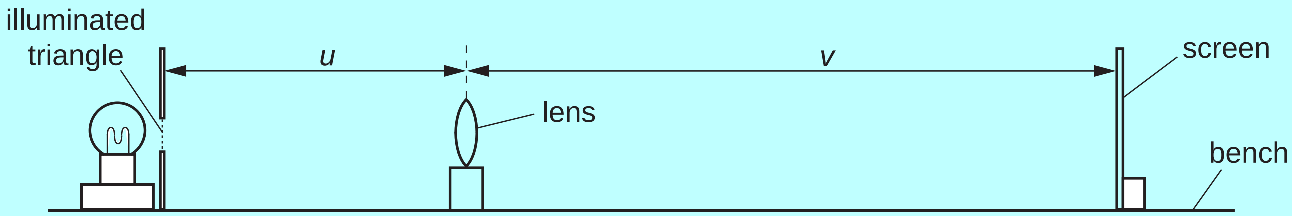

Fig. 3.1

Method 1

(a) Arrange the apparatus as shown in Fig. 3.1.

Place the lens a distance u = 20.0 cm from the illuminated triangle.

Place the screen near the lens.

Move the screen until a sharp image of the triangle is seen on the screen.

(i) Measure the distance v between the lens and the screen as indicated in Fig. 3.1.

v = ... [1]

(ii) Calculate a value f_1 for the focal length of the lens. Use the equation

$$f_1 = \frac{uv}{(u + v)}.$$

f_1 = ... [1]

Method 2

(b) **Keep the screen in the same position so that the values of *u* and *v* are the same as in (a).**

(i) Move the lens closer to the screen until another sharp image of the triangle is seen on the screen.

Fig. 3.2

Measure the new distance *u* between the illuminated triangle and the lens as indicated in Fig. 3.2.

u = ...

Measure the new distance *v* between the lens and the screen.

v = ...
[2]

(ii) Calculate a second value f_2 for the focal length of the lens. Use the equation

$$f_2 = \frac{uv}{(u + v)}.$$

f_2 = ... [1]

Method 3

(c) **Keep the screen in the same position so that the values of *u* and *v* are the same as in (b).**

(i) Measure h_O, the height of the illuminated triangle, as indicated in Fig. 3.2.

h_O = ...

Measure h_I, the height of the image of the triangle on the screen.

h_I = ...
[1]

(ii) Calculate a value M for the magnification, using the equation $M = \dfrac{h_I}{h_O}$.

M = ... [1]

(iii) Calculate a third value f_3 for the focal length of the lens.
Use your value of v from **(b)(i)** and the equation

$$f_3 = \frac{v}{(M + 1)} .$$

f_3 = ... [1]

(d) State **one** precaution that you took to ensure that the **measurements** of u and v in this experiment are as reliable as possible.

....

.... [1]

(e) **(i)** Explain why **Method 3** is likely to produce a less accurate value for the focal length than **Method 1**.

....

....

.... [1]

(ii) Suggest **one** improvement to make **Method 3** more accurate.

....

....

.... [1]

[Total: 11]

4 A student investigates the factors affecting the electrical output of a solar cell. A solar cell is a device which transforms light energy into electrical energy.

Plan an experiment which will enable him to investigate how the potential difference across the terminals of the solar cell varies with the angle of the incident light.

You are **not** required to carry out the experiment.

The apparatus available includes:

a solar cell as shown in Fig. 4.1
a laboratory lamp.

In your plan, you should:

- list any additional apparatus needed
- state the key variables to be kept constant
- explain briefly how to carry out the experiment, including any precautions that must be taken to ensure reliable results
- draw a table, with column headings, to show how to display the readings (you are **not** required to enter any readings in the table)
- explain how to use the readings to reach a conclusion.

You may add to Fig. 4.1 or draw another diagram if it helps to explain your plan.

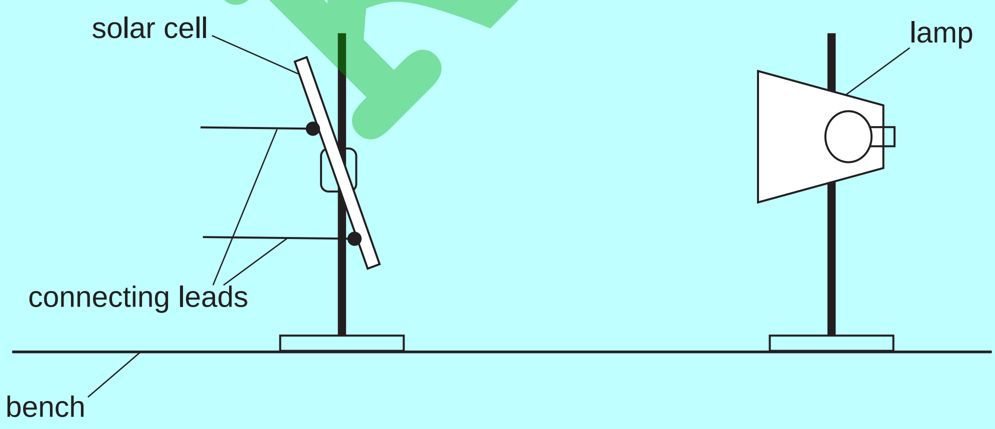

Fig. 4.1

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[Total: 7]

Cambridge Assessment International Education

Cambridge IGCSE™ (9–1)

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

* 5 9 6 1 2 3 4 4 0 5 *

BIOLOGY **0970/51**

Paper 5 Practical Test **May/June 2021**

1 hour 15 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

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DC (PQ) 210139

[Turn over

1 You are going to investigate the effect of the concentration of sugar solutions on osmosis in potato cells.

Read all the instructions but DO NOT CARRY THEM OUT until you have drawn a table for your results in the space provided in 1(a)(ii).

You should use the safety equipment provided while you are carrying out the practical work.

Step 1 Label four test-tubes **A**, **B**, **C** and **D** and put them into the test-tube rack.

Step 2 Use the volumes of 1 mol per dm^3 sugar solution and distilled water shown in Table 1.1 to make solutions containing different concentrations of sugar in each test-tube.

Use the syringes provided to make your solutions.

(a) **(i)** Complete Table 1.1 by writing in the concentration of the sugar solution in test-tube **C**.

Table 1.1

test-tube	volume of 1 mol per dm^3 sugar solution / cm^3	volume of distilled water / cm^3	concentration of sugar solution / mol per dm^3
A	20	0	1.0
B	12	8	0.6
C	8	12	
D	0	20	0.0

[1]

Step 3 Put the potato cylinders on a white tile and cut each cylinder to exactly 40 mm in length.

Step 4 Add one potato cylinder to each of test-tubes **A**, **B**, **C** and **D**.

Step 5 Leave the potato cylinders in the test-tubes for 20 minutes.

While you are waiting continue with the other questions.

Step 6 After 20 minutes empty the contents of test-tube **A** into the container labelled **waste**.

Step 7 Use the forceps to remove the potato cylinder from the waste container and place it on the white tile.

Step 8 Measure the length of the potato cylinder from test-tube **A** and record this measurement, in **millimetres**, in your table in **1(a)(ii)**. Put the potato cylinder from test-tube **A** onto a paper towel.

Step 9 Repeat steps 6, 7 and 8 for the potato cylinders in test-tubes **B**, **C** and **D**.

(ii) Prepare a table to record your results in the space provided.

[4]

(iii) Explain why it was important that the potato cylinders were all cut to the same length in step 3.

....

....

.... [1]

(iv) Identify the variable that you changed in this investigation (independent variable).

.... [1]

(v) Suggest **two** improvements that you could make to the method you have used in this investigation.

1 ....

....

2 ....

....
[2]

(vi) Describe **one** safety precaution you took while preparing the potato cylinders in step 3.

....

....

.... [1]

(b) Plan an investigation to find out the effect of temperature on osmosis in plant tissue.

....

....

....

....

....

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....

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....

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....

....

.... [6]

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(c) Potato cells contain starch grains.

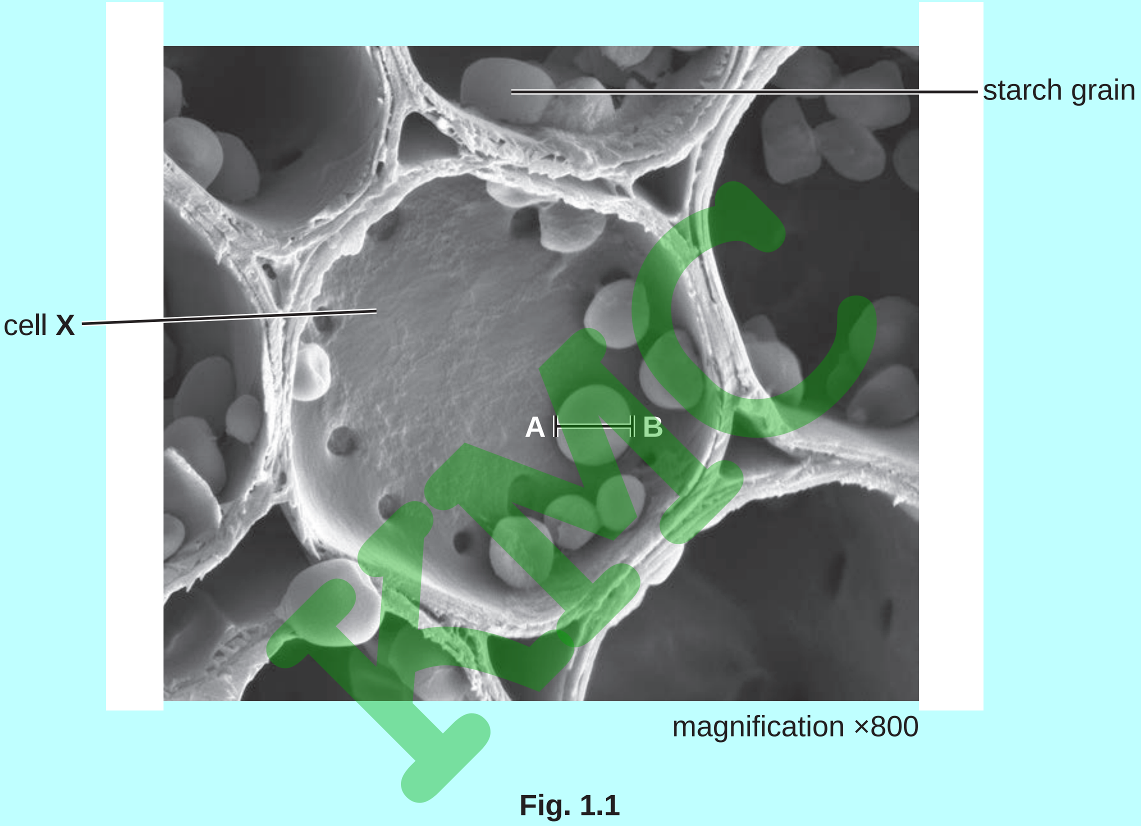
(i) State the solution that would be used to test for the presence of starch and give the result of a positive test.

solution ....

positive test result ....

.... [2]

Fig. 1.1 is a photomicrograph of some plant cells that contain starch grains.



magnification ×800

Fig. 1.1

(ii) Draw a large diagram of cell **X** in Fig. 1.1.

Label **one** starch grain on your drawing.

[5]

(iii) Line **AB** represents the diameter of the starch grain. Measure the length of line **AB** on Fig. 1.1.

length of line **AB** .... mm

Calculate the actual diameter of the starch grain using your measurement for line **AB**, the information in Fig. 1.1 and the formula:

$$\text{magnification} = \frac{\text{length of line } \mathbf{AB} \text{ on Fig. 1.1}}{\text{actual diameter of the starch grain}}$$

Give your answer to **two** significant figures.

....

[3]

[Total: 26]

2 **(a)** A student monitored their pulse rate after exercise. The student's pulse rate before exercise was 62 beats per minute.

The results are shown in Table 2.1.

Table 2.1

time after exercise / minutes	pulse rate / beats per minute
0	156
1	108
2	78
3	66
4	62
5	62

(i) Plot a line graph on the grid of the data in Table 2.1. Include a line of best fit.

[4]

(ii) Describe the relationship shown in your graph, between pulse rate and time after exercise.

....

....

....

....

.... [2]

(iii) Calculate the percentage change in pulse rate from 0 minutes to 5 minutes using the data in Table 2.1.

Give your answer to **two** decimal places.

Space for working.

....%
[3]

(b) The student monitored their pulse rate after exercise on three separate days and calculated their average pulse rate from the data they collected.

The results are shown in Table 2.2.

Table 2.2

time after exercise / minutes	pulse rate / beats per minute			average pulse rate / beats per minute
	day 1	day 2	day 3	
0	156	154	158	156
1	108	107	106	107
2	78	80	76	78
3	66	67	65	66
4	62	120	64	63
5	62	60	61	61

Explain why the student correctly calculated the average pulse rate at 4 minutes after exercise as 63 beats per minute rather than 82 beats per minute.

....

....

....

.... [2]

(c) Fig. 2.1 shows a cross-section of an artery and a vein as seen using a light microscope.

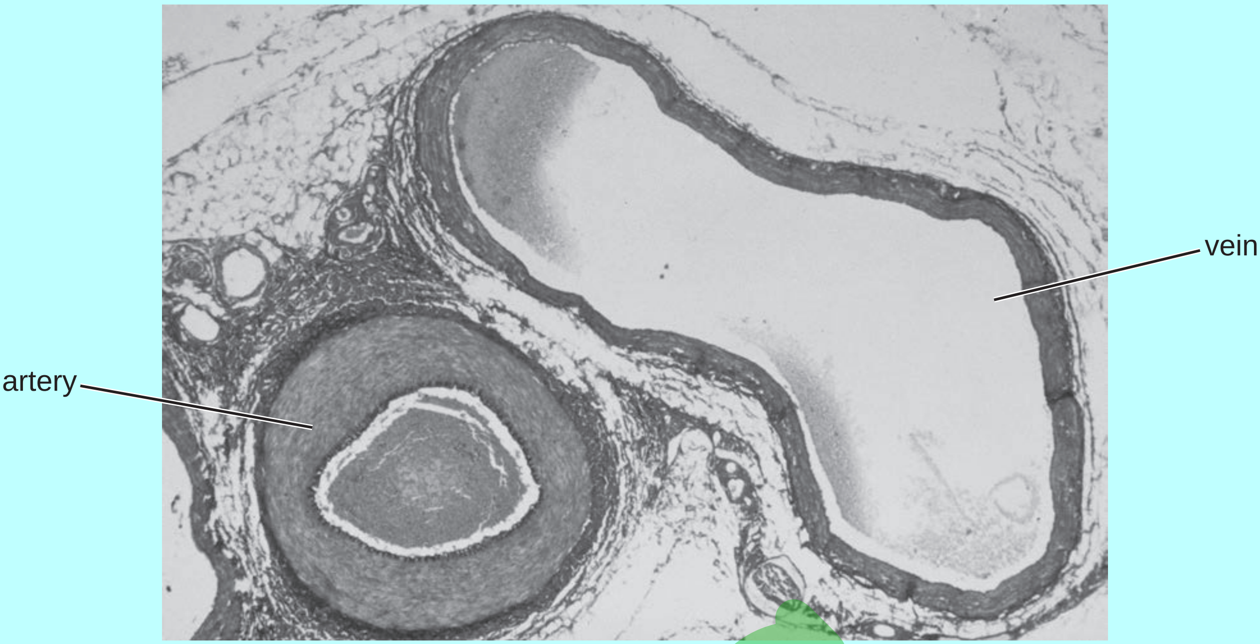


Fig. 2.1

State **one** visible similarity and **two** visible differences between the artery and the vein shown in Fig. 2.1.

similarity ....

....

difference 1 ....

....

difference 2 ....

....

[3]

[Total: 14]

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CANDIDATE NAME

CENTRE NUMBER

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PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2021**

1 hour 15 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
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- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

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1 In this experiment, you will investigate the period of a pendulum. Carry out the following instructions, referring to Fig. 1.1 and Fig. 1.2.

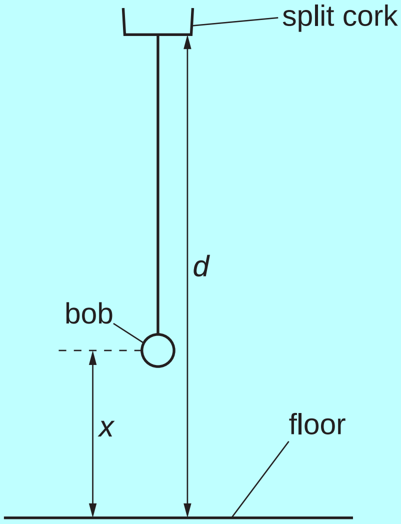


Fig. 1.1

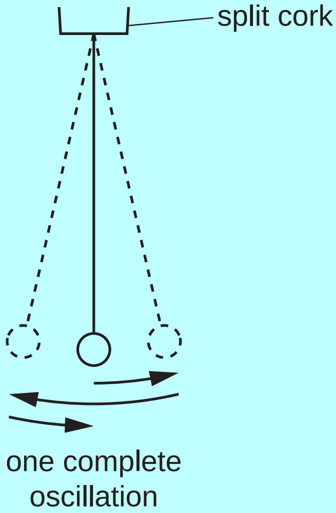


Fig. 1.2

A pendulum has been set up for you as shown in Fig. 1.1.

(a) Measure the distance *d* between the bottom of the split cork and the floor.

d = ... cm [1]

This distance *d* must remain constant throughout the experiment.

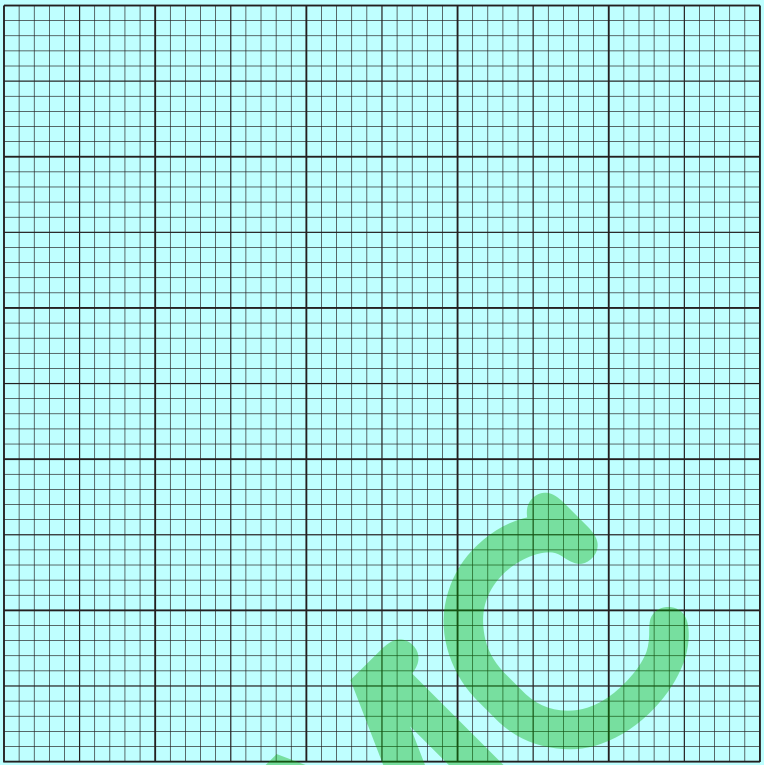
(b)
- Adjust the length of the pendulum until the distance *x*, measured from the centre of the bob to the floor, is 50.0 cm.
- Displace the bob slightly and release it so that it swings. Fig. 1.2 shows one complete oscillation of the pendulum.
- Measure, and record in Table 1.1, the time *t* for 10 complete oscillations.
- Calculate, and record in Table 1.1, the period *T* of the pendulum. The period is the time for one complete oscillation.
- Calculate, and record in Table 1.1, T^2. [2]

Table 1.1

x / cm	t / s	T / s	T^2 / s^2
50.0			
45.0			
40.0			
35.0			
30.0			

(c) Repeat the procedure in **(b)** using x = 45.0 cm, 40.0 cm, 35.0 cm and 30.0 cm. [3]

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



[4]

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

....

.... [1]

[Total: 11]

2 In this experiment, you will investigate resistance.

Carry out the following instructions, referring to Fig. 2.1. The circuit has been set up for you.

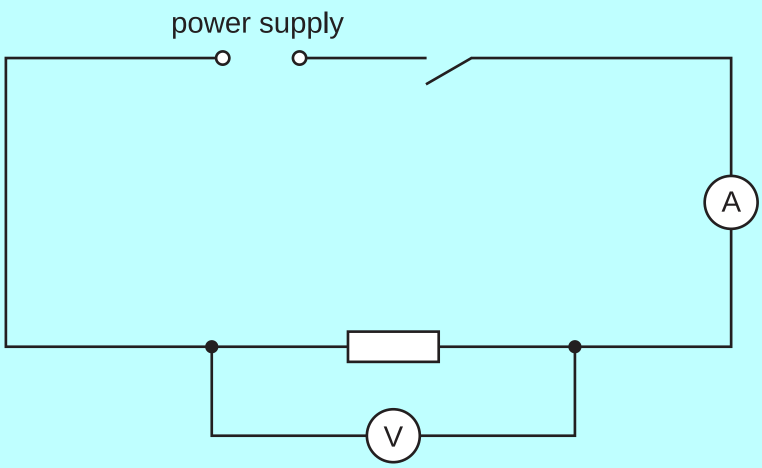


Fig. 2.1

(a) Close the switch.

(i) Record the current I_1 in the circuit.

I_1 = ... [1]

(ii) Record the potential difference (p.d.) V_1 across the resistor.

V_1 = ... [1]

Open the switch.

(iii) Calculate the resistance R_1 of the resistor using the equation $R_1 = \frac{V_1}{I_1}$.

R_1 = ... [1]

(b) Disconnect the voltmeter.

Connect the second resistor provided in **series** with the first resistor.

Connect the voltmeter across both resistors.

Close the switch.

- Record the current I_2 in the circuit.

I_2 = ...

- Record the potential difference (p.d.) V_2 across the resistors.

V_2 = ...

Open the switch.

- Calculate the resistance R_S of the resistors in series using the equation $R_S = \frac{V_2}{I_2}$.

R_S = ...

[2]

(c) Disconnect the voltmeter. Connect the second resistor in **parallel** with the first resistor.

Connect the voltmeter across both resistors.

Close the switch.

- Record the current I_3 in the circuit.

I_3 = ...

- Record the potential difference (p.d.) V_3 across the resistors.

V_3 = ...

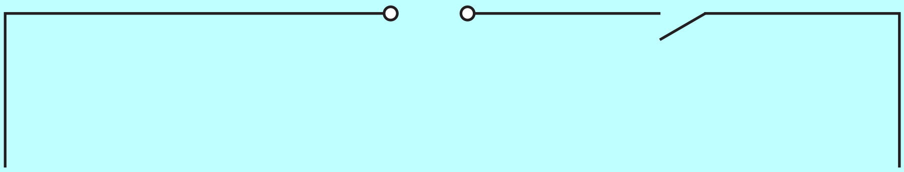
Open the switch.

- Calculate the resistance R_P of the resistors in parallel using the equation $R_P = \frac{V_3}{I_3}$.

R_P = ...

[2]

(d) Complete the circuit diagram to show the circuit you used in part **(c)**.



[2]

(e) Describe how you would extend part **(c)** of this experiment to investigate the relationship between the combined resistance of identical resistors connected in parallel and the number of resistors. You are **not** required to do this investigation.

....

....

....

.... [2]

[Total: 11]

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[Turn over

3 In this experiment, you will investigate the refraction of light in the material of a transparent block.

Carry out the following instructions, using the separate ray-trace sheet provided. You may refer to Fig. 3.1 for guidance.

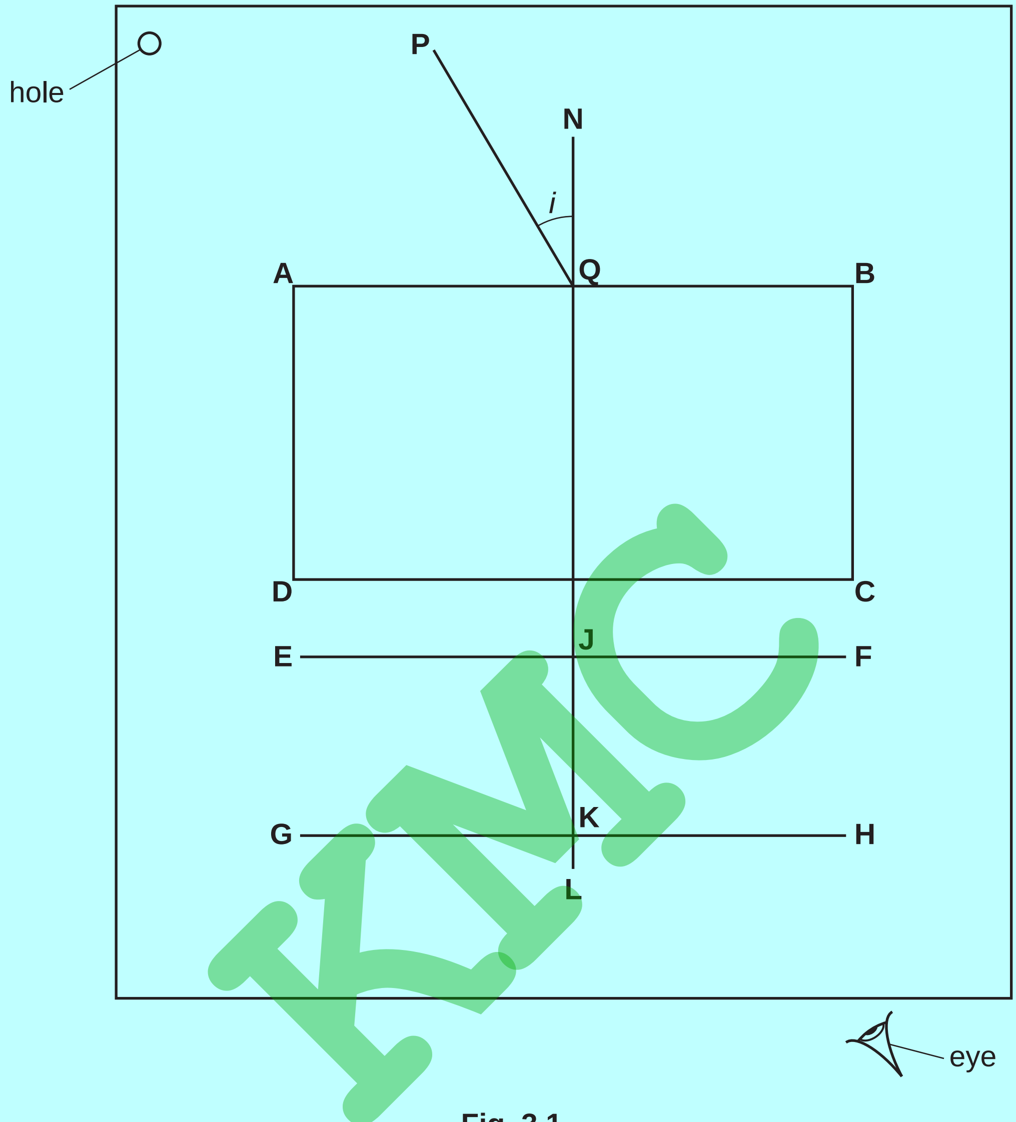

Fig. 3.1

(a)
- Place the transparent block, largest face down, on the ray-trace sheet supplied. The block should be approximately in the middle of the paper.
- Draw and label the outline of the block **ABCD**, as shown in Fig. 3.1.
- Remove the block and draw a normal at the centre of side **AB**. Continue the normal so that it passes through side **CD** of the block. Label the normal **NL**.
- Label the point **Q** where **NL** crosses **AB**.
- Draw a line **EF** parallel to **CD** and 2.0 cm below **CD**.
- Label the point **J** where **NL** crosses **EF**.
- Draw a line **GH** parallel to **CD** and 7.0 cm below **CD**.
- Label the point **K** where **NL** crosses **GH**.

[2]

(b)
- Draw the line **PQ** at an angle i = 30° to the normal as shown in Fig. 3.1.
- Place the paper on the pin board.
- Place two pins, P_1 and P_2, on line **PQ** at a suitable distance apart for this experiment.
- Replace the block and look from the position of the eye shown in Fig. 3.1 to observe the images of P_1 and P_2 through side **CD** of the block. Adjust your line of sight until the images of P_1 and P_2 appear one behind the other.
- Place a pin P_3 on line **EF** between your eye and the block so that the images of P_1 and P_2 seen through the block appear behind P_3.
- Place a pin P_4 on line **GH** between your eye and the block so that P_3, and the images of P_1 and P_2 seen through the block, appear behind P_4.
- Label the positions of P_1, P_2, P_3 and P_4.
- Remove the pins.

[2]

(c) **(i)** Measure and record the length a of the line from **J** to P_3.

a = ... [1]

(ii) Measure and record the length b of the line from **K** to P_4.

b = ... [1]

(iii) Calculate $\frac{b}{a}$.

$\frac{b}{a}$ = ... [2]

(d) State **one** precaution that you took in order to produce an accurate ray trace.

....

.... [1]

(e) A student plans to test the suggestion that, in this experiment, $\frac{b}{a}$ is a constant for all possible values of i. List suitable values of i that the student could use.

.... [2]

Tie your ray-trace sheet into this booklet between pages 8 and 9.

[Total: 11]

4 A student investigates the rate of cooling, in air, of heated blocks made of different metals. The temperature of each block is increased by placing it in hot water.

Plan an experiment to investigate how the rate of cooling depends on the metal from which each block is made.

You are **not** required to carry out this experiment.

The following apparatus is available to the student:

cylindrical blocks of different metals, each with a hole for a thermometer, as shown in Fig. 4.1
a thermometer.

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

In your plan, you should:

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

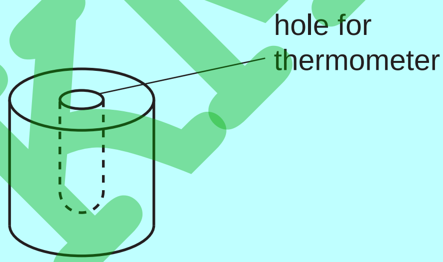

Fig. 4.1

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PHYSICS **0625/52**

Paper 5 Practical Test **May/June 2021**

1 hour 15 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

For Examiner's Use	
1	
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4	
Total	

This document has **12** pages. Any blank pages are indicated.

DC (PQ/SG) 199331/4

1 In this experiment, you will determine the density of sand.

Carry out the following instructions, referring to Fig. 1.1.

The beaker labelled A has a mark at the $250\,\text{cm}^3$ level.

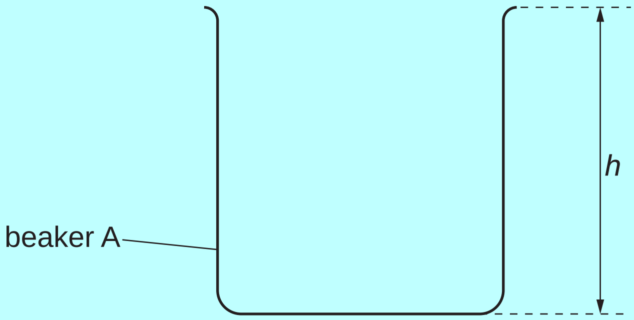

Fig. 1.1 (not to scale)

(a) Estimate the volume of water V_W that beaker A would hold when filled to the top.

V_W = ... cm^3 [1]

(b) **(i)** Use the string and the metre rule provided to accurately determine the circumference c of beaker A.

Record your readings and show your working.

c = ... cm [2]

(ii) Explain briefly how you used the string and the metre rule to determine c as accurately as possible. You may draw a diagram.

....

....

....

.... [2]

(c) Measure the height h of beaker A, as shown in Fig. 1.1.

h .... cm

Calculate the volume V_A of beaker A using the equation

$$V_A = \frac{hc^2}{12.6}.$$

V_A = ... cm^3 [2]

(d) **(i)** Beaker B contains dry sand. Pour the sand into the measuring cylinder.

- Record the volume V_S of sand.

V_S = ... cm^3

- Write down the mass m_B of beaker B, given on the card.

m_B = ... g

- Pour the sand into beaker B. Measure the mass m of beaker B containing the sand.

m = ... g

- Calculate the mass m_S of sand in the beaker. Use the equation $m_S = (m - m_B)$.

m_S = ... g
[2]

(ii) Calculate the density ρ of sand using the equation

$$\rho = \frac{m_S}{V_S}.$$

Include the unit.

ρ = ... [2]

[Total: 11]

2 In this experiment, you will investigate the position of the image in a plane mirror.

Carry out the following instructions. Use the ray-trace sheet supplied, referring to Fig. 2.1 for guidance.

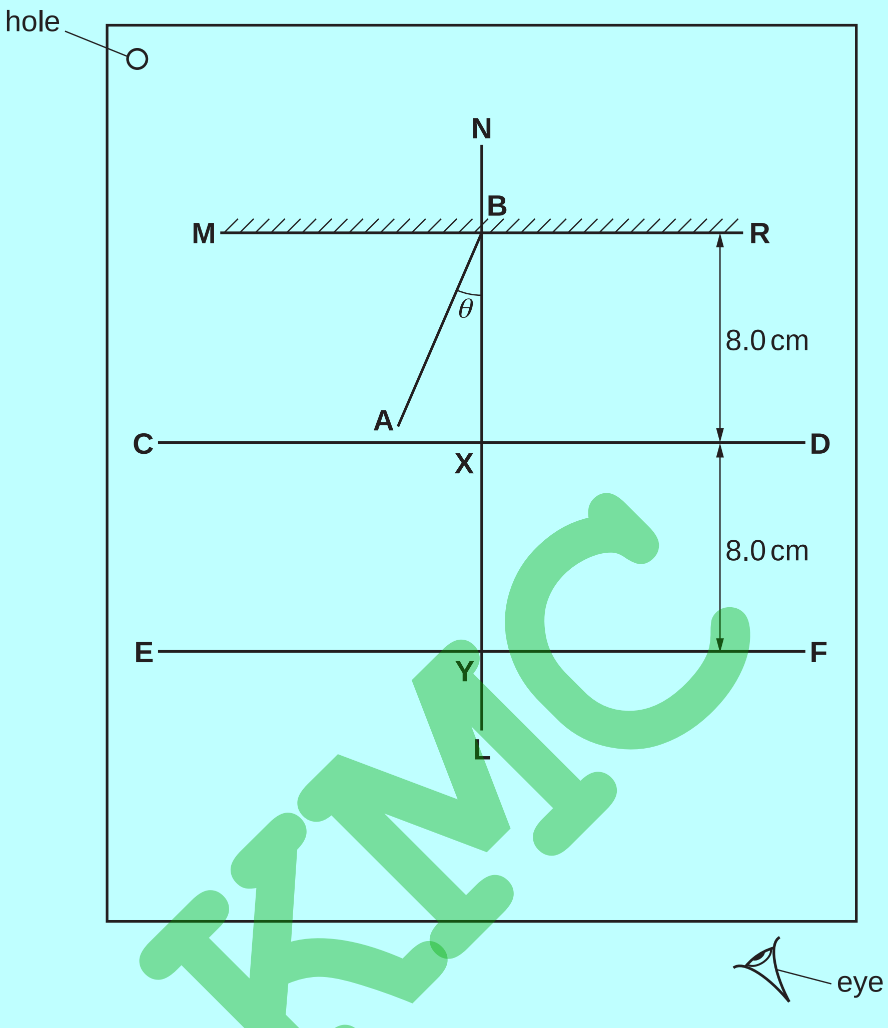

Fig. 2.1

(a)
- Draw a line 10 cm long near the top of the ray-trace sheet. Label the line **MR**. Draw a normal to this line that passes through its centre. Label the normal **NL**. Label the point at which **NL** crosses **MR** with the letter **B**.
- Draw a line **CD** 8.0 cm below **MR** and parallel to **MR**.
- Label the point **X** where **CD** crosses **NL**.
- Draw a line **EF** 8.0 cm below **CD** and parallel to **CD**.
- Label the point **Y** where **EF** crosses **NL**.

[2]

(b) • Draw a line 7.0 cm long from **B** at an angle of incidence $\theta_1 = 20°$ to the normal below **MR** and to the left of the normal. Label the end of this line **A**.

• Place two pins, P_1 and P_2, on line **AB** at a suitable distance apart for this type of ray-trace experiment.

[2]

(c) Place the reflecting face of the mirror vertically on the line **MR**.

View the images of pins P_1 and P_2 from the direction indicated by the eye in Fig. 2.1. Place pin P_3 on line **CD** so that the images of P_2 and P_1 appear exactly behind pin P_3. Label the position of P_3.

Place pin P_4 on line **EF** so that pin P_3, and the images of P_2 and P_1, all appear exactly behind pin P_4. Label the position of P_4.

[1]

(d) **(i)** Measure and record the distance a from **X** to P_3.

a = ... [1]

(ii) Measure and record the distance b from **Y** to P_4.

b = ... [1]

(iii) Calculate $\frac{a}{b}$.

$\frac{a}{b}$ = ... [1]

(e) • Repeat the steps in parts **(b)** and **(c)** using an angle of incidence $\theta_2 = 10°$.

• Measure and record the distance c from **X** to P_3.

c = ...

• Measure and record the distance d from **Y** to P_4.

d = ...

• Calculate $\frac{c}{d}$.

$\frac{c}{d}$ = ...

[1]

(f) State and explain whether the values of $\frac{a}{b}$ and $\frac{c}{d}$ can be considered to be equal in this experiment.

....

.... [1]

(g) A student carries out this experiment with care. Suggest a practical reason why the results may **not** be accurate.

....

.... [1]

Tie your ray-trace sheet into this booklet between pages 4 and 5.

[Total: 11]

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3 In this experiment, you will investigate resistance.

Carry out the following instructions, referring to Fig. 3.1.

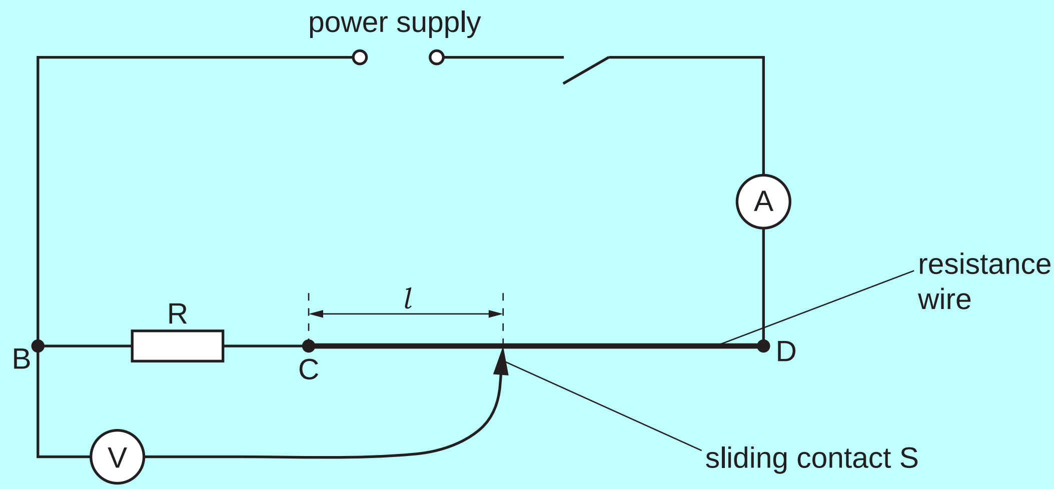


Fig. 3.1

(a) **(i)** Close the switch.

Measure the current I in the circuit.

I = ... [1]

(ii) Place the sliding contact S at C.

Measure the potential difference (p.d.) V_R across the resistor R.

V_R = ... [1]

Open the switch.

(iii) Calculate the resistance R of the resistor using the equation $R = \frac{V_R}{I}$.

R = ... [2]

(b) Disconnect the voltmeter from terminal B. Connect the voltmeter to terminal C. Close the switch.

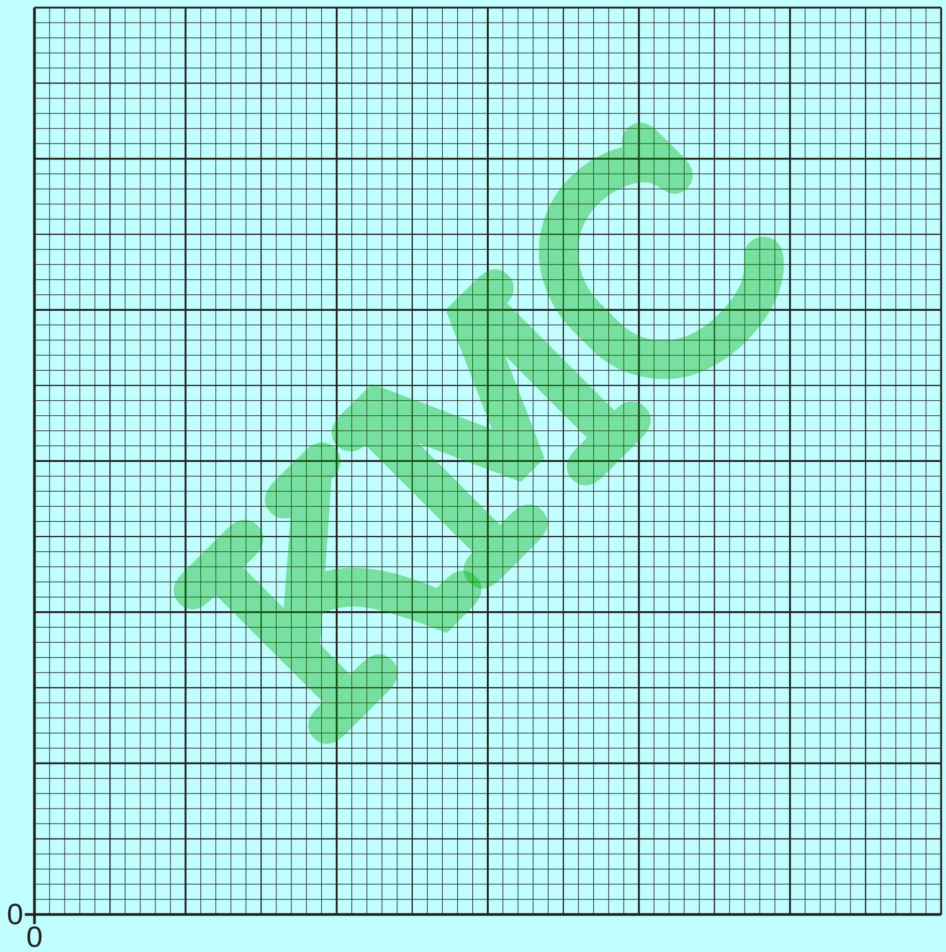
- Place the sliding contact S at a distance l = 20.0 cm from C.
- Measure, and record in Table 3.1, the reading on the voltmeter.
- Repeat the procedure using l = 40.0 cm, 60.0 cm, 80.0 cm and 100.0 cm. Open the switch.

Table 3.1

l / cm	V / V
20.0	
40.0	
60.0	
80.0	
100.0	

[1]

(c) Plot a graph of V / V (y-axis) against l / cm (x-axis). Start both axes at the origin (0,0).



[4]

(d) Use your value of V_R from **(a)(ii)** to find the length l_R of resistance wire that has the same resistance as resistor R. Show clearly on the graph how you obtained the necessary information.

l_R = ... cm [2]

[Total: 11]

4 A student investigates springs made from different metals.

Plan an experiment to investigate the extension of springs made from different metals.

You are **not** required to carry out this experiment.

The following apparatus is available:

boss, clamp and stand
metre rule
springs made from different metals
selection of loads with hangers.

You can also use other apparatus and materials that are usually available in a school laboratory.

In your plan, you should:

- write a list of suitable metals for the springs
- draw a diagram of the set up you would use
- explain briefly how to carry out the investigation
- state the key variables to keep constant
- draw a table, or tables, with column headings, to show how to display your readings (you are **not** required to enter any readings in the table)
- explain how you would use the readings to reach a conclusion.

....

....

....

....

[7]

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CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

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PHYSICS **0625/53**

Paper 5 Practical Test **May/June 2021**

1 hour 15 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION
- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

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This document has **16** pages. Any blank pages are indicated.

DC (PQ/SG) 199330/3

[Turn over

1 In this experiment, you will investigate the behaviour of a spring and use it to determine the density of modelling clay.

A stand and spring have been set up for you.

Carry out the following instructions, referring to Fig. 1.1 and Fig. 1.2.

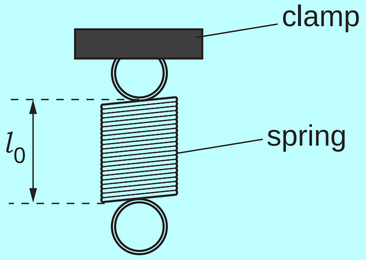


Fig. 1.1

(a) Measure the length l_0 of the spring without any load.

l_0 = ... cm [1]

(b) Suspend a load of weight W = 2.0 N from the spring, as shown in Fig. 1.2.

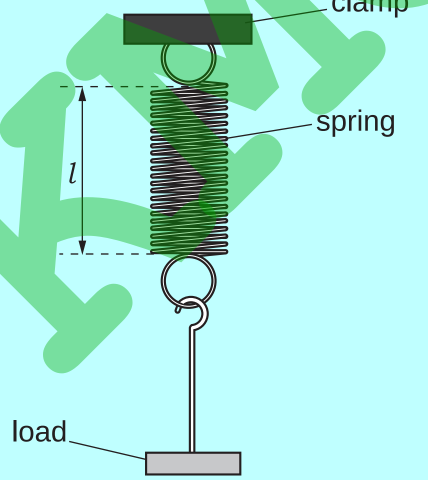


Fig. 1.2

(i) Measure the stretched length l of the spring.

l = ... cm [1]

(ii) Calculate the extension e of the spring for a load of weight W = 2.0 N.
Use your values from **(a)** and **(b)(i)** and the equation $e = (l - l_0)$.

e = ... cm [1]

(c) Remove the load from the spring.

Suspend the load U, which is made of modelling clay, from the spring.

Measure the stretched length l_U of the spring.

l_U = ...cm

Calculate the extension e_U of the spring with load U.

e_U = ...cm

The extension of a spring is directly proportional to the weight of the load.

Use your values of W and e from **(b)(ii)** and your value of e_U to determine the weight W_U of load U.
Show your working.

W_U = ...
[2]

(d) Fully immerse load U in the beaker of water, as shown in Fig. 1.3. The load U must **not** touch either the sides or the bottom of the beaker.

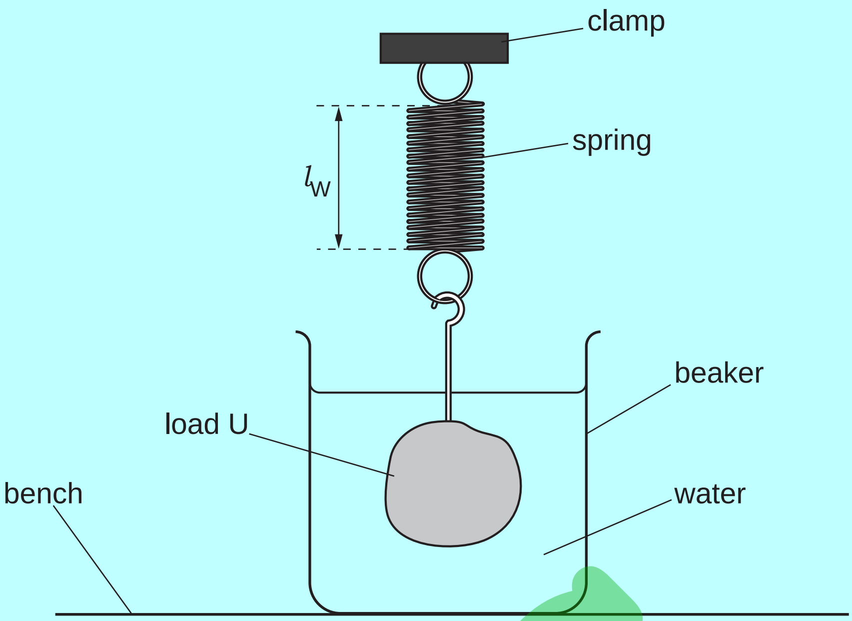


Fig. 1.3

Measure the stretched length l_W of the spring.

l_W = ... cm

Calculate the extension e_W of the spring with load U in the water.

e_W = ... cm

Calculate the density ρ of the modelling clay.
Use your value of e_U from **(c)**, your value of e_W and the equation

$$\rho = \frac{e_U}{(e_U - e_W)} \times k \text{, where } k = 1.0\,\mathrm{g/cm^3}.$$

ρ = ... $\mathrm{g/cm^3}$
[2]

(e) Suggest a possible source of inaccuracy in the determination of ρ in this experiment.

....

....

.... [1]

(f) Describe **one** precaution that you took when measuring the length of the spring, to ensure an accurate reading. You may draw a diagram.

....

.... [1]

(g) A student plots a graph of load against extension for the spring, to show that the two quantities are directly proportional.

State how his graph line shows that load and extension are directly proportional.

....

....

....

[2]

[Total: 11]

2 In this experiment, you will determine the electromotive force (e.m.f.) and resistance of a cell by using a resistance wire.

The circuit has been set up for you.

Carry out the following instructions, referring to Fig. 2.1.

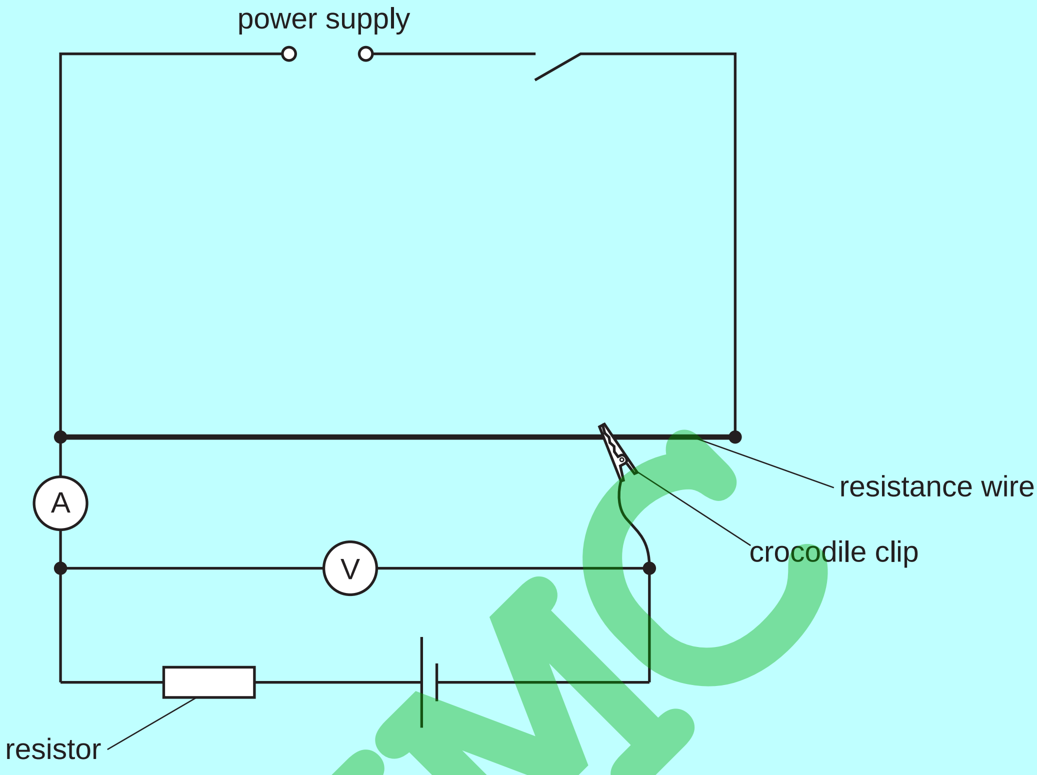


Fig. 2.1

(a) Close the switch.

Attach the crocodile clip to the resistance wire. Adjust its position until the value *V* of the potential difference (p.d.) across the cell and the resistor is 5.0 V.

Measure, and record in Table 2.1, the value of the current *I* for the cell and resistor in series.

Repeat this procedure for values of *V* = 4.5 V, 4.0 V, 3.5 V and 3.0 V. Detach the crocodile clip from the resistance wire.

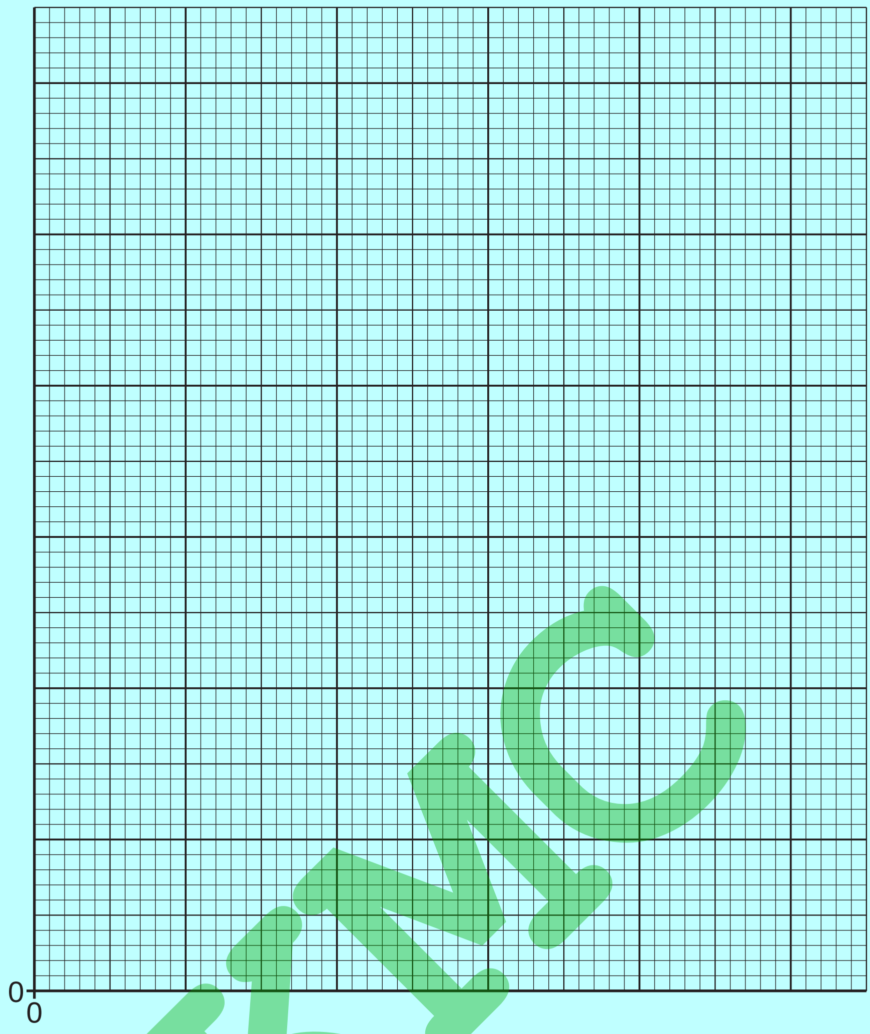
Open the switch.

Table 2.1

V / V	*I* / A
5.0	
4.5	
4.0	
3.5	
3.0	

[2]

(b) Plot a graph of I / A (y-axis) against V / V (x-axis). Start both axes at the origin (0,0).



[4]

(c) The e.m.f. E of the cell is equal to the value of V when I = 0.0 A.

Determine the value of E from the graph.

E = ... [1]

[Turn over

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

G = ... [1]

(ii) The value of $\frac{1}{G}$ is numerically equal to the resistance (r + R) where r is the resistance of the cell and R = 5.0 Ω.

Calculate the resistance r of the cell.

r = ... Ω [1]

(e) Suggest how the experiment and graph could be improved to obtain a more accurate value for e.m.f. E.

....

....

.... [2]

[Total: 11]

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3 In this experiment, you will investigate the refraction of light by a transparent block.
You will determine a quantity known as the refractive index of the material of the block.

Carry out the following instructions, using the separate ray-trace sheet provided. You may refer to Fig. 3.1 for guidance.

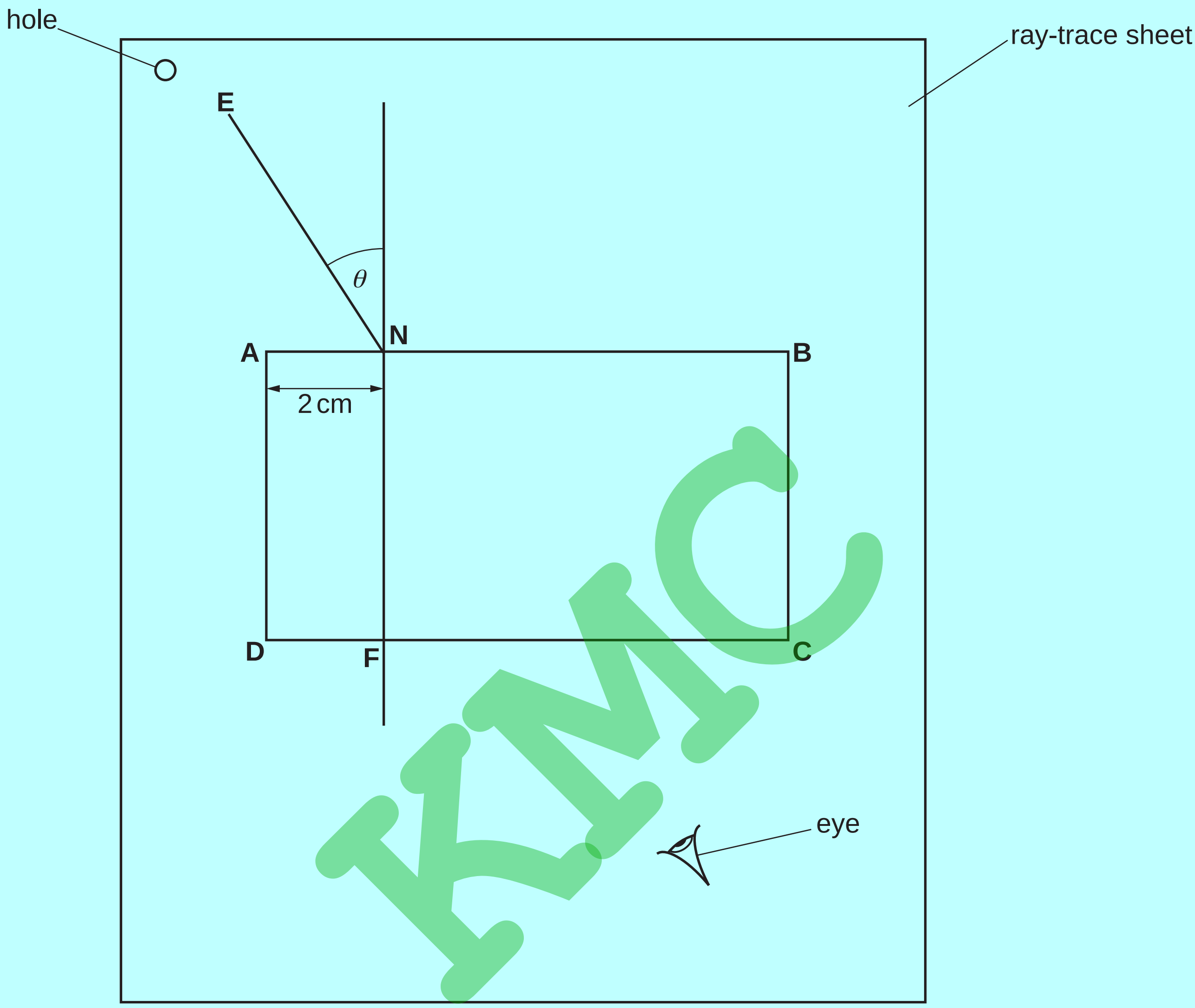

Fig. 3.1

(a)
- Place the block approximately in the centre of the ray-trace sheet. Carefully draw round the block and label the corners **ABCD** as indicated by Fig. 3.1.
- Remove the block from the ray-trace sheet.
- Draw a normal to line **AB** at a point **N**, 2 cm from **A**. Extend the normal downwards until it crosses the line **CD**. Label the point at which it crosses **CD** with the letter **F**.
- Draw a line **NE**, as indicated by Fig. 3.1, 8 cm long and at an angle θ_1 = 20°.

[1]

(b)
- Replace the block in exactly the same position as in **(a)**.
- Place two pins, P_1 and P_2, on line **NE**, a suitable distance apart for accurate ray tracing.
- Label the positions of P_1 and P_2.
- View the images of P_1 and P_2 through the block from the direction indicated by the eye in Fig. 3.1. Place two pins, P_3 and P_4, a suitable distance apart, so that pins P_3 and P_4, and the images of P_1 and P_2, all appear exactly one behind the other.
- Label the positions of P_3 and P_4.
- Remove the block and pins from the ray-trace sheet.
- Draw a line joining P_3 and P_4. Extend this line until it meets **NF**.
- Label the point at which this line meets **NF** with the letter **G**. Label the point at which this line crosses **CD** with the letter **H**.
- Draw a line joining points **N** and **H**.

[3]

(c) Measure the length a of line **NH**.

a = ... cm

Measure the length b of line **GH**.

b = ... cm

Calculate a value n_1 for the refractive index, using the equation $n_1 = \frac{a}{b}$.

n_1 = ...

[2]

(d) Draw a new line **NE**, as indicated by Fig. 3.1, 8 cm long and at an angle $\theta_2 = 40°$.

Repeat the steps in **(b)**.

(i) Measure the length c of the new line **NH**.

c = ... cm

Measure the length d of the new line **GH**.

d = ... cm

Calculate a second value n_2 for the refractive index, using the equation $n_2 = \frac{c}{d}$.

n_2 = ...

[1]

(ii) State whether n_1 or n_2 is likely to be the more accurate value.
Explain your answer.

statement ....

explanation ....

.... [1]

(e) **(i)** Measure the angle α, where α is the smaller angle between the line **GH** from **(b)** and the line **GH** from **(d)**.

α = ... [1]

(ii) A student suggests that the angle α should be equal to the difference between the angle θ_2 from **(d)** and the angle θ_1 from **(a)**.

State whether your results support this suggestion. Justify your answer by reference to your results.

statement ....

justification ....

.... [1]

(f) Suggest why different students, all carrying out this experiment carefully, may **not** obtain identical results.

....

.... [1]

Tie your ray-trace sheet into this booklet between pages 10 and 11.

[Total: 11]

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4 A student investigates the factors affecting the deflection of a wooden strip clamped at one end.

Plan an experiment which enables him to investigate how **one** factor affects the distance *D* that the free end of the wooden strip moves downwards when loads are placed on it.

You are **not** required to carry out the experiment.

The apparatus available includes:

a variety of wooden strips that can be clamped as shown in Fig. 4.1
a set of masses with a hanger.

In your plan, you should:

- list any additional apparatus needed
- state the key variables to be kept constant
- explain briefly how to carry out the experiment, including how *D* is to be measured and any precautions that must be taken to ensure reliable results
- draw a table, with column headings, to show how to display the readings (you are **not** required to enter any readings in the table)
- explain how to use the readings to reach a conclusion.

You may add to Fig. 4.1 or draw another diagram if it helps to explain your plan.

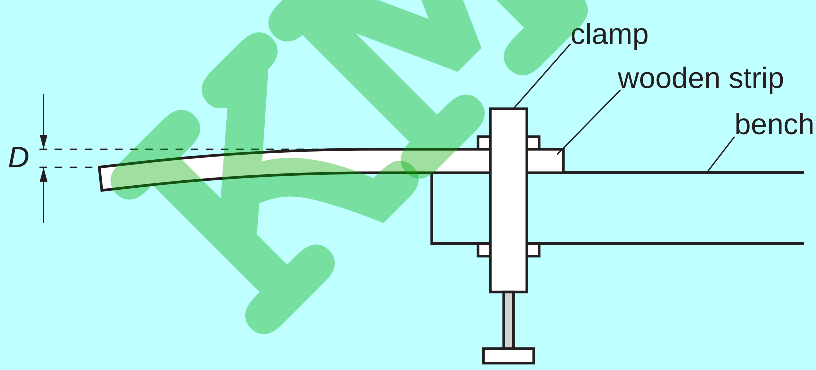

Fig. 4.1

[7]

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Cambridge Assessment International Education

Cambridge IGCSE™ (9–1)

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

0218879737

PHYSICS **0972/51**

Paper 5 Practical Test **May/June 2022**

1 hour 15 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

For Examiner's Use	
1	
2	
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Total	

This document has **16** pages. Any blank pages are indicated.

DC (PQ) 311564

1 In this experiment, you will investigate the stretching of a spring.

Carry out the following instructions, referring to Fig. 1.1.

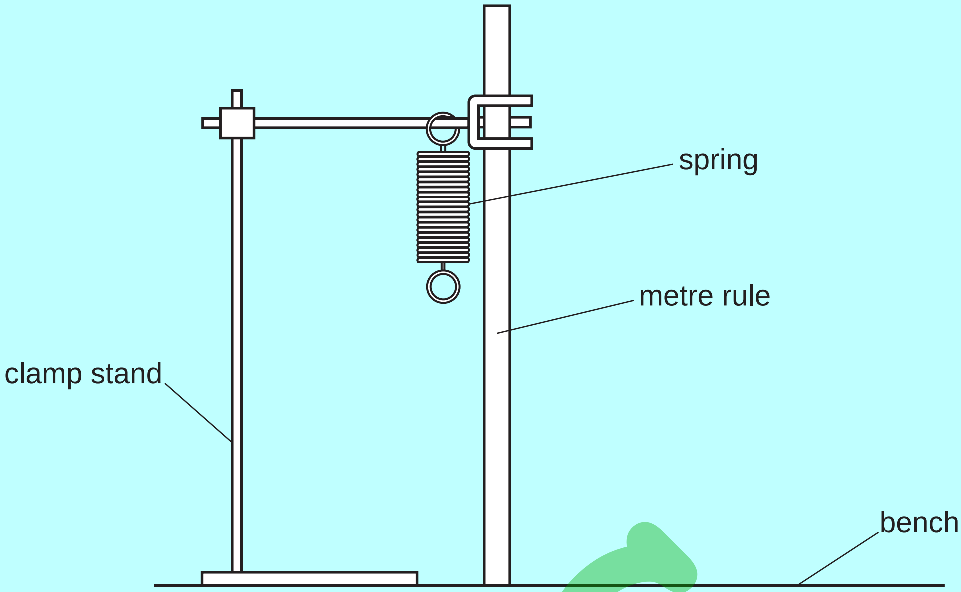

Fig. 1.1

(a) The metre rule is clamped in position close to the spring. Do **not** change the position of the metre rule.

(i) Take two readings from the metre rule to determine the unstretched length l_0 of the coiled part of the spring. Use the set square provided.

reading 1 .... cm

reading 2 .... cm

l_0 = ... cm
[3]

(ii) Draw a diagram to show clearly how you used the set square to obtain an accurate reading from the metre rule.

[1]

(b) Suspend a load of $P = 1.0\,\text{N}$ from the spring.

Record the new length l_1 of the coiled part of the spring.

l_1 = ... cm

Calculate the extension e_1 using the equation $e_1 = (l_1 - l_0)$.

e_1 = ... cm

Calculate a value for the spring constant k of the spring using the equation

$$k = \frac{P}{e_1}.$$

Include the unit.

k = ...

[2]

(c) Suspend a load of $P = 5.0\,\text{N}$ from the spring.

Record the new length l_5 of the coiled part of the spring.

l_5 = ... cm

Calculate the extension e_5 using the equation $e_5 = (l_5 - l_0)$.

e_5 = ... cm

Calculate a second value for the spring constant k of the spring using the equation

$$k = \frac{P}{e_5}.$$

Include the unit.

k = ...

[2]

(d) State whether your two values of the spring constant *k* can be considered equal within the limits of experimental accuracy.

Explain your answer by referring to your results.

statement ....

explanation ....

....

....
[1]

(e) A student improves the experiment by taking additional sets of readings.

(i) Suggest the additional apparatus that the student uses.

....

.... [1]

(ii) Suggest how the student uses the additional results.

....

.... [1]

[Total: 11]

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2 In this experiment, you will investigate the cooling of water.

Carry out the following instructions, referring to Fig. 2.1. You are provided with an insulating sleeve to place around the metal can while pouring hot water.

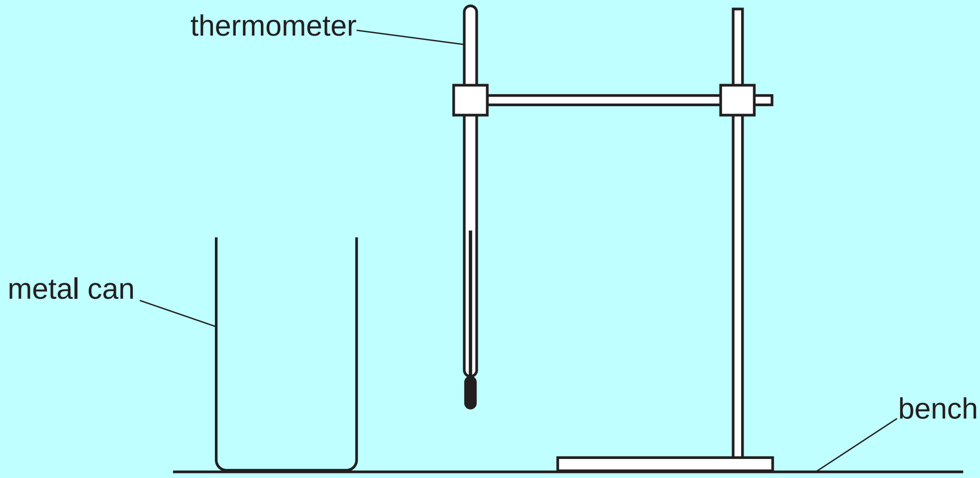

Fig. 2.1

(a) Use the thermometer to measure the room temperature θ_R.

θ_R = ... [1]

(b) (i) Place the insulating sleeve around the can.

Pour hot water into the can until the water level is up to approximately 2 cm from the top. Place the thermometer in the water.

Remove the insulating sleeve.

Record, in Table 2.1, the temperature θ of the hot water at time t = 0. Immediately start the stop-clock.

Measure, and record in Table 2.1, the water temperature every 30 s until you have 7 sets of readings.

Do **not** empty the can at this stage. [2]

(ii) Complete the column headings in Table 2.1.

Table 2.1

t /	θ /
0	
30	
60	
90	
120	
150	
180	

[1]

(c) **(i)** Calculate the decrease in temperature $\Delta\theta_1$ of the hot water between times $t = 0$ and $t = 60$ s.

$\Delta\theta_1$ = ...

Calculate the average rate of cooling R_1 of the water using the equation

$$R_1 = \frac{\Delta\theta_1}{\Delta t},$$

where $\Delta t = 60$ s. Include the unit.

R_1 = ... [1]

(ii) Calculate the decrease in temperature $\Delta\theta_2$ of the hot water between times $t = 120$ s and $t = 180$ s.

$\Delta\theta_2$ = ...

Calculate the average rate of cooling R_2 of the water using the equation

$$R_2 = \frac{\Delta\theta_2}{\Delta t},$$

where $\Delta t = 60$ s. Include the unit.

R_2 = ...

[1]

(d) A student states that most of the thermal energy lost by the water in the can is by evaporation from the water surface.

Another student states that most of the thermal energy lost by the water in the can is by conduction through the sides of the can.

The students repeat the experiment twice to investigate the two statements.

Suggest **one** suitable addition to the apparatus for **each** additional experiment.

1. ....

2. ....
[2]

(e) **(i)** Place the insulating sleeve around the can.

Pour the water from the can into the measuring cylinder.

Measure and record the volume *V* of water.

V = ... cm^3 [1]

(ii) State **two** precautions taken when reading the volume of water in the measuring cylinder in order to obtain an accurate result.

1. ....

2. ....
[2]

[Total: 11]

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3 In this experiment, you will investigate the resistance of a wire.

Carry out the following instructions, referring to Fig. 3.1.

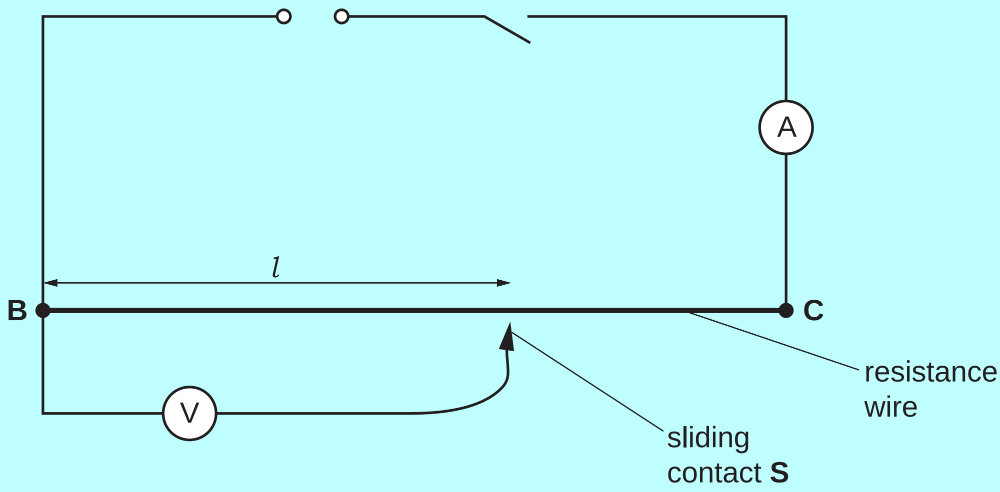


Fig. 3.1

(a) Close the switch.

Measure the current I in the circuit.

I = ... [1]

(b) Place the sliding contact at a distance l = 5.0 cm from **B**.

Measure, and record in Table 3.1, the potential difference (p.d.) V across the length l of resistance wire **BC**.

Open the switch.

Calculate, and record in Table 3.1, the resistance R of 5.0 cm of the resistance wire using the equation

$$R = \frac{V}{I}.$$

Close the switch.

Repeat the procedure in **(b)** using l values of 25.0 cm, 45.0 cm, 65.0 cm and 85.0 cm.

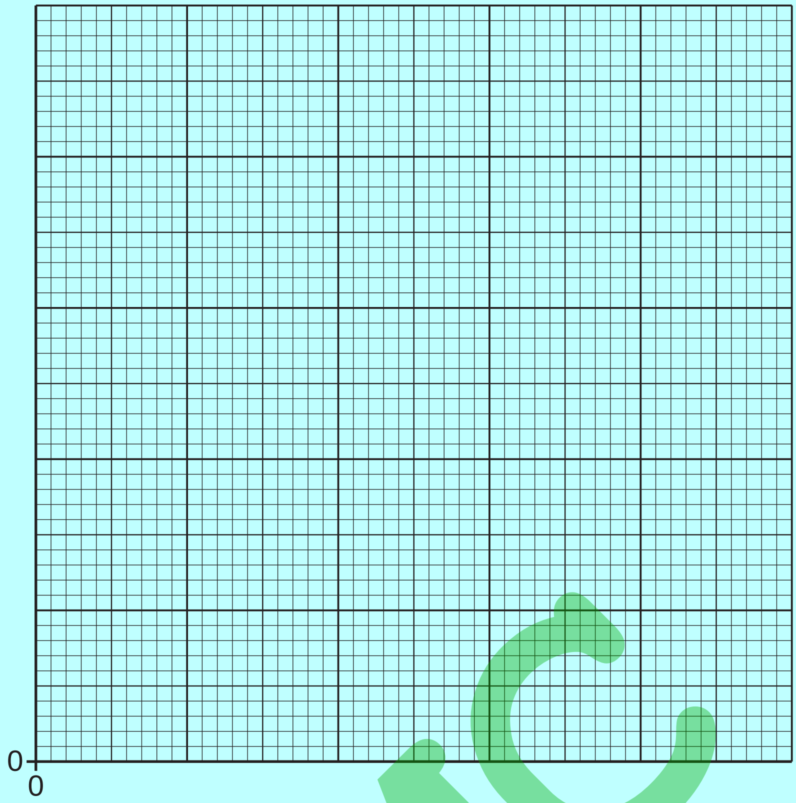
Open the switch.

Table 3.1

l / cm	V / V	R / Ω
5.0		
25.0		
45.0		
65.0		
85.0		

[4]

(c) Plot a graph of R/Ω (y-axis) against l/cm (x-axis). Start both axes at the origin (0,0).



[4]

(d) Use your graph to determine the resistance R_{50} of 50.0 cm of the resistance wire.

Show clearly on the graph how you obtained the necessary information.

R_{50} = ... Ω [2]

[Total: 11]

4 A student investigates the force required to break different beams made from a mixture of sand and cement. All the beams have the same cross-section.

Plan an experiment to investigate the force required to break the beams.

Fig. 4.1 shows the set-up.

You are **not** required to do this investigation.

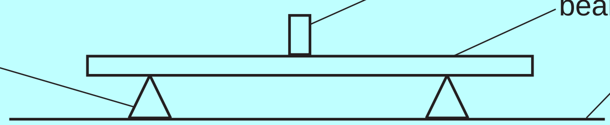


Fig. 4.1

The following apparatus is available:

- a selection of beams made from different ratios of sand and cement and of various lengths
- triangular blocks to support the beams
- a metre rule
- a selection of loads.

You can also use other apparatus and materials that are usually available in a school laboratory.

The student takes all the necessary safety precautions. You are **not** required to write about safety precautions.

In your plan, you should:

- explain briefly how to carry out the investigation (you may add to the diagram if it helps your explanation)
- state the key variables to keep constant
- draw a table, or tables, with column headings, to show how to display your readings (you are **not** required to enter any readings in the table)
- explain how you would use the readings to reach a conclusion.

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Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

1569183693

PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2022**

1 hour 15 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

For Examiner's Use	
1	
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Total	

This document has **16** pages. Any blank pages are indicated.

DC (CJ/SG) 303525/2

1 In this experiment, you will investigate the stretching of a spring.

Carry out the following instructions, referring to Fig. 1.1.

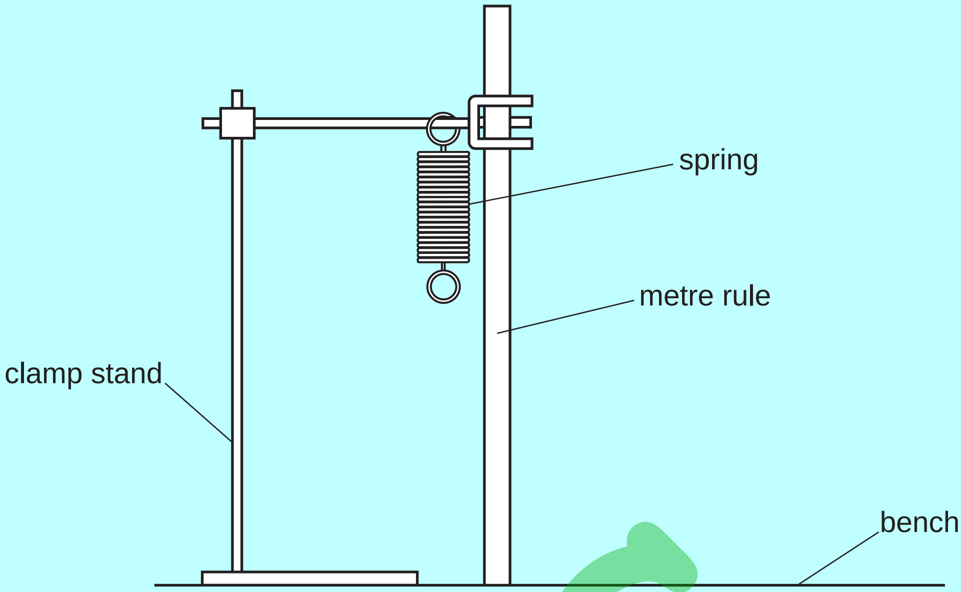

Fig. 1.1

(a) The metre rule is clamped in position close to the spring. Do **not** change the position of the metre rule.

(i) Take two readings from the metre rule to determine the unstretched length l_0 of the coiled part of the spring. Use the set square provided.

reading 1 .... cm

reading 2 .... cm

l_0 = ... cm
[3]

(ii) Draw a diagram to show clearly how you used the set square to obtain an accurate reading from the metre rule.

[1]

(b) Suspend a load of $P = 1.0\,\text{N}$ from the spring.

Record the new length l_1 of the coiled part of the spring.

l_1 = ... cm

Calculate the extension e_1 using the equation $e_1 = (l_1 - l_0)$.

e_1 = ... cm

Calculate a value for the spring constant k of the spring using the equation

$$k = \frac{P}{e_1}.$$

Include the unit.

k = ...

[2]

(c) Suspend a load of $P = 5.0\,\text{N}$ from the spring.

Record the new length l_5 of the coiled part of the spring.

l_5 = ... cm

Calculate the extension e_5 using the equation $e_5 = (l_5 - l_0)$.

e_5 = ... cm

Calculate a second value for the spring constant k of the spring using the equation

$$k = \frac{P}{e_5}.$$

Include the unit.

k = ...

[2]

(d) State whether your two values of the spring constant *k* can be considered equal within the limits of experimental accuracy.

Explain your answer by referring to your results.

statement ....

explanation ....

....

....
[1]

(e) A student improves the experiment by taking additional sets of readings.

(i) Suggest the additional apparatus that the student uses.

....

.... [1]

(ii) Suggest how the student uses the additional results.

....

.... [1]

[Total: 11]

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2 In this experiment, you will investigate the cooling of water.

Carry out the following instructions, referring to Fig. 2.1. You are provided with an insulating sleeve to place around the metal can while pouring hot water.

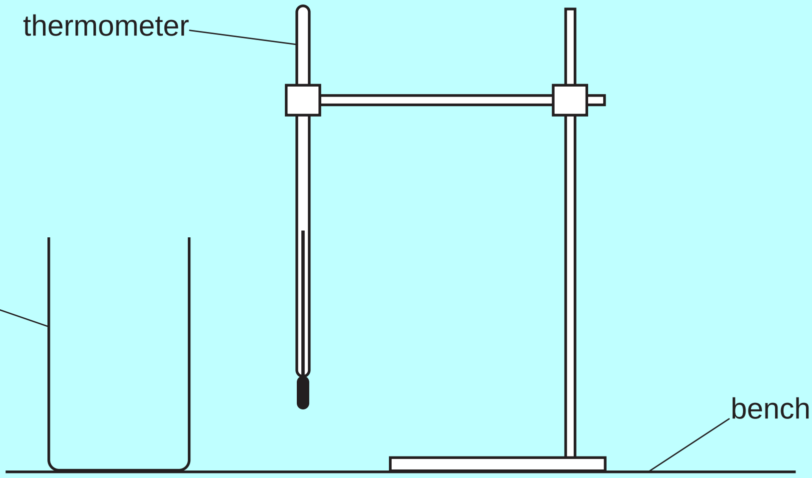

Fig. 2.1

(a) Use the thermometer to measure the room temperature θ_R.

θ_R = ... [1]

(b) **(i)** Place the insulating sleeve around the can.

Pour hot water into the can until the water level is up to approximately 2 cm from the top. Place the thermometer in the water.

Remove the insulating sleeve.

Record, in Table 2.1, the temperature θ of the hot water at time t = 0. Immediately start the stop-clock.

Measure, and record in Table 2.1, the water temperature every 30 s until you have 7 sets of readings.

Do **not** empty the can at this stage. [2]

(ii) Complete the column headings in Table 2.1.

Table 2.1

t /	θ /
0	
30	
60	
90	
120	
150	
180	

[1]

(c) **(i)** Calculate the decrease in temperature $\Delta\theta_1$ of the hot water between times t = 0 and t = 60 s.

$\Delta\theta_1$ = ...

Calculate the average rate of cooling R_1 of the water using the equation

$$R_1 = \frac{\Delta\theta_1}{\Delta t},$$

where Δt = 60 s. Include the unit.

R_1 = ... [1]

(ii) Calculate the decrease in temperature $\Delta\theta_2$ of the hot water between times t = 120 s and t = 180 s.

$\Delta\theta_2$ = ...

Calculate the average rate of cooling R_2 of the water using the equation

$$R_2 = \frac{\Delta\theta_2}{\Delta t},$$

where Δt = 60 s. Include the unit.

R_2 = ...
[1]

(d) A student states that most of the thermal energy lost by the water in the can is by evaporation from the water surface.

Another student states that most of the thermal energy lost by the water in the can is by conduction through the sides of the can.

The students repeat the experiment twice to investigate the two statements.

Suggest **one** suitable addition to the apparatus for **each** additional experiment.

1. ....

2. ....
[2]

(e) **(i)** Place the insulating sleeve around the can.

Pour the water from the can into the measuring cylinder.

Measure and record the volume *V* of water.

V = ... cm^3 [1]

(ii) State **two** precautions taken when reading the volume of water in the measuring cylinder in order to obtain an accurate result.

1. ....

2. ....
[2]

[Total: 11]

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3 In this experiment, you will investigate the resistance of a wire.

Carry out the following instructions, referring to Fig. 3.1.

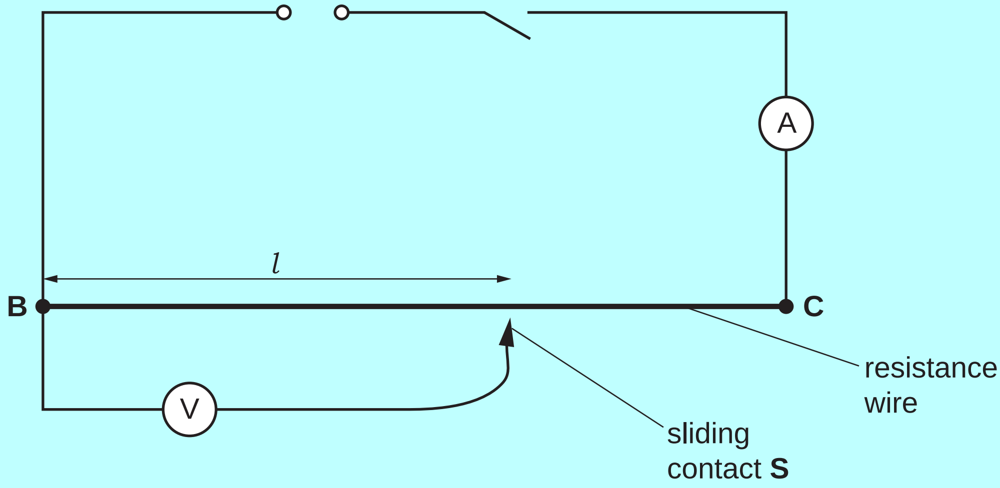


Fig. 3.1

(a) Close the switch.

Measure the current I in the circuit.

I = ... [1]

(b) Place the sliding contact at a distance l = 5.0 cm from **B**.

Measure, and record in Table 3.1, the potential difference (p.d.) V across the length l of resistance wire **BC**.

Open the switch.

Calculate, and record in Table 3.1, the resistance R of 5.0 cm of the resistance wire using the equation

$$R = \frac{V}{I}.$$

Close the switch.

Repeat the procedure in **(b)** using l values of 25.0 cm, 45.0 cm, 65.0 cm and 85.0 cm.

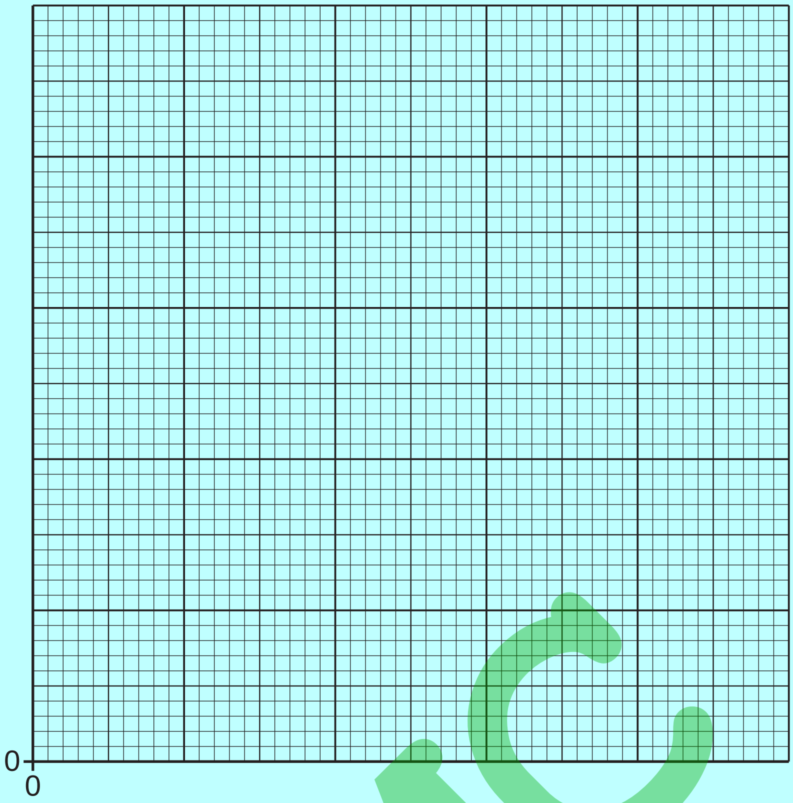
Open the switch.

Table 3.1

l / cm	V / V	R / Ω
5.0		
25.0		
45.0		
65.0		
85.0		

[4]

(c) Plot a graph of R/Ω (y-axis) against l/cm (x-axis). Start both axes at the origin (0,0).



[4]

(d) Use your graph to determine the resistance R_{50} of 50.0 cm of the resistance wire.

Show clearly on the graph how you obtained the necessary information.

R_{50} = ... Ω [2]

[Total: 11]

4 A student investigates the force required to break different beams made from a mixture of sand and cement. All the beams have the same cross-section.

Plan an experiment to investigate the force required to break the beams.

Fig. 4.1 shows the set-up.

You are **not** required to do this investigation.

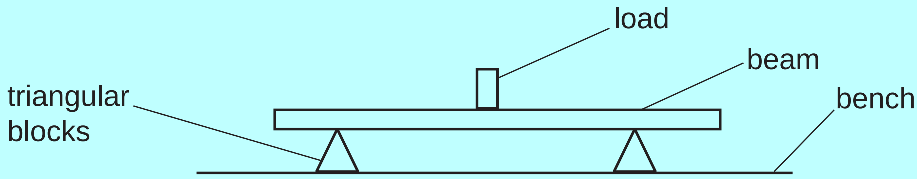


Fig. 4.1

The following apparatus is available:

- a selection of beams made from different ratios of sand and cement and of various lengths
- triangular blocks to support the beams
- a metre rule
- a selection of loads.

You can also use other apparatus and materials that are usually available in a school laboratory.

The student takes all the necessary safety precautions. You are **not** required to write about safety precautions.

In your plan, you should:

- explain briefly how to carry out the investigation (you may add to the diagram if it helps your explanation)
- state the key variables to keep constant
- draw a table, or tables, with column headings, to show how to display your readings (you are **not** required to enter any readings in the table)
- explain how you would use the readings to reach a conclusion.

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Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

3407610418

PHYSICS **0625/52**

Paper 5 Practical Test **May/June 2022**

1 hour 15 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

For Examiner's Use	
1	
2	
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Total	

This document has **12** pages. Any blank pages are indicated.

DC (LK/FC) 303515/2

1 In this experiment, you will investigate the balancing of a metre rule.

Carry out the following instructions, referring to Fig. 1.1.

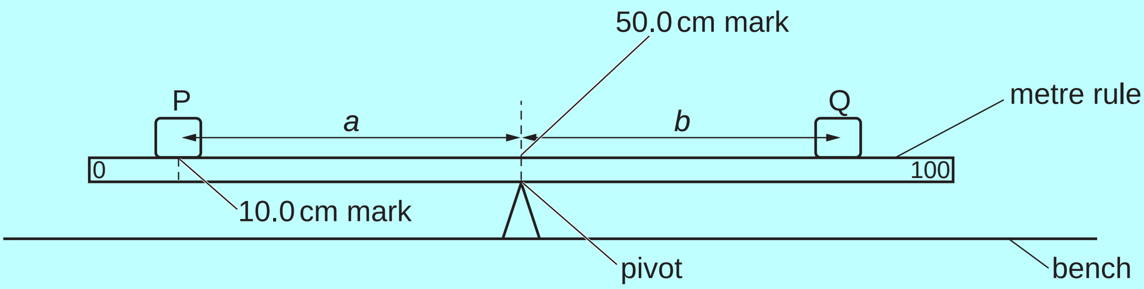

Fig. 1.1

(a) • Place the metre rule on the pivot at the 50.0 cm mark.

• Place object P with its centre on the metre rule at the 10.0 cm mark.

(i) Record, in Table 1.1, the distance *a* from the centre of object P to the pivot. [1]

(ii) • Place object Q on the metre rule.

• Keep object P at the 10.0 cm mark and adjust the position of object Q until the metre rule is as close to balancing as possible.

Record, in Table 1.1, the distance *b* between the centre of object Q and the pivot. [1]

(iii) Repeat the steps above with object P placed at the 15.0 cm mark, 20.0 cm mark, 25.0 cm mark and 30.0 cm mark.

Record all the values of *a* and *b* in Table 1.1.

Table 1.1

a / cm	*b* / cm

[2]

(b) Plot a graph of a / cm (y-axis) against b / cm (x-axis). You do **not** need to start your graph from the origin (0,0).

[4]

(c) Determine the gradient G of the graph.

Show clearly on the graph how you obtained the necessary information.

G = ... [3]

[Total: 11]

2 In this experiment, you will investigate the resistances of combinations of resistors.

Carry out the following instructions, referring to Fig. 2.1. The circuit has been set up for you.

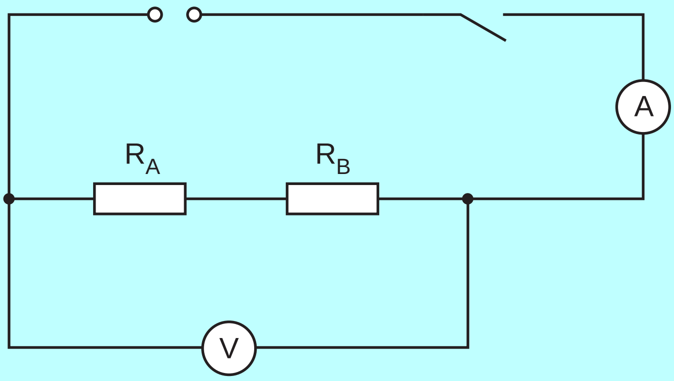

Fig. 2.1

(a) Close the switch.

(i) Measure the current I_1 in the circuit.

I_1 = ... A [1]

(ii) Measure the potential difference (p.d.) V_1 across resistors R_A and R_B in series.

V_1 = ... V [1]

(iii) Open the switch.

Calculate the resistance R_1 of the combination of resistors in series. Use the equation

$$R_1 = \frac{V_1}{I_1}.$$

Include the unit.

R_1 = ... [1]

(b) Disconnect the voltmeter. Connect resistor R_C in parallel with resistors R_A and R_B.

Do **not** change the series combination of resistors R_A and R_B.

Connect the voltmeter across the combination of all three resistors.

(i) Draw a circuit diagram showing the circuit described in **(b)**.

[2]

(ii) Close the switch.

Measure the current I_2 in the circuit.

I_2 = ... A

Measure the potential difference V_2 across the combination of the three resistors.

V_2 = ... V

Open the switch.

Calculate the resistance R_2 of the combination of resistors. Use the equation

$$R_2 = \frac{V_2}{I_2}.$$

Include the unit.

R_2 = ...
[2]

(c) Disconnect the voltmeter. Rearrange the resistors to set up the circuit shown in Fig. 2.2.

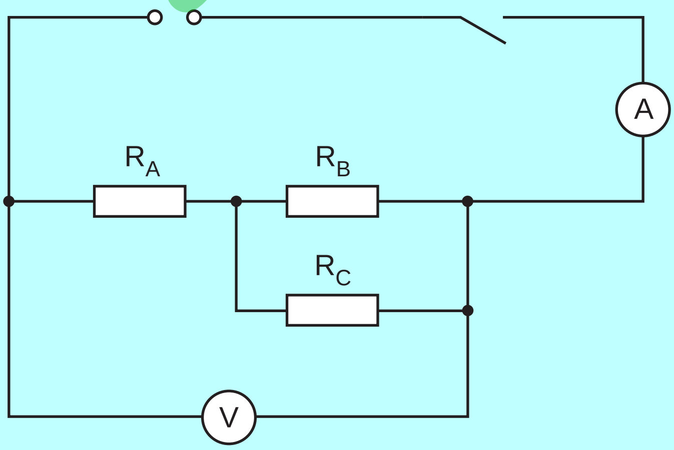

Fig. 2.2

Close the switch.

Measure the current I_3 in the circuit.

I_3 = ... A

Measure the potential difference V_3 across the combination of the three resistors.

V_3 = ... V

Open the switch.

Calculate the resistance R_3 of the combination of resistors. Use the equation

$$R_3 = \frac{V_3}{I_3}.$$

Include the unit. Give your answer to a suitable number of significant figures for this experiment.

R_3 = ...
[2]

(d) A student thinks the three resistors R_A, R_B and R_C have the same resistance within the limits of experimental accuracy.

Suggest how the student could use the apparatus provided to test his idea.

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.... [2]

[Total: 11]

3 In this experiment, you will determine the focal length f of a lens.

Carry out the following instructions, referring to Fig. 3.1.

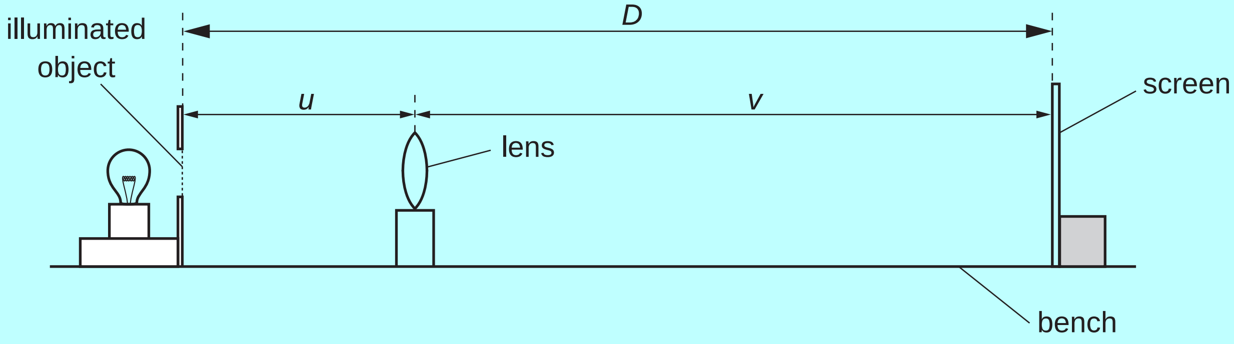

Fig. 3.1

(a) • Place the screen a distance D = 75.0 cm from the illuminated object.

• Place the lens between the object and the screen so that the lens is close to the illuminated object.

• Move the lens away from the object until a clearly focused image is formed on the screen.

(i) Measure, and record in Table 3.1, the distance u between the centre of the lens and the illuminated object. [1]

(ii) Measure, and record in Table 3.1, the distance v between the centre of the lens and the screen. [1]

(iii) Calculate, and record in Table 3.1, the focal length f of the lens using the equation

$$f = \frac{uv}{D}.$$

[1]

(b) • Place the screen at a distance D = 85.0 cm from the illuminated object.

• Place the lens between the object and the screen so that the lens is close to the illuminated object.

• Move the lens until a clearly focused image is formed on the screen.

Measure, and record in Table 3.1, the distance u between the centre of the lens and the illuminated object.

Measure, and record in Table 3.1, the distance v between the centre of the lens and the screen.

Calculate, and record in Table 3.1, the focal length *f* of the lens using the equation

$$f = \frac{uv}{D}.$$

Table 3.1

D / cm	u / cm	v / cm	f / cm
75.0			
85.0			

[2]

(c) Calculate the average value f_A of the focal length of the lens. Show your working.

f_A = ... cm [2]

(d) State **two** precautions that you took to obtain accurate readings in this experiment.

1. ....

....

2. ....

....
[2]

(e) A student states that a more accurate value for the focal length *f* of the lens can be determined by plotting a graph of *uv* against *D*. The gradient of the graph is numerically equal to the focal length.

(i) Suggest a suitable number of sets of readings that the student should take.

.... [1]

(ii) Explain briefly how this graphical method can give a more accurate value for the focal length.

....

....

....

.... [1]

[Total: 11]

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4 A student investigates insulators.

Plan an experiment to list insulating discs in order from best insulator to worst insulator.

You are **not** required to carry out this investigation.

The following apparatus is available:

- five discs made from different insulating materials
- a thermometer
- a stop-watch
- a heated metal cylinder (see Fig. 4.1)
- a second metal cylinder with a hole for the thermometer (see Fig. 4.1).

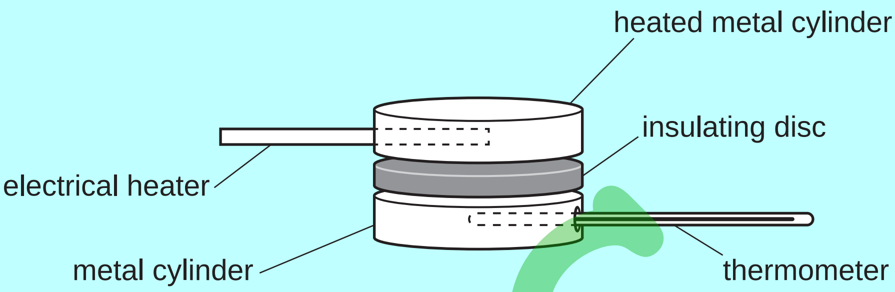

Fig. 4.1

You can also use other apparatus and materials that are usually available in a school laboratory.

In your plan, you should:

- explain briefly how you would carry out the investigation

- state the key variables that you would control

- draw a table, or tables, with column headings, to show how you would display your readings (you are **not** required to enter any readings in the table)

- explain how you would use your readings to reach a conclusion.

[7]

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Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 5 5 8 6 7 0 9 8 2 1 *

PHYSICS **0625/53**

Paper 5 Practical Test **May/June 2022**

1 hour 15 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

For Examiner's Use	
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2	
3	
4	
Total	

This document has **12** pages. Any blank pages are indicated.

DC (EF) 308974

1 In this experiment, you will investigate the forces supporting a metre rule.

Carry out the following instructions, referring to Fig. 1.1.

Do **not** attempt to change the position of either newton meter by adjusting the positions of the loops of thread attached to them.

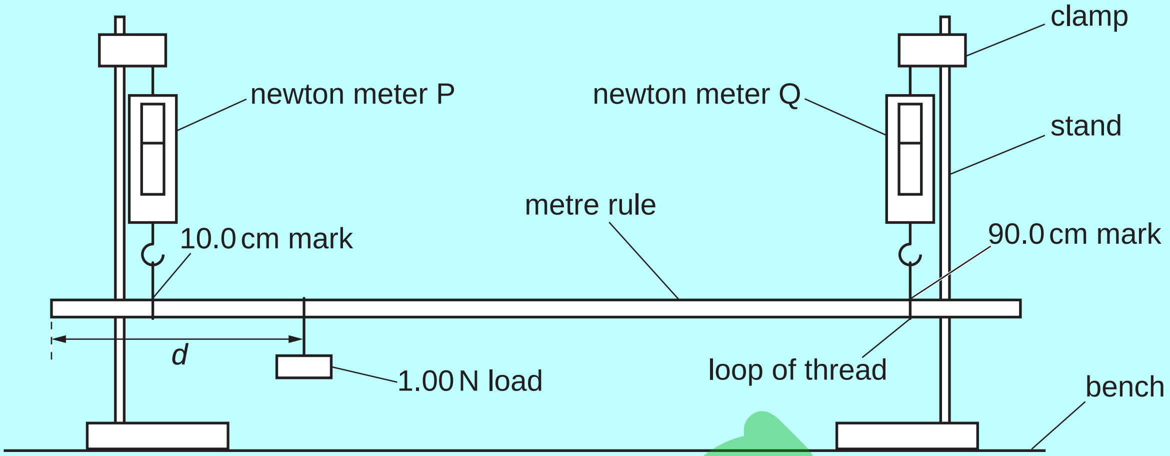


Fig. 1.1

(a) Move the 1.00 N load to a distance d = 25.0 cm from the 0.0 cm end of the rule.

Move one stand slightly, if necessary, so that the newton meters are as near to vertical as possible.

Read, and record in Table 1.1, the value F_P on newton meter P and the value F_Q on newton meter Q.

Repeat this procedure for d = 35.0 cm, d = 45.0 cm, d = 55.0 cm and d = 65.0 cm.

Table 1.1

d / cm	F_P / N	F_Q / N
25.0		
35.0		
45.0		
55.0		
65.0		

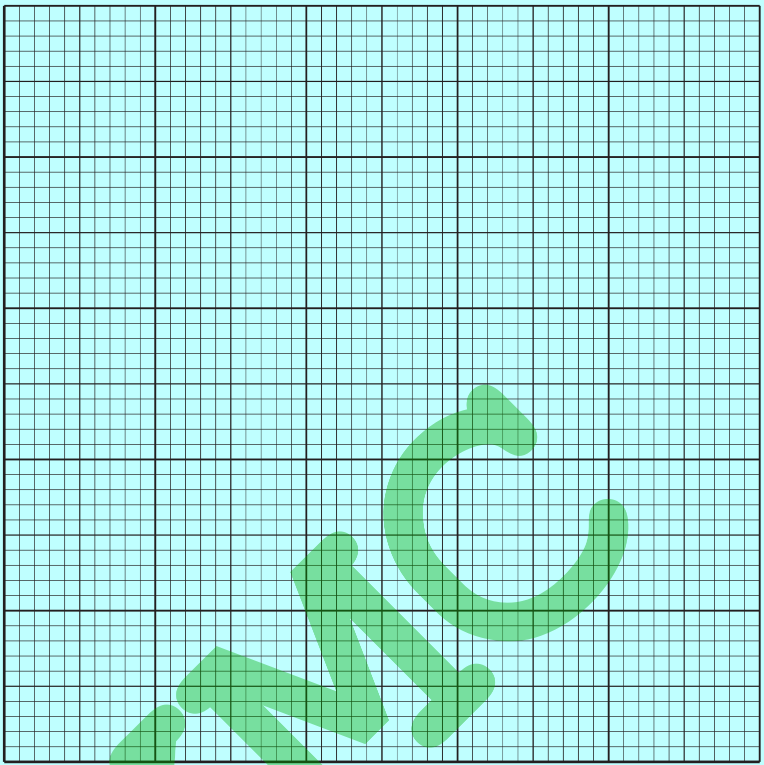
[2]

(b) Plot a graph of F_P/N (*y*-axis) against *d*/cm (*x*-axis).

On the same axes, and using the same scales, plot a graph of F_Q/N (*y*-axis) against *d*/cm (*x*-axis).

Draw two best-fit lines, one for each set of plots. Show clearly on your graph which line is for F_P and which line is for F_Q.

F_P/N
F_Q/N



[5]

(c) From your graph, determine F_0, the value of F_P where the two best-fit lines cross.

F_0 = ...

Calculate the weight W_R of the metre rule, using the equation $W_R = (2 \times F_0) - k$, where $k = 1.00$ N.

W_R = ...

[2]

(d) This experiment can be done by moving a clamp to make the rule horizontal before taking each reading.

Explain how to make sure that the rule is horizontal.
You may draw a diagram.

....

....

.... [1]

(e) A student does the experiment with the same equipment as you. He reads values of F_P which are the same as yours but his values of F_Q are all higher than yours by 0.10 N.

Suggest a reason for this difference. Assume that your values of F_P and F_Q in Table 1.1 are correct.

....

....

.... [1]

[Total: 11]

2 In this experiment, you will investigate how the volume of water in a beaker affects the rate at which the water cools.

Carry out the following instructions, referring to Fig. 2.1.

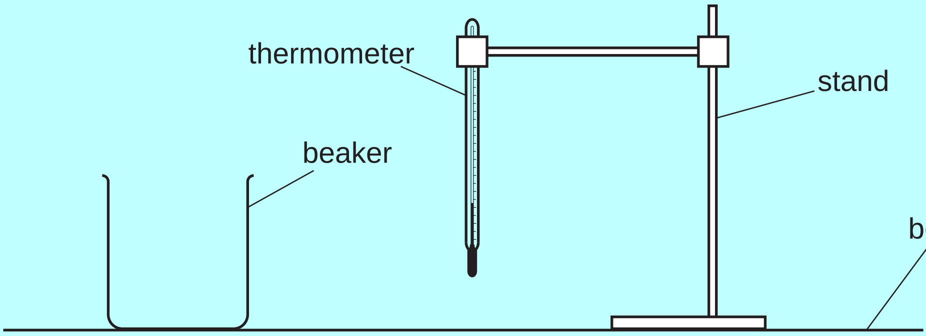


Fig. 2.1

(a) During this experiment, the thermometer must remain clamped securely to the stand.

Pour 150 cm^3 of hot water into the beaker.
Place the thermometer in the water.
Wait until the reading on the thermometer stops rising.

In the first row of Table 2.1, record the temperature θ of the water at $t = 0$ and immediately start the stop-clock.
Record the temperature θ of the water at times $t = 30\,s$, $t = 60\,s$, $t = 90\,s$, $t = 120\,s$, $t = 150\,s$ and $t = 180\,s$.

Remove the thermometer from the beaker and tip out the water. [1]

(b) **(i)** Repeat **(a)** using 50 cm^3 of hot water. [2]

(ii) Complete the headings in Table 2.1.

Table 2.1

	beaker with 150 cm^3 of hot water	beaker with 50 cm^3 of hot water
t /	θ /	θ /
0		
30		
60		
90		
120		
150		
180		

[1]

(c) Write a conclusion stating how the volume of water affects the rate of cooling of the water. Justify your answer by reference to your results.

....

....

....

.... [2]

(d) **(i)** Using your results for 50 cm^3 of water, calculate the average cooling rate x for the first 90 s of the experiment. Use your readings from Table 2.1 and the equation

$$x = \frac{\theta_0 - \theta_{90}}{T}$$

where T = 90 s and θ_0 and θ_{90} are the temperatures at t = 0 and t = 90 s.
Include the unit for the cooling rate.

x = ... [1]

(ii) A student does this experiment in a room with a much higher room temperature than your room.

State how this affects her value of x in **(d)(i)**.
Explain your answer by reference to your results from the beaker with 50 cm^3 of hot water.

statement ....

explanation ....

....

....
[2]

(e) Some thermal energy is lost from the sides of the beaker.
Another student wishes to find out how much this loss of thermal energy affects the cooling rate of 50 cm^3 of water.

Briefly describe an additional experiment that the student can carry out to investigate this. Explain how the results can be used to determine how much this loss affects the cooling rate.

You are **not** required to carry out the experiment.

additional experiment ....

....

use of results ....

....
[2]

[Total: 11]

3 In this experiment, you will determine the focal length of a converging lens by different methods.

Method 1

Carry out the following instructions, referring to Fig. 3.1.

(a) Arrange the illuminated object, lens and mirror as shown in Fig. 3.1.

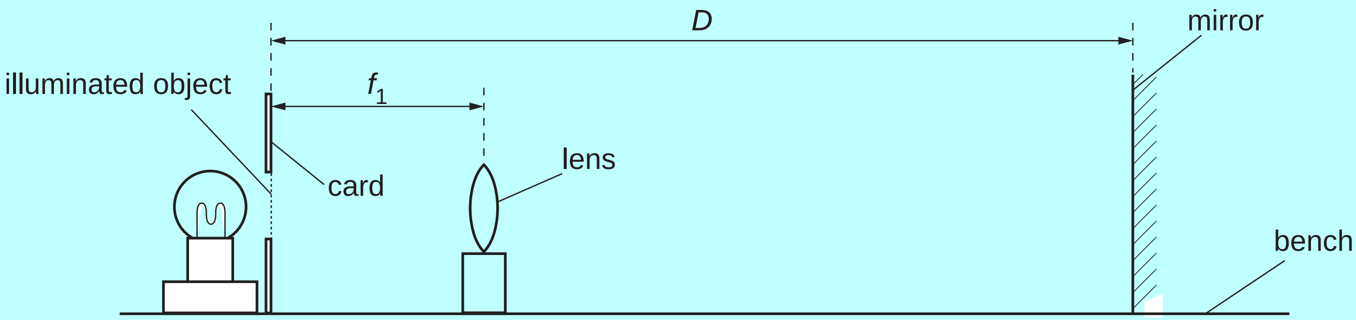


Fig. 3.1

(i) Set the distance D between the mirror and the illuminated object to 40 cm.

Move the lens until a sharp image appears on the front of the card, by the side of the illuminated object.

Measure the distance f_1 between the lens and the illuminated object. This is a value for the focal length of the lens.

f_1 = ... [1]

(ii) Briefly describe a technique to obtain an image on the card that is as sharp as possible in this experiment.

....

....

.... [1]

Method 2

Carry out the following instructions, referring to Fig. 3.2.

(b) Set up the lens, illuminated object and screen as shown in Fig. 3.2.

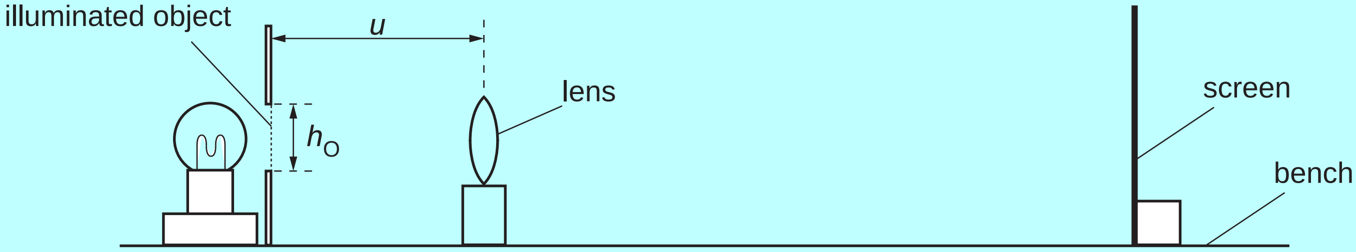


Fig. 3.2

Set the distance between the illuminated object and the lens to u = 20.0 cm.

Move the screen until a sharp image of the illuminated object appears on the screen.

(i) Measure h_O, the height of the illuminated triangle, as indicated in Fig. 3.2.

h_O = ...

Measure h_I, the height of the image of the triangle on the screen.

h_I = ...
[2]

(ii) Calculate a value W using the equation $W = \frac{h_O}{h_I}$.

W = ...

Calculate a second value f_2 for the focal length of the lens, using the equation

$f_2 = \frac{u}{(W + 1)}$.

f_2 = ...
[2]

(iii) Describe **one** difficulty that can be experienced when measuring the height of the image. Suggest an improvement to overcome this difficulty.

difficulty ....

....

improvement ....

....
[2]

(c) A student suggests that f_1 and f_2 should be equal.

State whether your results support this suggestion.
Justify your statement by reference to your results.

statement ....

justification ....

....
[2]

(d) Describe **one** precaution you took to obtain reliable measurements of f_1 and u in this experiment.

....

....
[1]

[Total: 11]

4 A student investigates the resistance of a light-dependent resistor (LDR).
The resistance of an LDR changes as the intensity of light falling on it varies.

The resistance R of the LDR is calculated using the equation $R = \frac{V}{I}$

where V is the potential difference (p.d.) across the LDR and I is the current in the LDR.

Plan an experiment to investigate how the light intensity affects the resistance of an LDR.
You are **not** required to carry out the experiment.

The apparatus available includes:
an LDR
equipment to connect the circuit, part of which is shown in Fig. 4.1
a lamp with a power supply.

In your plan, you should:

- complete the circuit diagram in Fig. 4.1 to show a voltmeter connected to measure the potential difference across the LDR
- state how the light intensity falling on the LDR will be varied and list any additional apparatus needed
- explain briefly how to do the experiment, including any precautions taken to ensure reliable results
- state **one** key variable to be kept constant
- draw a table, or tables, with column headings, to show how to display the readings (you are **not** required to enter any readings in the table)
- explain how to use the readings to reach a conclusion.

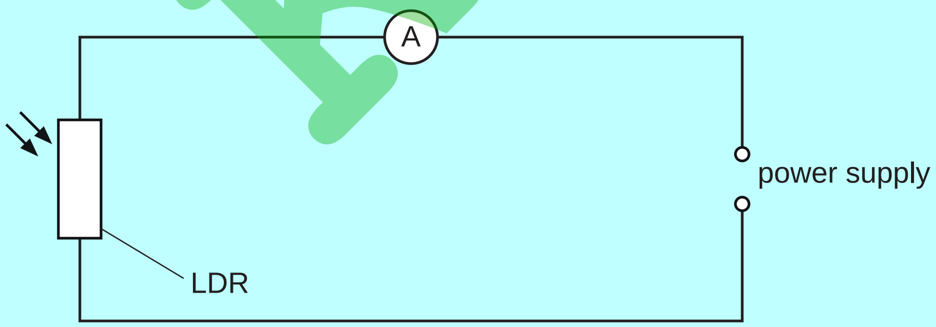


Fig. 4.1

[7]

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Cambridge Assessment International Education

Cambridge IGCSE™ (9–1)

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

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PHYSICS **0972/51**

Paper 5 Practical Test **May/June 2023**

1 hour 15 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

For Examiner's Use	
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Total	

This document has **12** pages. Any blank pages are indicated.

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[Turn over

1 In this experiment, you will investigate the balancing of a metre ruler.

Carry out the following instructions, referring to Fig. 1.1.

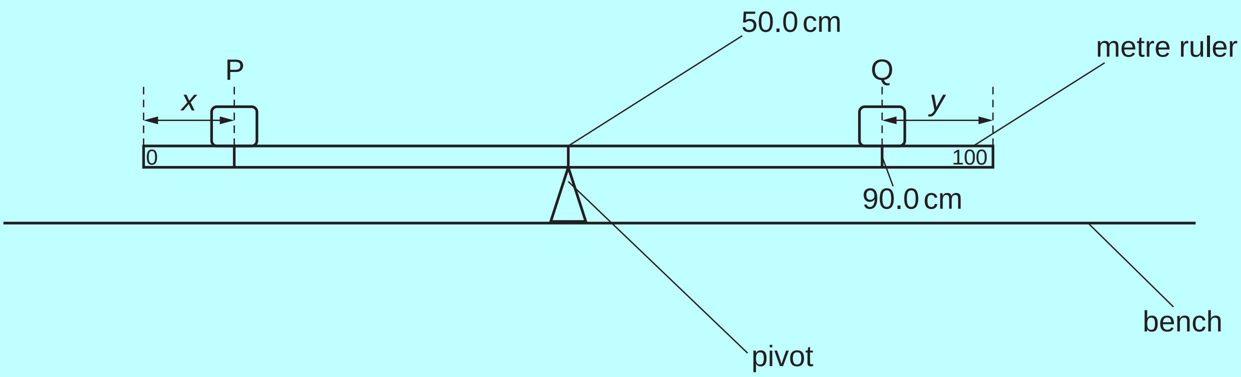


Fig. 1.1

(a)
- Place the metre ruler on the pivot at the 50.0 cm mark with its scale facing upwards.
- Place the object Q with its centre on the metre ruler at the 90.0 cm mark.

Record the distance *y* from the centre of Q to the 100.0 cm end of the ruler.

y = ... cm [1]

(b)
- Place a load P of weight *P* = 2.0 N on the metre ruler.
- Adjust the position of P so that the metre ruler is as near as possible to being balanced.

(i) Measure, and record in Table 1.1, the distance *x* from the centre of P to the zero end of the ruler. Record the weight *P*. [1]

(ii) Repeat the steps above, using loads of weight *P* = 3.0 N, 4.0 N, 5.0 N and 6.0 N.

Record all the values of *P* and *x* in Table 1.1. Ensure that the position of object Q on the metre ruler does **not** change.

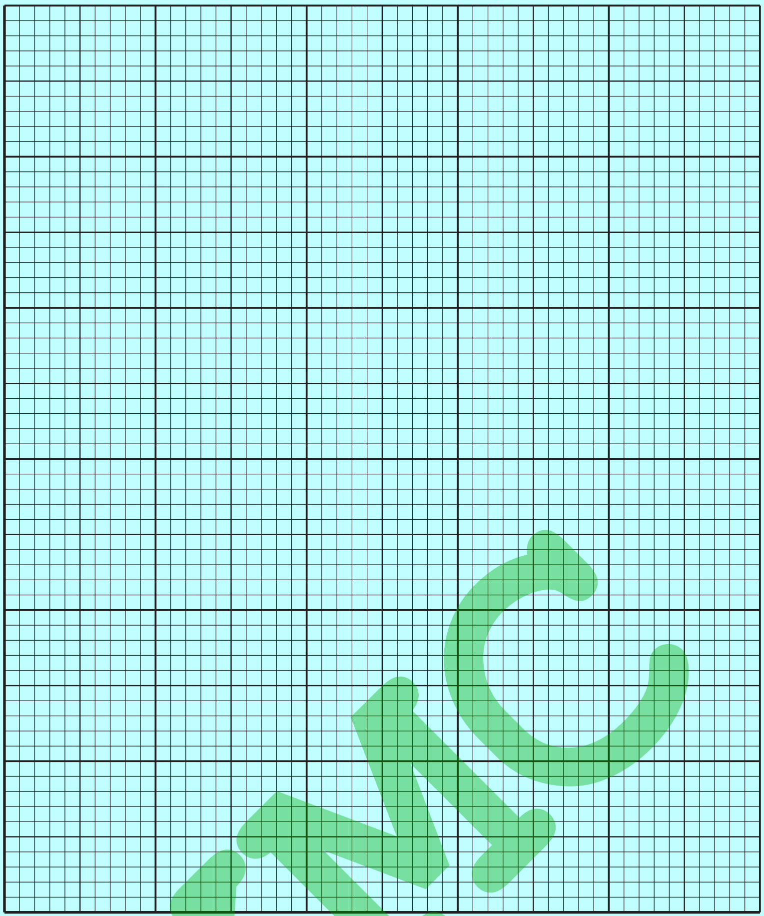
Table 1.1

P / N	*x* / cm

[3]

(c) Plot a graph of P / N (y-axis) against x / cm (x-axis).

Draw the best-fit line.



[4]

(d) Use the graph to find the value of x required to balance the ruler when $P = 3.5$ N.

Show clearly on the graph how you determined the value of x.

x = ... cm [2]

[Total: 11]

2 In this experiment, you will investigate the cooling of water.

Carry out the following instructions, referring to Fig. 2.1.

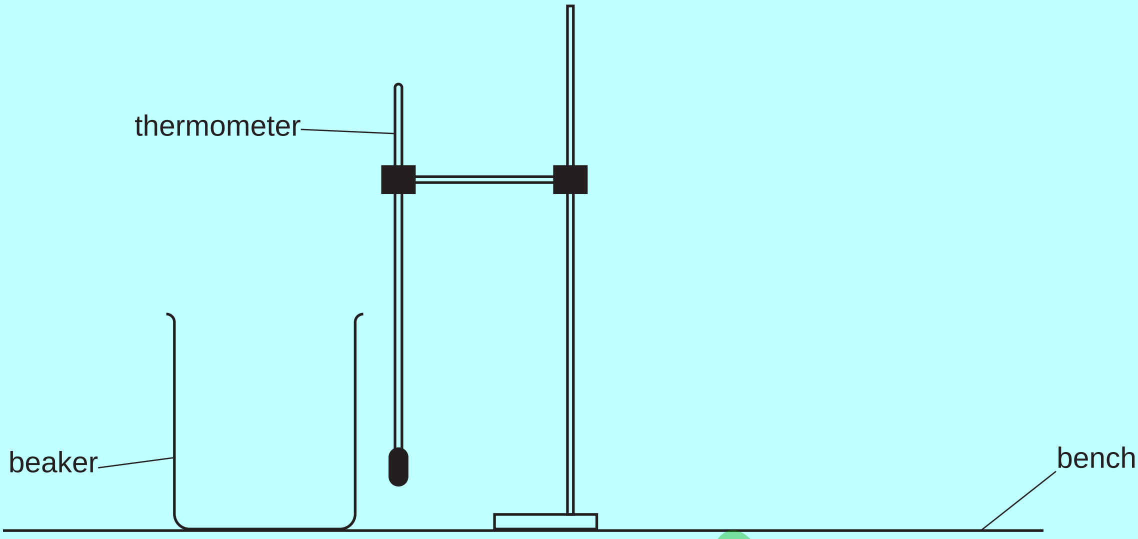


Fig. 2.1

(a) Use the thermometer to measure the room temperature θ_R.

θ_R = ... [1]

(b) **(i)** Pour 200 cm^3 of hot water into the beaker. Place the thermometer in the hot water in the beaker.

Record in Table 2.1 the temperature θ of the hot water at time $t = 0$. Immediately start the stop-watch.

Continue recording the temperature in Table 2.1 at 30 s intervals until you have seven sets of readings. [2]

(ii) Complete the column headings in Table 2.1.

Table 2.1

t /	θ /
0	
30	
60	
90	
120	
150	
180	

[1]

(c) **(i)** Calculate the decrease in temperature $\Delta\theta$ between $t = 0$ and $t = 180$ s.

$\Delta\theta$ = ... [1]

(ii) Calculate the average rate of cooling R of the water using the equation $R = \frac{\Delta\theta}{\Delta t}$, where $\Delta t = 180$ s. Include the unit.

R = ... [2]

(d) A student states that the average rate of cooling of the water decreases as the temperature comes nearer to room temperature.

(i) Suggest **one** change to the experiment that you could make to test the statement.

....

.... [1]

(ii) Suggest how to display the results to make it easier to see the trend in the rate of cooling.

....

....

.... [2]

(e) Explain briefly why it is good practice to read the thermometer scale at right angles.

....

.... [1]

[Total: 11]

3 In this experiment, you will investigate the refraction of light using a semicircular transparent block.

Carry out the following instructions using the separate ray-trace sheet provided. You may refer to Fig. 3.1 and Fig. 3.2 for guidance.

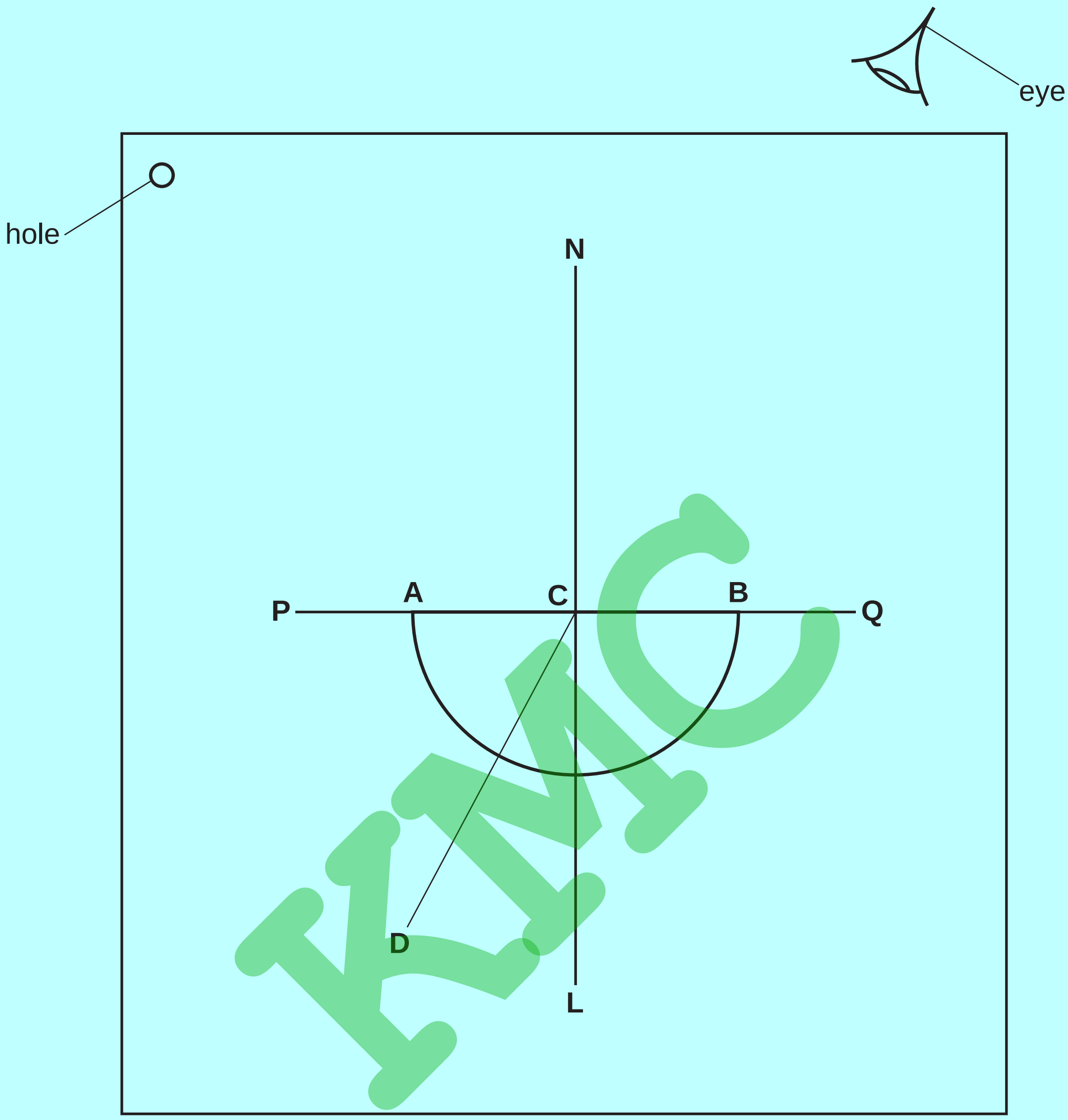


Fig. 3.1

(a)
- Draw a line across the ray-trace sheet supplied, approximately in the middle. Label the line **PQ**.
- Place the transparent block, largest face down, with the straight side on the line **PQ** and the curved side below the line.
- Draw round the outline of the block. Label the ends of the straight side of the block **A** and **B**.
- Remove the block and draw the normal **NL** through the centre of **AB**. Continue the normal so that it passes through the curved side of the block.
- Label the point **C** where the normal **NL** crosses **AB**.

[1]

(b)
- Draw the line **DC** at an angle $i = 30°$ to the normal, as shown in Fig. 3.1.
- Place the paper on the pin board.
- Place two pins, P_1 and P_2, on line **DC** at a suitable distance apart for this experiment.
- Replace the block and look from the position of the eye shown in Fig. 3.1 to observe the images of P_1 and P_2 through side **AB** of the block. Adjust your line of sight until the images of P_1 and P_2 appear one behind the other.
- Place two pins, P_3 and P_4, between your eye and the block so that P_3, P_4, and the images of P_1 and P_2 seen through the block, appear one behind the other.
- Label the positions of P_1, P_2, P_3 and P_4.
- Remove the block and the pins.
- Draw a line joining the positions of P_3 and P_4. Continue the line to **AB**.
- Label **E**, the end of the line furthest from **AB**.

[3]

(c) Measure the acute angle θ between the line **NL** and the line **CE**. (An acute angle is less than 90°.)

θ = ...° [2]

(d) State **one** precaution that you take to produce an accurate ray trace.

....

.... [1]

(e) Place the transparent block on the ray-trace sheet in the position shown in Fig. 3.2.

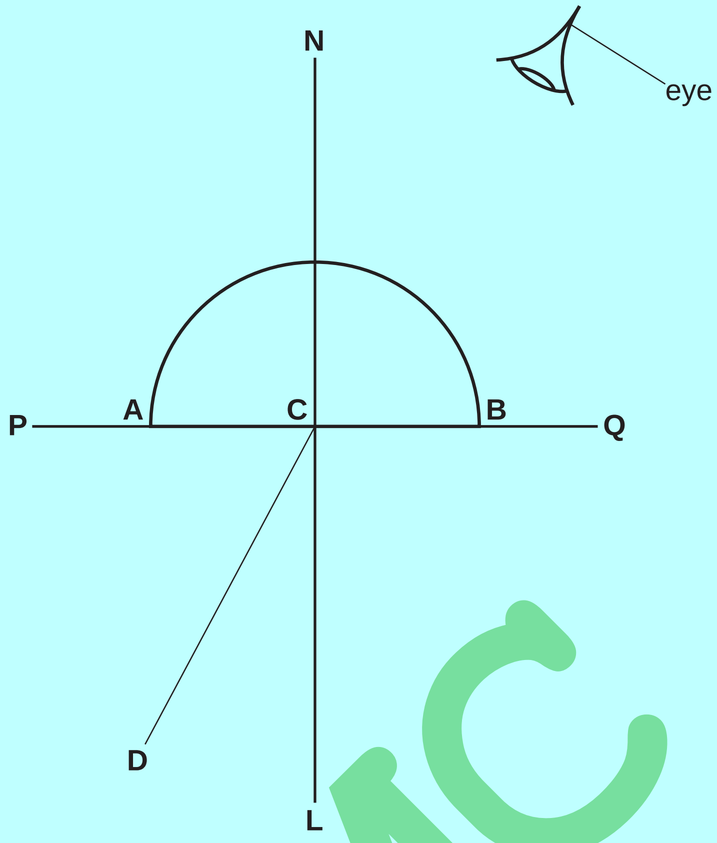


Fig. 3.2

- Replace pins P_1 and P_2 on line **DC** in the same positions used in **(b)**.
- Observe the images of P_1 and P_2 through the curved side of the block. Adjust your line of sight until the images of P_1 and P_2 appear one behind the other.
- Place two pins, P_5 and P_6, between your eye and the block so that P_5, P_6, and the images of P_1 and P_2 seen through the block, appear one behind the other.
- Label the positions of P_5 and P_6.
- Remove the block and the pins.
- Draw a line joining the positions of P_5 and P_6. Continue the line to **AB**.
- Label **F**, the end of the line furthest from **AB**.

[2]

(f) Measure the acute angle θ between the line **NL** and the line **CF**. (An acute angle is less than 90°.)

θ = ... ° [2]

[Total: 11]

Tie your ray-trace sheet into this question booklet between pages 8 and 9.

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4 A student investigates the change in resistance of a lamp filament when the current in the lamp is increased.

The following apparatus is available:

- a power supply
- a low-voltage filament lamp
- an ammeter
- a voltmeter
- connecting wires.

Other apparatus normally found in a school laboratory is also available.

Plan an experiment to investigate the change in resistance of the lamp filament when the current in the lamp is increased.

Resistance R is given by the equation $R = \frac{V}{I}$, where V is the potential difference (p.d.) across the lamp and I is the current in the lamp.

You are **not** required to do this investigation.

You should:

- draw a diagram of the circuit used
- explain briefly how to do the investigation, including how to change the current
- draw a table, or tables, with column headings, to show how to display your readings (you are **not** required to enter any readings in the table)
- explain how to use your readings to reach a conclusion.

....

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Cambridge Assessment International Education

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PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2023**

1 hour 15 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

For Examiner's Use	
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Total	

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DC (DE/SG) 316232/3

1 In this experiment, you will investigate the balancing of a metre ruler.

Carry out the following instructions, referring to Fig. 1.1.

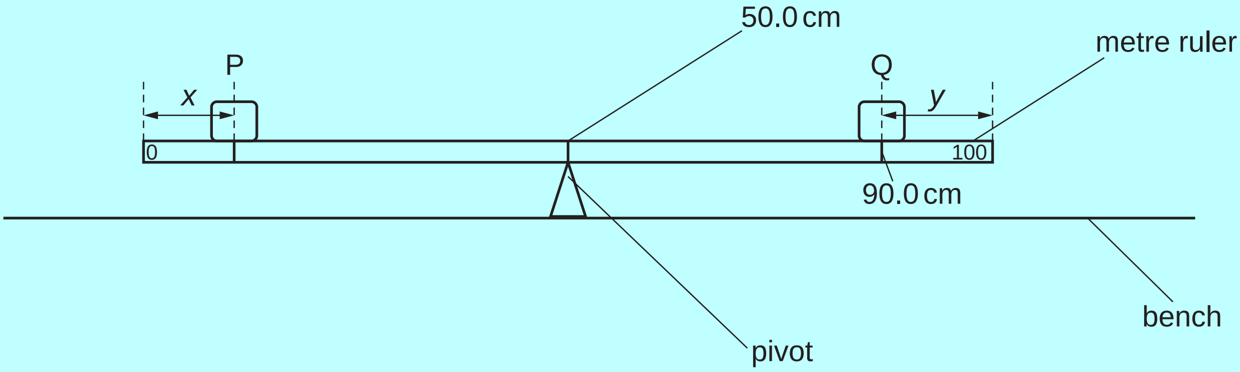


Fig. 1.1

(a) • Place the metre ruler on the pivot at the 50.0 cm mark with its scale facing upwards.
• Place the object Q with its centre on the metre ruler at the 90.0 cm mark.

Record the distance *y* from the centre of Q to the 100.0 cm end of the ruler.

y = ... cm [1]

(b) • Place a load P of weight *P* = 2.0 N on the metre ruler.
• Adjust the position of P so that the metre ruler is as near as possible to being balanced.

(i) Measure, and record in Table 1.1, the distance *x* from the centre of P to the zero end of the ruler. Record the weight *P*. [1]

(ii) Repeat the steps above, using loads of weight *P* = 3.0 N, 4.0 N, 5.0 N and 6.0 N.

Record all the values of *P* and *x* in Table 1.1. Ensure that the position of object Q on the metre ruler does **not** change.

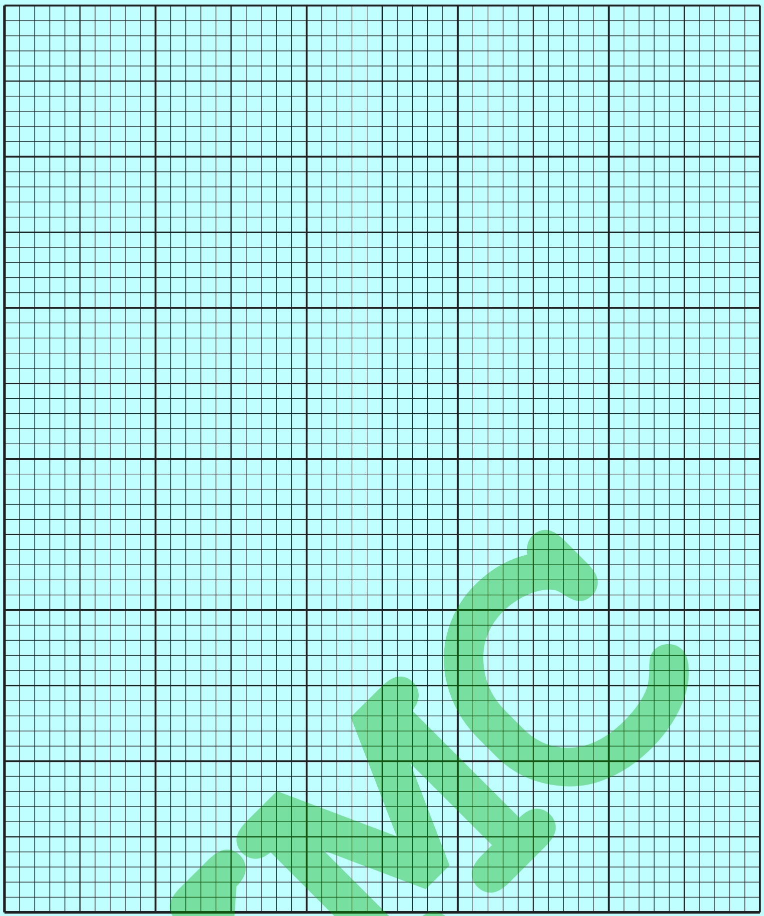
Table 1.1

P / N	*x* / cm

[3]

(c) Plot a graph of P / N (y-axis) against x / cm (x-axis).

Draw the best-fit line.



[4]

(d) Use the graph to find the value of x required to balance the ruler when P = 3.5 N.

Show clearly on the graph how you determined the value of x.

x = ... cm [2]

[Total: 11]

2 In this experiment, you will investigate the cooling of water.

Carry out the following instructions, referring to Fig. 2.1.

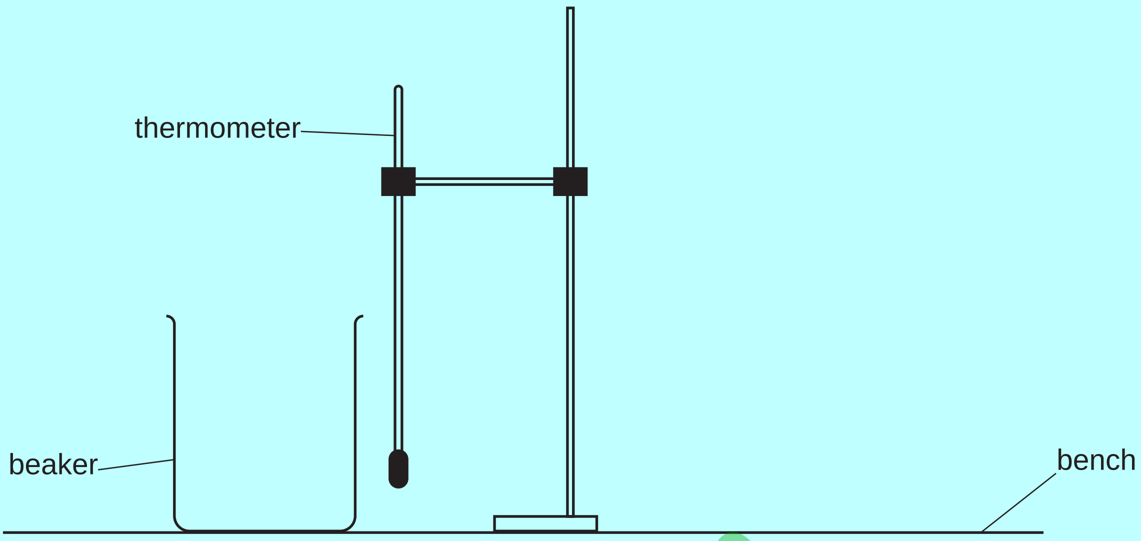


Fig. 2.1

(a) Use the thermometer to measure the room temperature θ_R.

θ_R = ... [1]

(b) (i) Pour 200 cm^3 of hot water into the beaker. Place the thermometer in the hot water in the beaker.

Record in Table 2.1 the temperature θ of the hot water at time $t = 0$. Immediately start the stop-watch.

Continue recording the temperature in Table 2.1 at 30 s intervals until you have seven sets of readings. [2]

(ii) Complete the column headings in Table 2.1.

Table 2.1

t /	θ /
0	
30	
60	
90	
120	
150	
180	

[1]

(c) **(i)** Calculate the decrease in temperature $\Delta\theta$ between $t = 0$ and $t = 180$ s.

$\Delta\theta$ = ... [1]

(ii) Calculate the average rate of cooling R of the water using the equation $R = \frac{\Delta\theta}{\Delta t}$, where $\Delta t = 180$ s. Include the unit.

R = ... [2]

(d) A student states that the average rate of cooling of the water decreases as the temperature comes nearer to room temperature.

(i) Suggest **one** change to the experiment that you could make to test the statement.

....

.... [1]

(ii) Suggest how to display the results to make it easier to see the trend in the rate of cooling.

....

....

.... [2]

(e) Explain briefly why it is good practice to read the thermometer scale at right angles.

....

.... [1]

[Total: 11]

3 In this experiment, you will investigate the refraction of light using a semicircular transparent block.

Carry out the following instructions using the separate ray-trace sheet provided. You may refer to Fig. 3.1 and Fig. 3.2 for guidance.

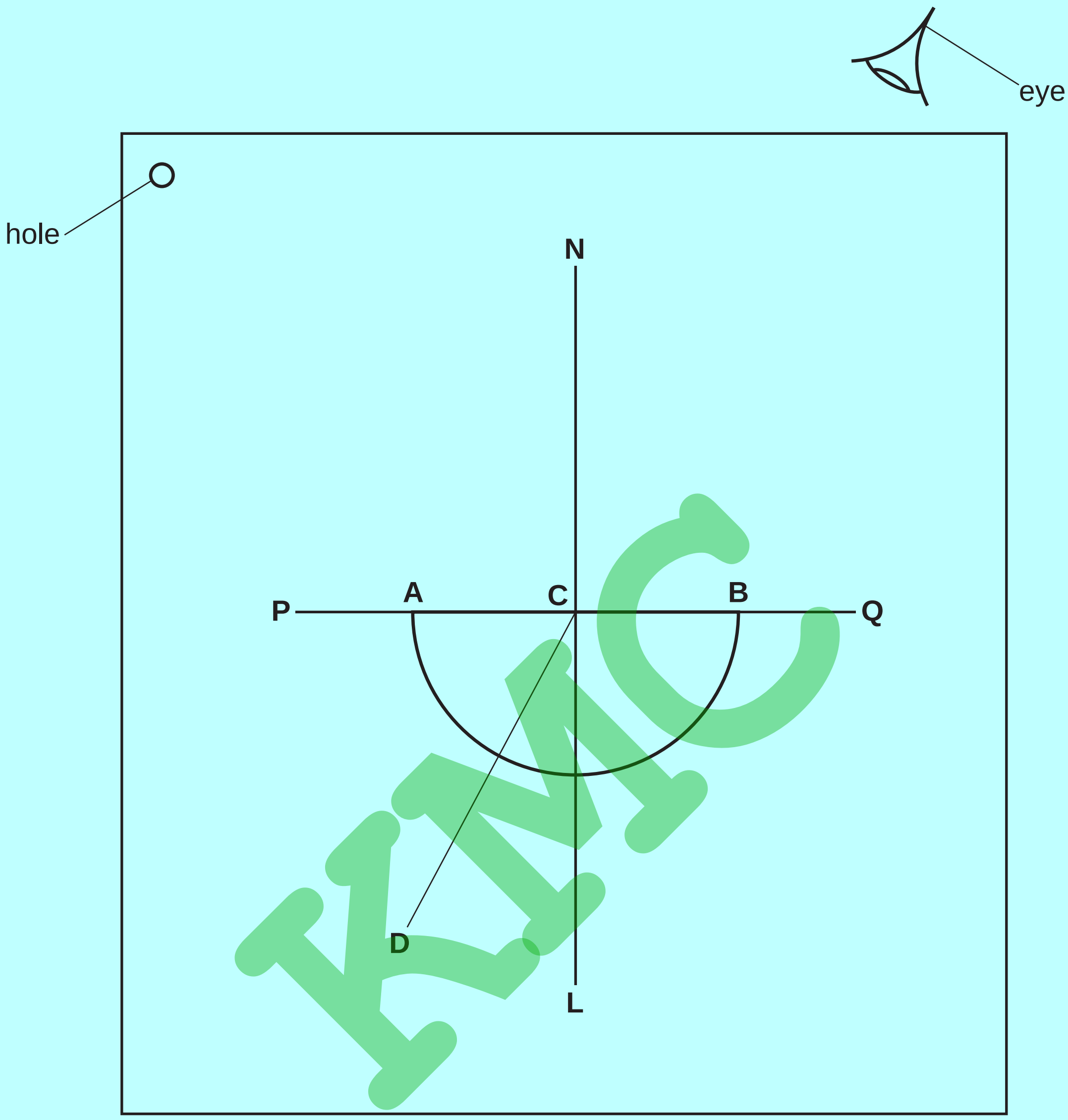


Fig. 3.1

(a)
- Draw a line across the ray-trace sheet supplied, approximately in the middle. Label the line **PQ**.
- Place the transparent block, largest face down, with the straight side on the line **PQ** and the curved side below the line.
- Draw round the outline of the block. Label the ends of the straight side of the block **A** and **B**.
- Remove the block and draw the normal **NL** through the centre of **AB**. Continue the normal so that it passes through the curved side of the block.
- Label the point **C** where the normal **NL** crosses **AB**.

[1]

(b)
- Draw the line **DC** at an angle *i* = 30° to the normal, as shown in Fig. 3.1.
- Place the paper on the pin board.
- Place two pins, P_1 and P_2, on line **DC** at a suitable distance apart for this experiment.
- Replace the block and look from the position of the eye shown in Fig. 3.1 to observe the images of P_1 and P_2 through side **AB** of the block. Adjust your line of sight until the images of P_1 and P_2 appear one behind the other.
- Place two pins, P_3 and P_4, between your eye and the block so that P_3, P_4, and the images of P_1 and P_2 seen through the block, appear one behind the other.
- Label the positions of P_1, P_2, P_3 and P_4.
- Remove the block and the pins.
- Draw a line joining the positions of P_3 and P_4. Continue the line to **AB**.
- Label **E**, the end of the line furthest from **AB**.

[3]

(c) Measure the acute angle θ between the line **NL** and the line **CE**. (An acute angle is less than 90°.)

θ = ...° [2]

(d) State **one** precaution that you take to produce an accurate ray trace.

....

.... [1]

(e) Place the transparent block on the ray-trace sheet in the position shown in Fig. 3.2.

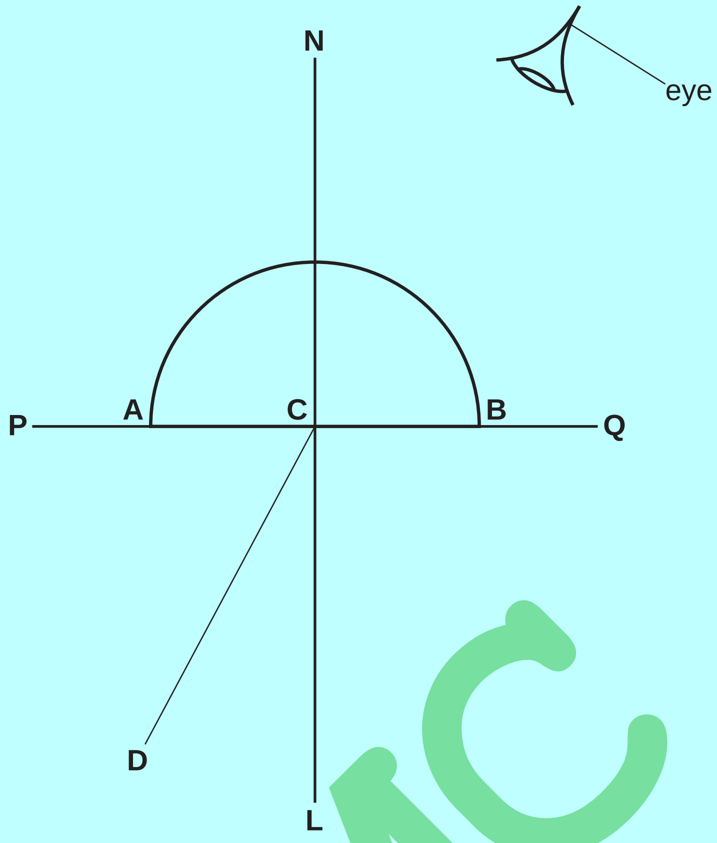


Fig. 3.2

- Replace pins P_1 and P_2 on line **DC** in the same positions used in **(b)**.
- Observe the images of P_1 and P_2 through the curved side of the block. Adjust your line of sight until the images of P_1 and P_2 appear one behind the other.
- Place two pins, P_5 and P_6, between your eye and the block so that P_5, P_6, and the images of P_1 and P_2 seen through the block, appear one behind the other.
- Label the positions of P_5 and P_6.
- Remove the block and the pins.
- Draw a line joining the positions of P_5 and P_6. Continue the line to **AB**.
- Label **F**, the end of the line furthest from **AB**.

[2]

(f) Measure the acute angle θ between the line **NL** and the line **CF**. (An acute angle is less than 90°.)

θ = ... ° [2]

[Total: 11]

Tie your ray-trace sheet into this question booklet between pages 8 and 9.

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4 A student investigates the change in resistance of a lamp filament when the current in the lamp is increased.

The following apparatus is available:

- a power supply
- a low-voltage filament lamp
- an ammeter
- a voltmeter
- connecting wires.

Other apparatus normally found in a school laboratory is also available.

Plan an experiment to investigate the change in resistance of the lamp filament when the current in the lamp is increased.

Resistance R is given by the equation $R = \frac{V}{I}$, where V is the potential difference (p.d.) across the lamp and I is the current in the lamp.

You are **not** required to do this investigation.

You should:

- draw a diagram of the circuit used
- explain briefly how to do the investigation, including how to change the current
- draw a table, or tables, with column headings, to show how to display your readings (you are **not** required to enter any readings in the table)
- explain how to use your readings to reach a conclusion.

[7]

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CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

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PHYSICS **0625/52**

Paper 5 Practical Test **May/June 2023**

1 hour 15 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

For Examiner's Use	
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3	
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Total	

This document has **12** pages. Any blank pages are indicated.

DC (DE/FC) 316254/3

[Turn over

1 In this experiment, you will investigate the stretching of a spring.

Carry out the following instructions, referring to Fig. 1.1.

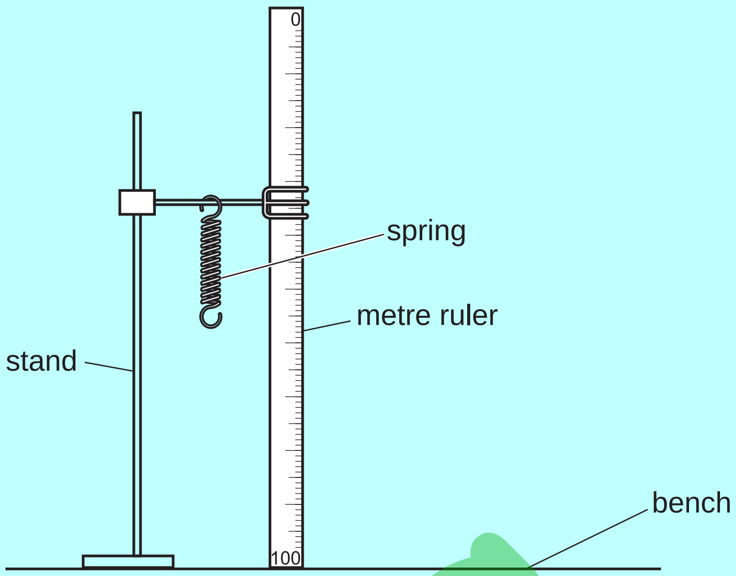

Fig. 1.1

(a) The metre ruler is clamped in position near to the spring. Do **not** change the position of the metre ruler.

(i) The value l_0 is the length of the spring when the load L is 0.0 N.

Measure the unstretched length l_0 of the spring. Do **not** include the loops at the ends of the spring in your measurement.

Record l_0 in cm to the nearest mm in Table 1.1. [1]

(ii) Draw a diagram of the spring to show clearly the length l_0 of the spring.

[1]

(b)
- Suspend a load L = 1.0 N from the spring.
- Record the new length l of the spring in Table 1.1.
- Calculate the extension e of the spring using the equation $e = (l - l_0)$.
- Record the value of e in Table 1.1.
- Repeat the procedure using loads L = 2.0 N, 3.0 N, 4.0 N and 5.0 N.
- Record all the readings and results in Table 1.1.

Table 1.1

L / N	l / cm	e / cm
0.0		0
1.0		
2.0		
3.0		
4.0		
5.0		

[3]

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

Draw the best-fit line.

[4]

(d) Use the graph to determine e_A, the extension produced by a load of 2.5 N. Show clearly on the graph how you obtained the necessary information.

e_A = ... [2]

[Total: 11]

2 In this experiment, you will investigate the cooling of water.

Carry out the following instructions, referring to Fig. 2.1.

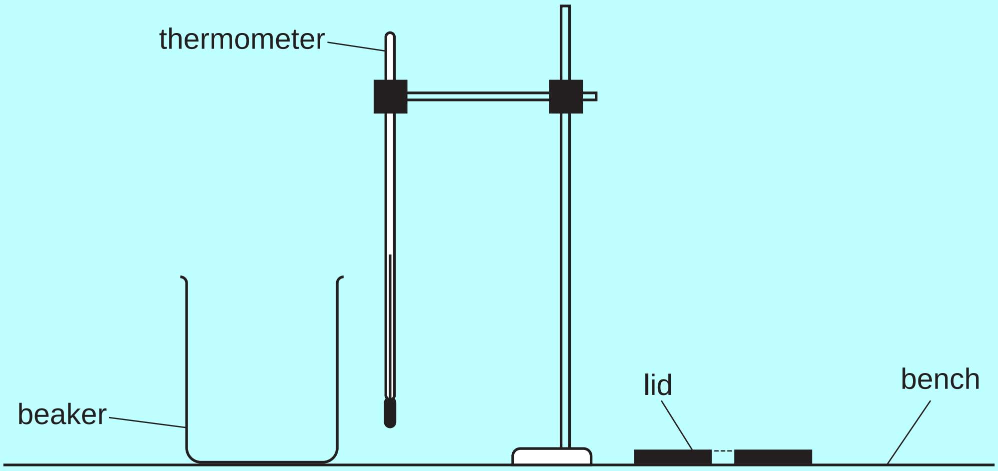

Fig. 2.1

(a) Use the thermometer to measure the room temperature θ_R.

θ_R = ... [1]

(b) (i) Pour $200\,cm^3$ of hot water into the beaker. Place the lid on the beaker. Place the thermometer in the hot water in the beaker.

Record, in Table 2.1, the temperature θ of the hot water at time t = 0. Immediately start the stop-watch.

Continue recording the temperature in Table 2.1 at 30 s intervals until you have seven sets of readings.

[2]

(ii) Complete the column headings in Table 2.1.

Table 2.1

t /	θ /
0	
30	
60	
90	
120	
150	
180	

[1]

(c) **(i)** Calculate the decrease in temperature $\Delta\theta$ between t = 0 and t = 180 s.

$\Delta\theta$ = ... [1]

(ii) Calculate the average rate of cooling R of the water using the equation $R = \dfrac{\Delta\theta}{\Delta t}$, where Δt = 180 s. Include the unit.

R = ... [2]

(d) A student states that the water cools slowly.

Suggest **two** changes to the experiment that you could make to increase the rate of cooling of the hot water without changing the starting temperature of the hot water. Room temperature remains constant.

1 ....

....

2 ....

.... [2]

(e) State **one** precaution that you take to obtain accurate temperature readings.

Explain briefly the reason for this precaution.

statement ....

explanation ....

....

.... [2]

[Total: 11]

3 In this experiment, you will investigate the refraction of light using a semicircular transparent block.

Carry out the following instructions, using the separate ray-trace sheet provided. You may refer to Fig. 3.1 and Fig. 3.2 for guidance.

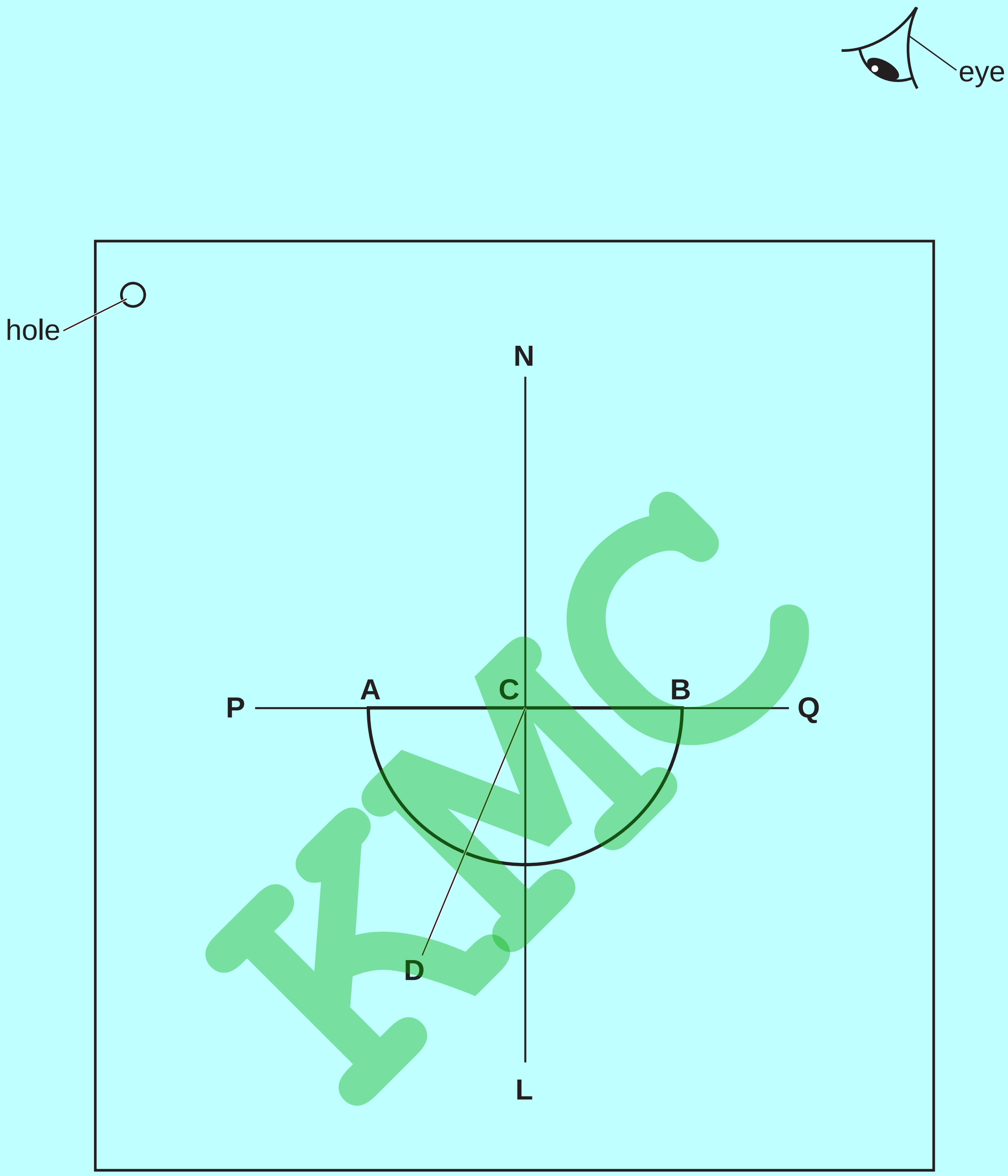

Fig. 3.1

(a)
- Draw a line across the ray-trace sheet supplied, approximately in the middle. Label the line **PQ**.
- Place the transparent block, largest face down, with the straight side on the line **PQ** and the curved side below the line.
- Draw round the outline of the block. Label the ends of the straight side of the block **A** and **B**.
- Remove the block and draw the normal **NL** through the centre of **AB**. Continue the normal so that it passes through the curved side of the block.
- Label the point **C** where the normal **NL** crosses **AB**.

[1]

(b)
- Draw the line **DC** at an angle i = 20° to the normal, as shown in Fig. 3.1.
- Place the paper on the pin board.
- Place two pins, P_1 and P_2, on line **DC** at a suitable distance apart for this experiment.
- Replace the block and look from the position of the eye shown in Fig. 3.1 to observe the images of P_1 and P_2 through side **AB** of the block. Adjust your line of sight until the images of P_1 and P_2 appear one behind the other.
- Place two pins, P_3 and P_4, between your eye and the block so that P_3, P_4, and the images of P_1 and P_2 seen through the block, appear one behind the other.
- Label the positions of P_1, P_2, P_3 and P_4.
- Remove the block and the pins.
- Draw a line joining the positions of P_3 and P_4. Continue the line to **AB**.
- Label **E**, the end of the line furthest from **AB**.

[3]

(c) Measure the acute angle θ between the line **NL** and the line **EC**. (An acute angle is less than 90°.)

θ = ... ° [2]

(d) State **one** precaution that you take to produce an accurate ray trace.

....

.... [1]

(e)

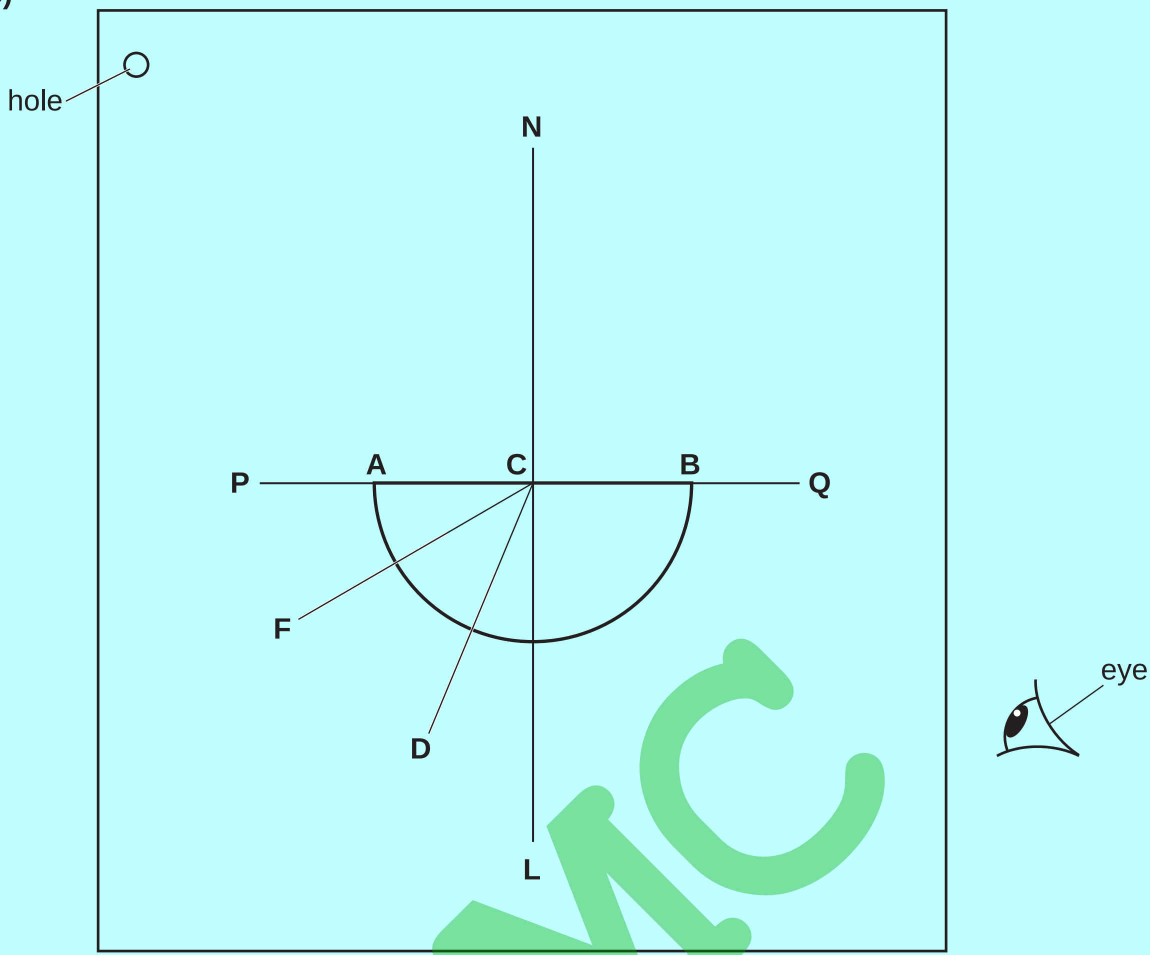

Fig. 3.2

- On the ray-trace sheet, draw a line **FC** at an angle i = 70° to the normal **NL**, as shown in Fig. 3.2.
- Replace the transparent block on the ray-trace sheet in the position shown in Fig. 3.2.
- Place pins P_1 and P_2 on line **FC** at a suitable distance apart for this type of experiment.
- Observe the images of P_1 and P_2 through the curved side of the block. Look from the position of the eye shown in Fig. 3.2.
- Adjust your line of sight until the images of P_1 and P_2 appear one behind the other.
- Place two pins, P_5 and P_6, between your eye and the block so that P_5, P_6, and the images of P_1 and P_2 seen through the block, appear one behind the other.
- Label the positions of P_5 and P_6.
- Remove the block and the pins.
- Draw a line joining the positions of P_5 and P_6. Continue the line to **AB**.
- Label **G**, the end of the line furthest from **AB**.

[2]

(f) Measure the acute angle θ between the line **NL** and the line **GC**. (An acute angle is less than 90°.)

θ = ... ° [2]

[Total: 11]

Tie your ray-trace sheet into this question booklet between pages 8 and 9.

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4 A student investigates the change in current in a conducting liquid as the distance between two electrodes is changed. The circuit is shown in Fig. 4.1.

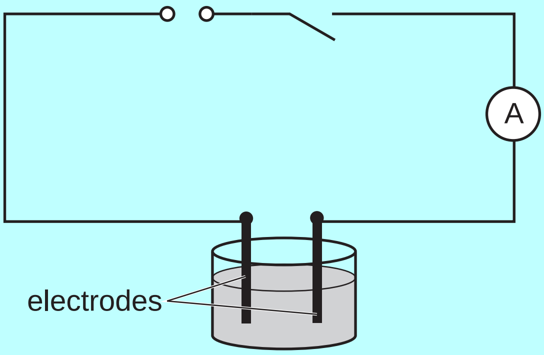

Fig. 4.1

Plan an experiment to investigate the change in current in the liquid as the distance between the electrodes is changed.

You are **not** required to do this investigation.

You should:

- explain briefly how to do the investigation
- state the key variables to keep constant
- draw a table, or tables, with column headings, to show how to display your readings (you are **not** required to enter any readings in the table)
- explain how to use your readings to reach a conclusion.

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PHYSICS **0625/53**

Paper 5 Practical Test **May/June 2023**

1 hour 15 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION
- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

For Examiner's Use	
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Total	

This document has **12** pages. Any blank pages are indicated.

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[Turn over

1 In this experiment, you will determine the mass M_R of a metre ruler using a balancing method.

Carry out the following instructions, referring to Fig. 1.1.

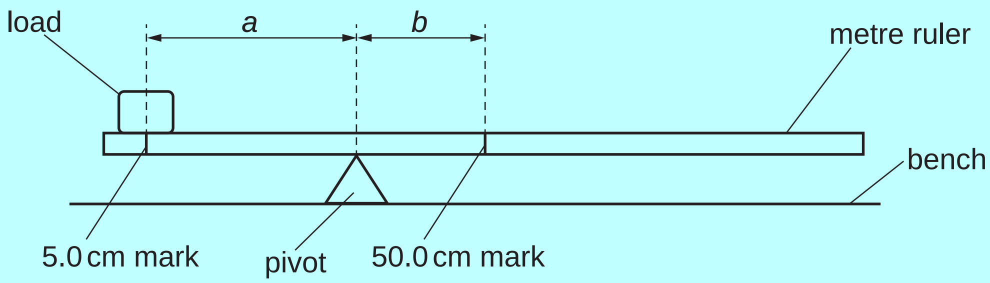


Fig. 1.1

(a) **(i)** Place a load of mass $M = 20\,g$ with its centre at the 5.0 cm mark of the metre ruler.

Explain briefly how you make sure that the centre of the load is at the 5.0 cm mark. You may draw a diagram if it helps your explanation.

....

....

.... [1]

(ii) Place the metre ruler on the pivot. Adjust the position of the metre ruler on the pivot until the metre ruler is as near as possible to being balanced. Check that the position of the centre of the load remains at the 5.0 cm mark.

Record, in Table 1.1, the scale reading p on the ruler at the position of the pivot.

Calculate, and record in Table 1.1:

- The distance a between the 5.0 cm mark and the pivot. Use your value of p and the equation $a = p - 5.0$.
- The distance b between the 50.0 cm mark and the pivot. Use your value of p and the equation $b = 50.0 - p$.

Repeat this procedure for values of $M = 40\,g$, $60\,g$, $80\,g$ and $100\,g$.

[2]

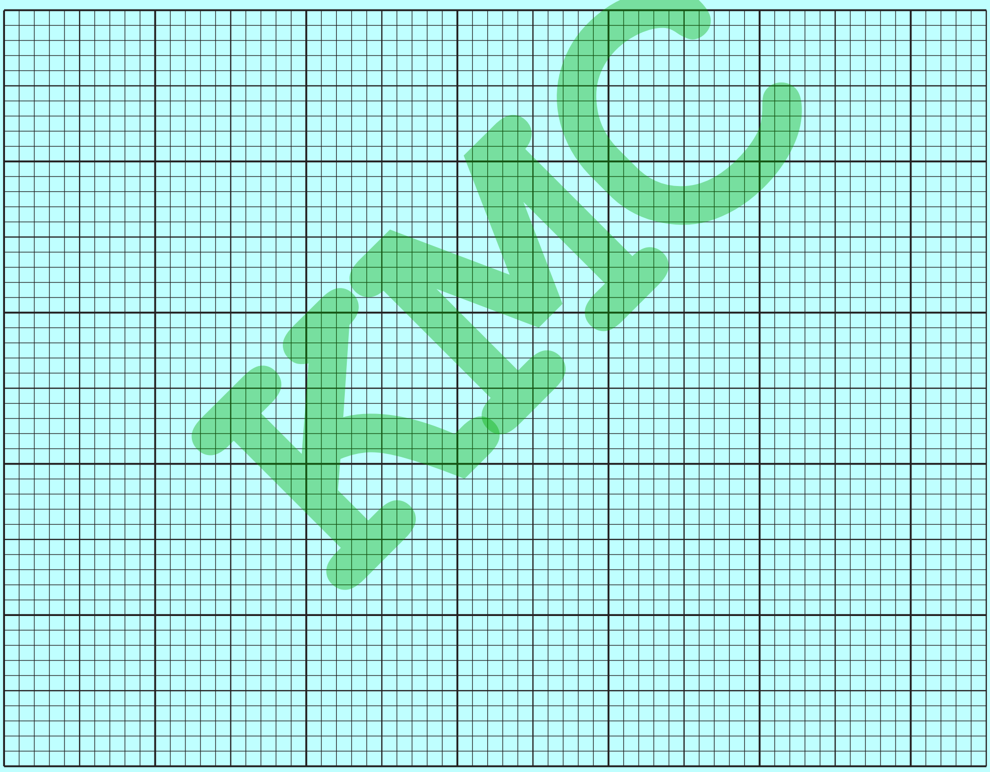
Table 1.1

M / g	p / cm	a / cm	b / cm	$\frac{b}{a}$
20				
40				
60				
80				
100				

(b) For each value of M, calculate and record in Table 1.1 the value $\frac{b}{a}$. [1]

(c) Plot a graph of M / g (y-axis) against $\frac{b}{a}$ (x-axis).

Draw the best-fit line.



[4]

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

G = ... [1]

(ii) The mass M_R of the metre ruler is numerically equal to G.

Write down the value of M_R in this experiment. Include the unit.

M_R = ... [1]

(e) The determination of M_R by this method assumes that the centre of mass of the metre ruler is at the 50.0 cm mark.

A student finds that the centre of mass of his metre ruler is at the 48.7 cm mark.

Suggest how he changes the procedure in **(a)(ii)** to allow for this.

....

....

.... [1]

[Total: 11]

2 In this experiment, you will investigate circuits containing different combinations of resistors. Fig. 2.1 shows **circuit A** which has been set up for you.

Carry out the following instructions, referring to Fig. 2.1.

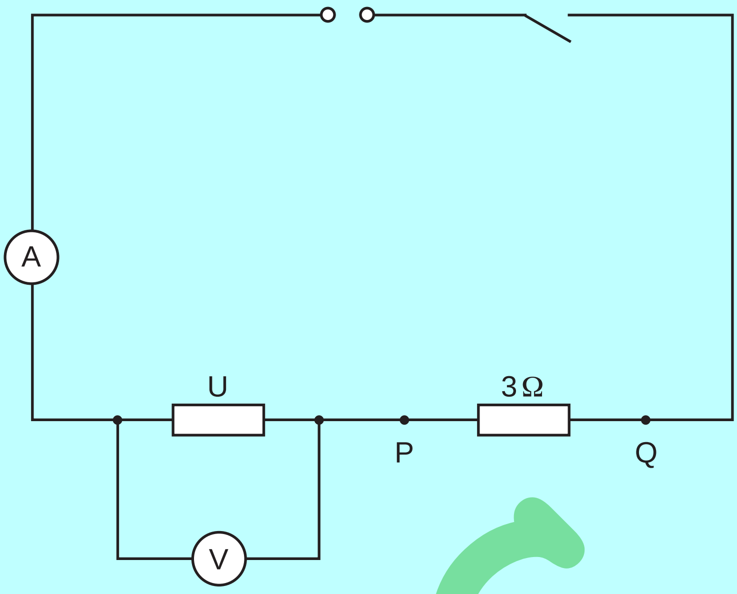


Fig. 2.1

(a) Circuit A

Close the switch.

Measure, and record in Table 2.1, the potential difference (p.d.) V across resistor U.

Measure, and record in Table 2.1, the current I in the circuit.

Open the switch.

Table 2.1

circuit	V / V	I / A	R / Ω
A			
B			
C			

[1]

(b) Circuit B

Connect a second 3Ω resistor between terminals P and Q so that it is in parallel with the first 3Ω resistor, as shown in Fig. 2.2. The rest of the circuit must remain as in Fig. 2.1.

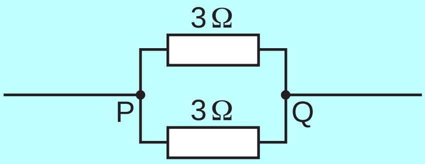


Fig. 2.2

Close the switch.

Measure, and record in Table 2.1, the potential difference (p.d.) V across resistor U.

Measure, and record in Table 2.1, the current I in the circuit.

Open the switch.

[1]

(c) Circuit C

Connect a third 3Ω resistor between terminals P and Q so that it is in parallel with the other 3Ω resistors, as shown in Fig. 2.3. The rest of the circuit must remain as in Fig. 2.1.

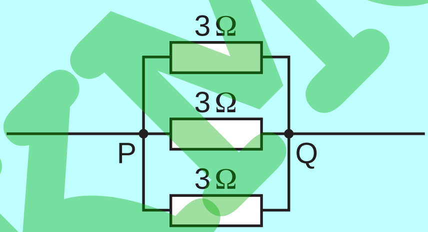


Fig. 2.3

Close the switch.

Measure, and record in Table 2.1, the potential difference (p.d.) V across resistor U.

Measure, and record in Table 2.1, the current I in the circuit.

Open the switch.

[1]

(d) (i) Calculate, and record in Table 2.1, the resistance R of resistor U for each combination of resistors.
Use your readings from Table 2.1 and the equation $R = \frac{V}{I}$.

[3]

(ii) A student suggests that the values of *R* should be the same.

State whether your results support this suggestion. Justify your statement by reference to values from your results.

statement ....

justification ....

....

.... [2]

(e) A student determines the resistance of resistor U using a variable resistor to control the current in the circuit.

(i) Briefly explain **one** advantage of using a variable resistor for this purpose rather than the procedure carried out in **(a)**, **(b)** and **(c)**.

....

....

.... [1]

(ii) Draw the circuit symbol for a variable resistor.

[1]

(f) Another student suggests that potential difference and current for resistor U are proportional.

State how a graph of potential difference against current for resistor U can confirm this suggestion.

....

....

....

.... [1]

[Total: 11]

3 In this experiment, you will investigate the reflection of light by two mirrors.

Carry out the following instructions, using the separate ray-trace sheet provided.
You may refer to Fig. 3.1 for guidance.

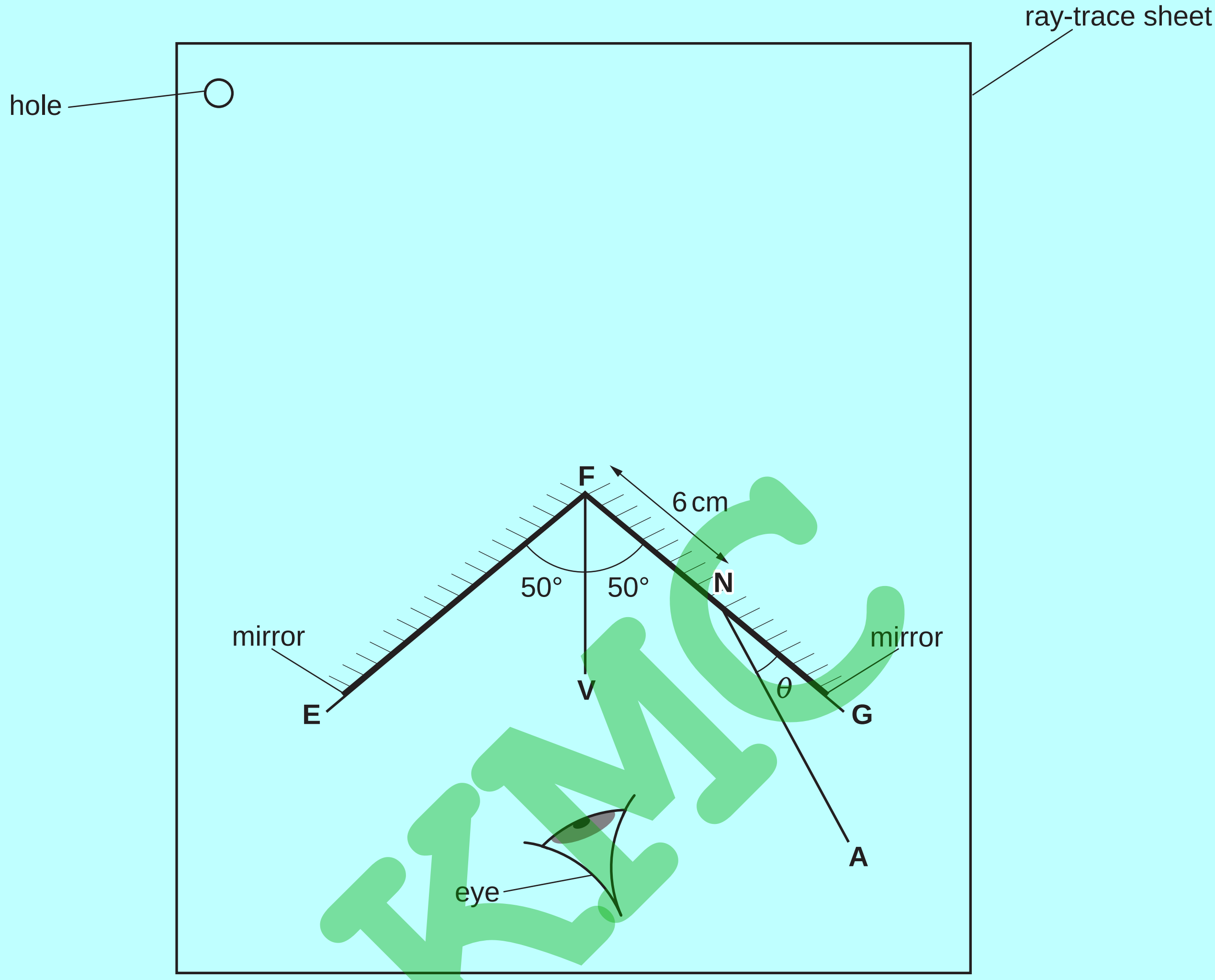


Fig. 3.1

(a)
- Mark and label a point **F** approximately in the centre of your ray-trace sheet.
- Draw a 5 cm long line **FV**, from point **F**, as shown in Fig. 3.1.
- Draw two lines, **FG** and **FE**, each 9 cm long and at 50° either side of **FV**, as shown in Fig. 3.1.
- Draw a normal to line **FG**, crossing **FG** at a point **N**, 6 cm from **F**.
- Label the lower end of the normal with the letter **L**.
- Draw a line **NA**, as shown in Fig. 3.1, 8 cm long and at an angle θ_1 = 15° to **NG**.

[2]

(b)
- Place the plane mirrors on lines **FG** and **FE**, with their reflecting surfaces facing inwards, as shown in Fig. 3.1.
- Place two pins, P_1 and P_2, on line **NA**, a suitable distance apart for accurate ray tracing.
- Label the positions of P_1 and P_2.
- View the images of P_1 and P_2 from the direction indicated by the eye in Fig. 3.1.
- Place two pins, P_3 and P_4, a suitable distance apart, so that pins P_3 and P_4, and the images of P_1 and P_2, all appear one behind the other.
- Label the positions of P_3 and P_4.
- Remove the mirrors and pins from the ray-trace sheet.

[1]

(c)
- Draw a line joining P_3 and P_4. Extend this line 10 cm above **FE**.
- Label the lower end of this line with the letter **B**. Label the upper end with the letter **R**.

[1]

(d) **(i)**
- Draw a new line **NA**, 8 cm long and at an angle $\theta_2 = 40°$.
- Repeat the steps in **(b)**.
- Draw a line joining the new positions of P_3 and P_4. Extend this line until it crosses **BR**.
- Label the lower end of this line with the letter **C**. Label the upper end with the letter **T**.

[2]

(ii) Measure the acute angle α between lines **BR** and **CT**. (An acute angle is less than 90°.)

α = ...° [1]

(iii) A student thinks that there is a relationship between angle α and the values of angle θ_1 from **(a)** and angle θ_2 from **(d)(i)**.

State what your results suggest that relationship could be. Justify your answer by reference to values from your results.

statement ....

justification ....

....

[2]

(e) Suggest **one** precaution to take in this type of experiment to ensure accurate results.

....

.... [1]

(f) Suggest **one** reason why different students, all doing this experiment carefully, may **not** obtain identical results.

....

.... [1]

[Total: 11]

Tie your ray-trace sheet into this booklet between pages 8 and 9.

4 A student investigates the rate of cooling of hot water in a container which has a lid.

Plan an experiment which will enable him to compare the effect of lids of different thicknesses on the rate of cooling.

The apparatus available includes:

- a beaker
- a supply of hot water
- insulating material from which lids can be cut.

You are **not** required to do the experiment.

In your plan, you should:

- list any additional apparatus needed
- explain briefly how to do the experiment, including the measurements to take so that the rate of cooling can be determined
- state the key variables to keep constant
- draw a table, or tables, with column headings, to show how to display the readings (you are **not** required to enter any readings in the table)
- explain how to use the readings to reach a conclusion.

You may draw a diagram if it helps to explain your plan.

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