Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

7917946542

PHYSICS **0625/62**

Paper 6 Alternative to Practical **February/March 2018**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

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.
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.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **14** printed pages and **2** blank pages.

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CAMBRIDGE International Examinations

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1 A student is determining the mass of a metre rule by a balancing method.

He is using the apparatus shown in Fig. 1.1.

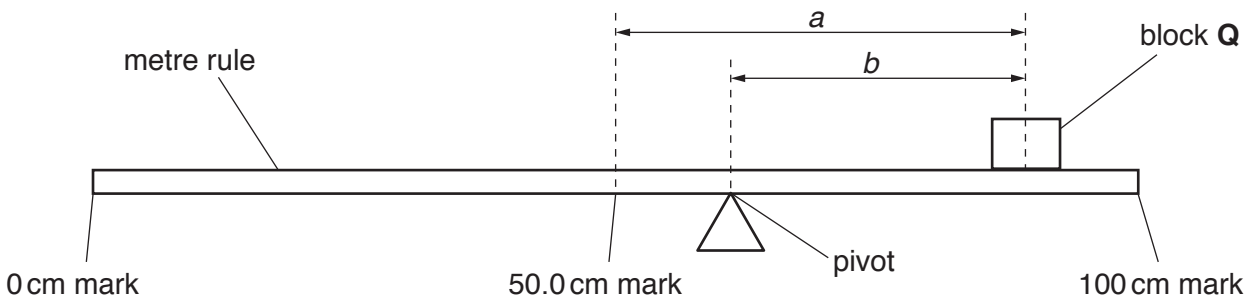


Fig. 1.1

(a) He places the metre rule on the pivot and then places block **Q** with its centre at the 95.0 cm mark.
The student stated that it is difficult to place the mass accurately at the 95.0 cm mark.

Explain how the student could overcome this. You may draw a diagram to help your explanation.

.....

.....

.....[1]

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(b) The student keeps block **Q** at the 95.0 cm mark and adjusts the position of the metre rule on the pivot until the metre rule is as near to being balanced as possible.

Describe a method to find the point at which the metre rule is as near to being balanced as possible.

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.....[2]

(c) The student determines the distance *a* between the centre of block **Q** and the 50.0 cm mark and also the distance *b* between the centre of block **Q** and the pivot.

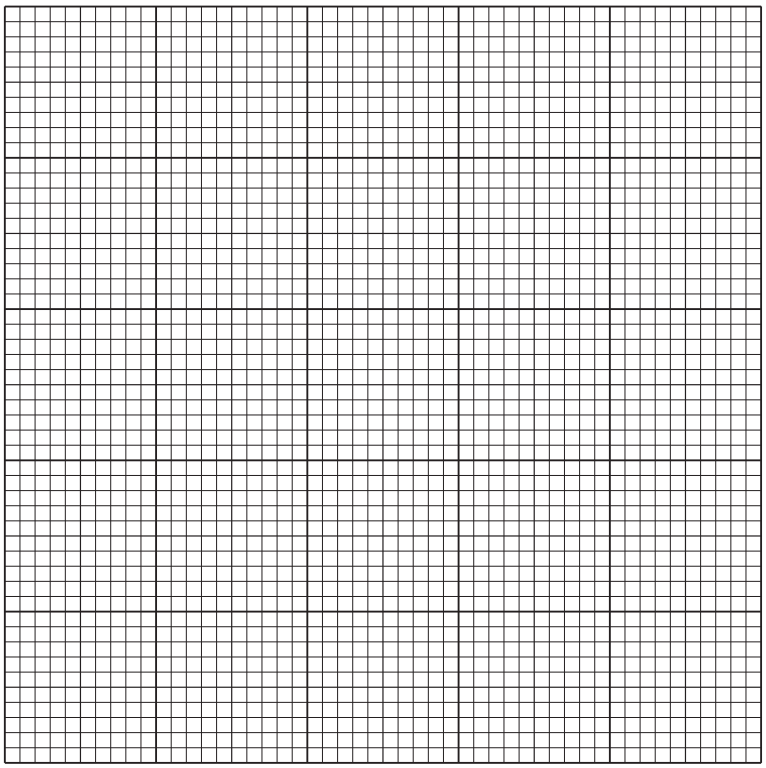
He repeats the procedure for positions of block **Q** at the 90.0 cm, 85.0 cm, 80.0 cm and 75.0 cm marks. His results are shown in Table 1.1.

Table 1.1

position of **Q** / cm	*a* / cm	*b* / cm
95.0	45.0	39.0
90.0	40.0	34.3
85.0	35.0	30.0
80.0	30.0	25.2
75.0	25.0	21.4

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(i) Plot a graph of a/cm (y-axis) against b/cm (x-axis). You do not need to start your axes at the origin (0, 0).



[4]

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

G = ...[1]

(iii) Calculate the mass M_R of the metre rule using the equation $M_R = \dfrac{M}{(G-1)}$,

where M = 20 g. Record the value for M_R to a suitable number of significant figures for this experiment.

M_R = ...[2]

(d) Two students carry out the experiment correctly but with different values for the mass of block **Q**. One student obtains values of *b* that are larger than those obtained by the other student.

State and explain whether the larger values of *b* are likely to produce a more accurate value for the mass of the metre rule.

.....

.....

.....[1]

[Total: 11]

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2 Some students are investigating how the volume of water affects the rate at which water in a beaker cools.

They are using the apparatus shown in Fig. 2.1.

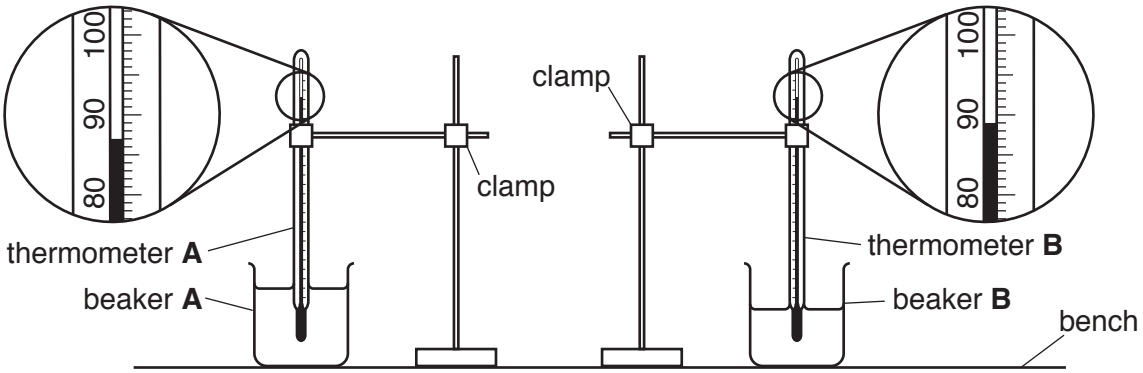


Fig. 2.1

(a) (i) 200 cm^3 of hot water is poured into beaker **A** and the initial temperature rises to the value shown on thermometer **A** in Fig. 2.1.

In the first row of Table 2.1, record this temperature θ_A for time $t = 0$.

100 cm^3 of hot water is poured into beaker **B**. The temperature rises to the value shown on thermometer **B** in Fig. 2.1.

In the first row of the table, record this temperature θ_B for time $t = 0$.

[1]

(ii) The temperatures θ_A and θ_B of the water in each experiment at times $t = 30$ s, 60 s, 90 s, 120 s, 150 s and 180 s are shown in the table.

Complete the headings and the time column in the table. [2]

Table 2.1

	beaker **A** with 200 cm^3 of water	beaker **B** with 100 cm^3 of water
t/	θ_A/	θ_B/
0		
	85.0	86.0
	83.0	83.0
	81.5	80.5
	80.0	78.0
	78.5	76.0
	77.5	74.5

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(b) Describe one precaution which should be taken to ensure that the temperature readings in the experiment are as accurate as possible.

.....

.....[1]

(c) Write a conclusion stating how the volume of water in the beaker affects the rate of cooling of the water. Justify your answer by reference to the results.

.....

.....

.....

.....

.....[2]

(d) **(i)** Using the results for 100 cm^3 of water, calculate the average rate of cooling x_1 for the **first** 90 s of the experiment. Use the 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 time 0 and at time 90 s.
Include the unit for the rate of cooling.

x_1 = ...[1]

(ii) Using the results for 100 cm^3 of water, calculate the average rate of cooling x_2 in the **last** 90 s of the experiment. Use the 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 time 90 s and at time 180 s.
Include the unit for the rate of cooling.

x_2 = ...[1]

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(e) A student suggests that it is important that the experiments with the two volumes of water should have the same starting temperatures.

State whether your values for x_1 and x_2 support this suggestion. Justify your statement with reference to your results.

statement .....

justification .....

.....

.....
[1]

(f) Another student plans to investigate whether more thermal energy is lost from the water surface than from the sides of the beakers.

Describe an experiment that could be done to investigate this.

You may draw a diagram to help your description.

.....

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.....[2]

[Total: 11]

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3 A student is investigating a circuit containing different lamps.
She is using the circuit shown in Fig. 3.1.

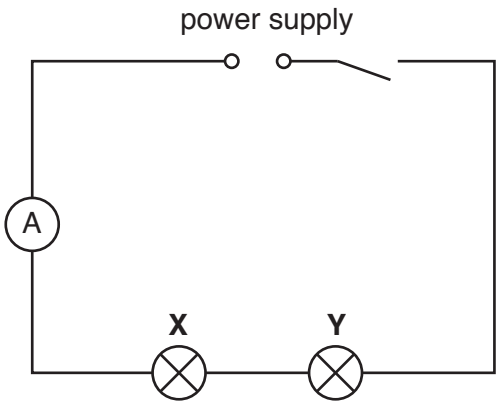


Fig. 3.1

(a) On Fig. 3.1, draw a voltmeter connected so that it measures the potential difference (p.d.) across lamp **X**.

[1]

(b) The student uses the ammeter to measure the current in the circuit.

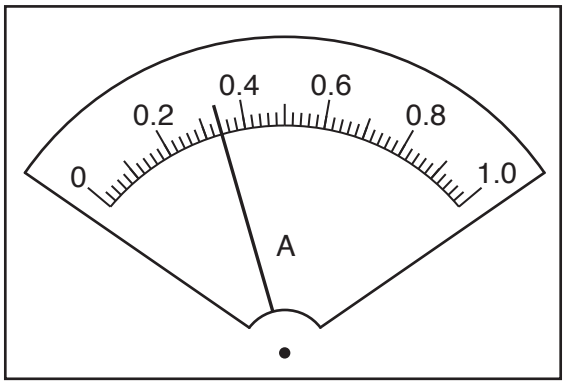


Fig. 3.2

Record the current I_S in the circuit, as shown in Fig. 3.2.

I_S = ...[1]

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(c) (i) The student uses the voltmeter to measure the p.d. V_X across lamp **X** and then reconnects the voltmeter to measure the p.d. V_Y across lamp **Y**.

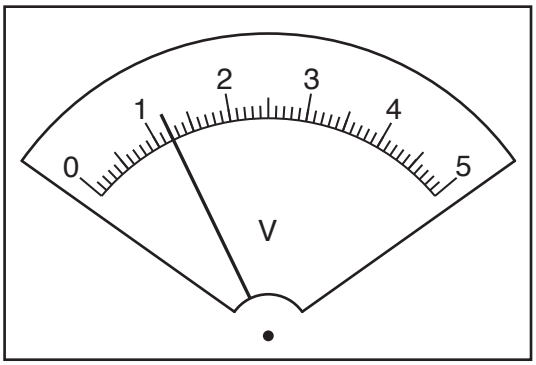


Fig. 3.3

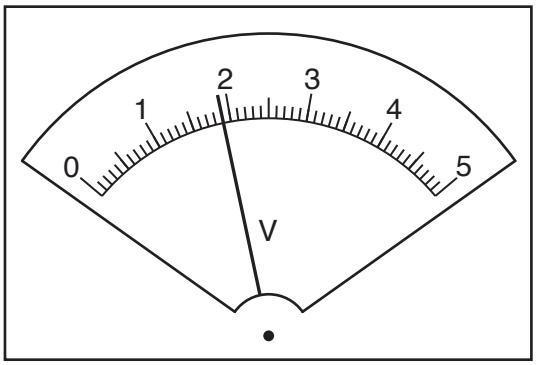


Fig. 3.4

Record the value of the p.d. V_X across lamp **X**, shown in Fig. 3.3.

V_X = ...

Record the value of the p.d. V_Y across lamp **Y**, shown in Fig. 3.4.

V_Y = ...
[1]

(ii) She then measures the p.d. V_S across both lamps in series.

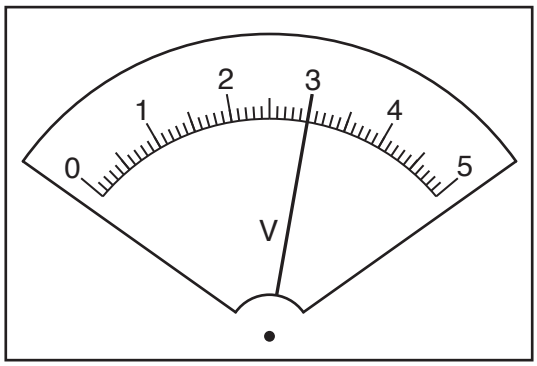


Fig. 3.5

Record the value of the p.d. V_S across both lamps in series, shown in Fig. 3.5.

V_S = ...[1]

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(iii) A student suggests that V_S should be equal to ($V_X + V_Y$).
State whether the readings support this suggestion. Justify your statement with reference to the results.

statement .....

justification .....

.....

.....
[2]

(d) Calculate the resistance R_1 of lamp **X**. Use the readings from **(b)** and **(c)(i)** and the equation $R_1 = \frac{V_X}{I_S}$.

R_1 = ... Ω [1]

(e) **(i)** The circuit components are to be rearranged so that

- lamps **X** and **Y** are connected in parallel
- the ammeter measures the current in lamp **X** only
- the voltmeter measures the p.d. across the lamps.

Draw a circuit diagram of this arrangement.

[2]

(ii) The student sets up the circuit as described in **(e)(i)**.

She measures and records the current in lamp **X** and the p.d. across the lamps.

She then calculates a new resistance R_2 for lamp **X** in this parallel circuit.

R_2 = 8.3 Ω

The student notices that lamp **X** is very bright in this parallel circuit, but it was dim in the series circuit in **(a)**.

Suggest how temperature affects the resistance of a lamp.
Justify your suggestion by reference to the value of R_1 from **(d)** and the value of R_2.

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.....
[2]

[Total: 11]

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4 A student is investigating the factors that affect the size of the crater (hole) a ball makes when it is dropped into sand.

Plan an experiment which would enable you to investigate one factor which might affect the size of the crater.

The apparatus available includes

metal balls of different sizes
a tray of sand

Write a plan for the experiment.

In your plan you should:

- state which factor is being investigated,
- state the key variables that you would control,
- list any additional apparatus needed,
- explain briefly how you would carry out the experiment including what would be measured and how this would be done,
- state the precautions which should be taken to obtain reliable results,
- suggest a suitable graph which could be drawn from the results.

You may draw a diagram if it helps to explain your plan.

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