UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

*1930630374*

**PHYSICS** **5054/42**

Paper 4 Alternative to Practical **October/November 2010**

**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 a soft 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.

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

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[Turn over

**1** A student investigates the movement of a suspended metre rule.

*For Examiner's Use*

Metre rule A is clamped horizontally above the bench, as shown in Fig. 1.1.

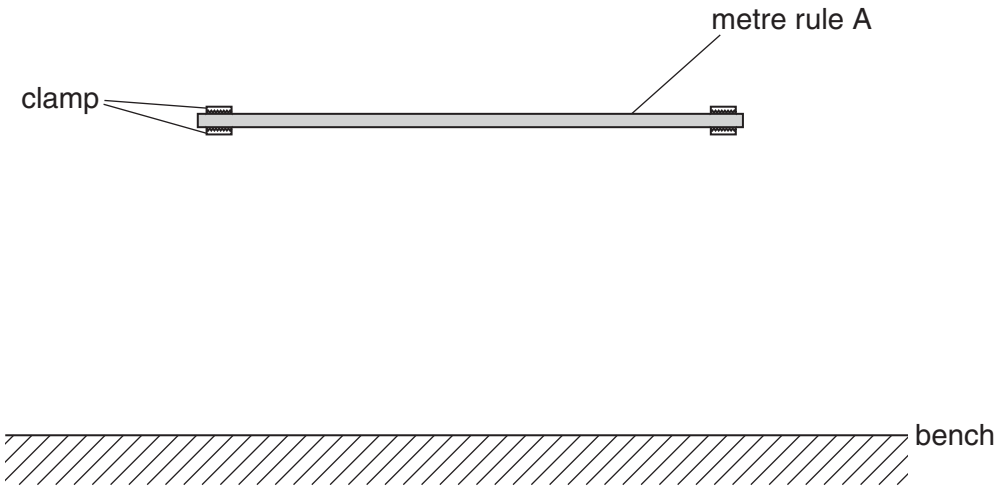



**Fig. 1.1**

**(a)** Describe how the student checks that A is horizontal. You may draw on Fig. 1.1.

.....

.....

.....[1]

**(b)** A second metre rule B is suspended horizontally from A by two strings of equal length. Both strings are placed a distance *d* from the centres of the metre rules, as shown in Fig. 1.2.

For Examiner's Use

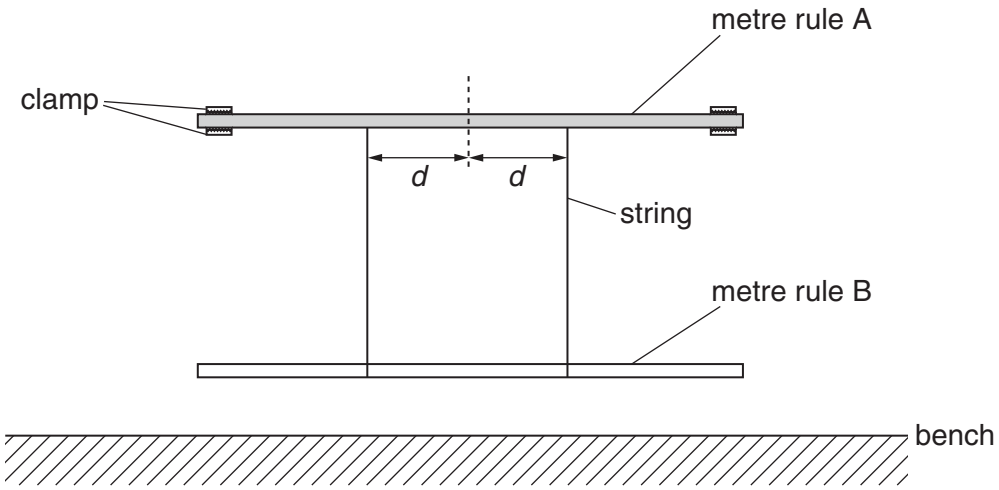



**Fig. 1.2**

Describe how the student checks that the two strings are equal distances from the centre of metre rule B.

.....

.....

.....[1]

**(c)** B is made to rotate backwards and forwards through a small angle in a horizontal plane about its centre, as shown in Fig. 1.3.

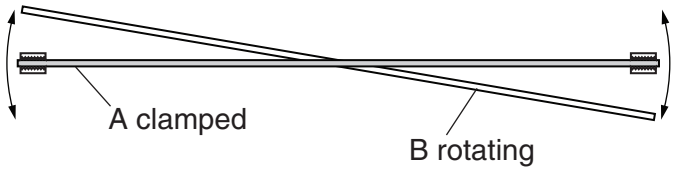



**Fig. 1.3** (view from above)

The student determines the time *T* for B to rotate once, forwards and then backwards.

**(i)** **On Fig. 1.2**, mark where the eye of the student is placed to observe the rotations. [1]

**(ii)** Describe how the student determines *T* accurately.

.....

.....

.....[3]

**(d)** $T$ is determined for different values of $d$. Values of $d$ and $T$ are recorded in Fig. 1.4.

For Examiner's Use

| $d$/cm | $T$/s |
|---|---|
| 15.0 | 2.74 |
| 20.0 | 2.07 |
| 25.0 | 1.63 |
| 30.0 | 1.37 |
| 35.0 | 1.18 |
| 40.0 | 1.03 |

**Fig. 1.4**

**(i)** On Fig. 1.5, plot the graph of $T$/s on the $y$-axis against $d$/cm on the $x$-axis. Start your graph from $d$ = 10.0 cm and $T$ = 1.00 s. Draw the curved line of best fit.

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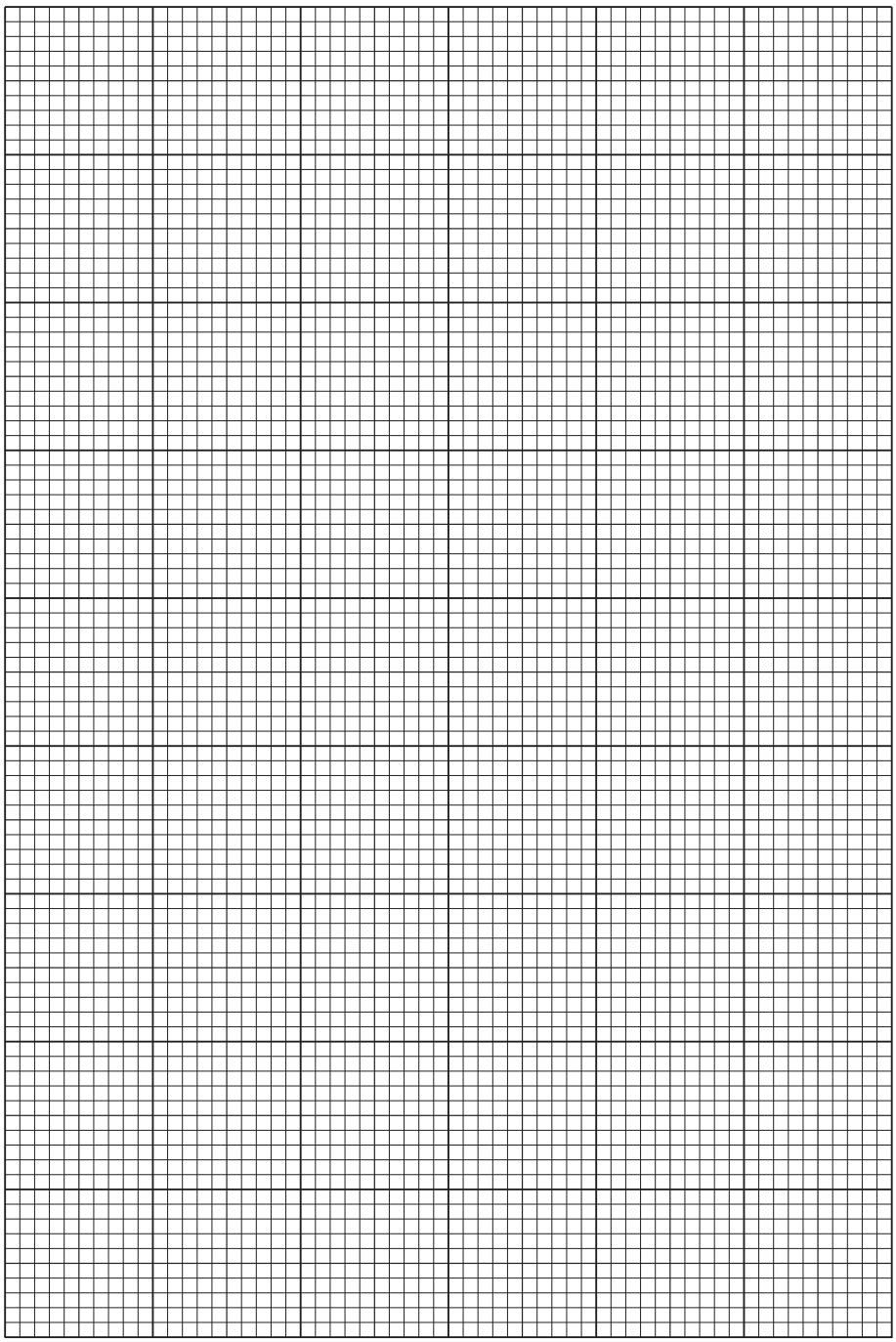


**Fig. 1.5**

[4]

**(ii)** Use data from the table to show that $T$ is inversely proportional to $d$.

.....

.....[2]

**(iii)** Suggest a reason why values for $d$ smaller than 15 cm are not measured.

.....

.....[1]

**2** A student plots a heating curve for water.

*For Examiner's Use*

The student places an electrical heater in a beaker of water at room temperature, as shown in Fig. 2.1.

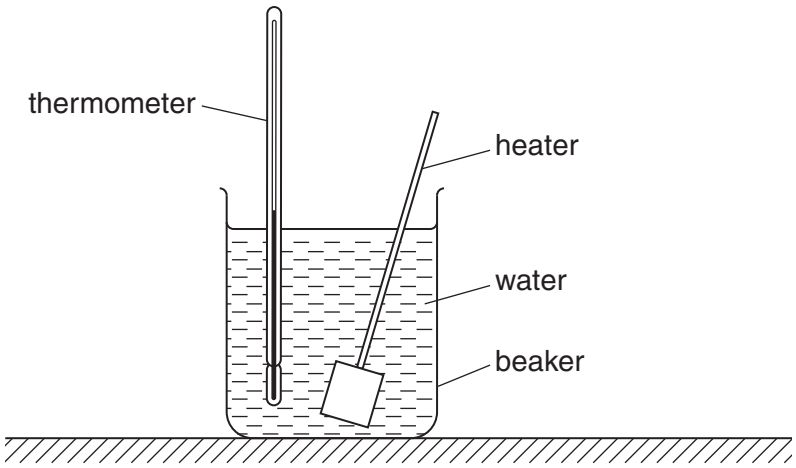



**Fig. 2.1**

The student measures the temperature of the water every minute for thirty minutes.

**(a)** The student suggests using the second hand of a wall clock to measure the time. Another student suggests using a stopwatch reading to 0.01 s. Suggest and explain which timer is the more suitable to use.

.....

.....[1]

**(b)** The student draws a table to record the results.

On Fig. 2.2, complete the headings of the table.



**Fig. 2.2**

[2]

For Examiner's Use

**(c)** The student starts with water at room temperature and notices that the temperature increases for 20 minutes and then stays steady at 60 °C.

**(i)** The student uses the data to plot a graph of the variation with time of the temperature of the water. On the axes of Fig. 2.3, sketch the shape of the graph obtained. Mark any known values on the graph.




**Fig. 2.3**

[3]

**(ii)** Explain why the temperature of the water does not rise above 60°C.

.....

.....[1]

For Examiner's Use

**3** A student performs an experiment to find out whether a coin is made of pure copper.

The student collects twenty identical coins and places them in a light bag.
The bag is hung on a newton meter, as shown in Fig. 3.1.

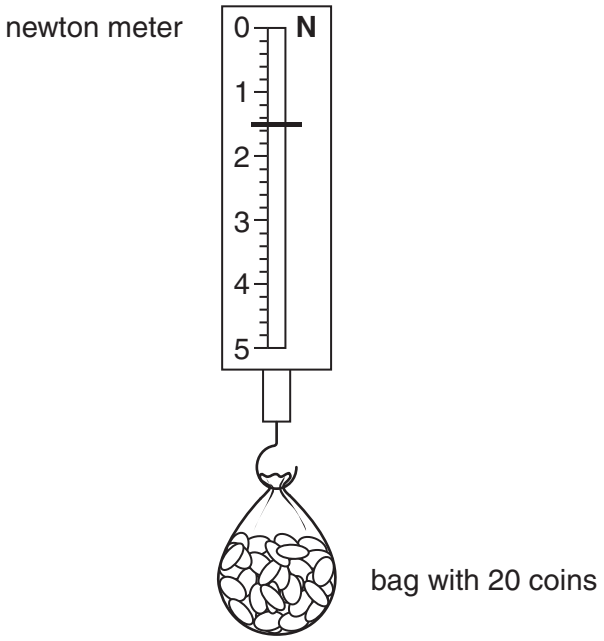



**Fig. 3.1**

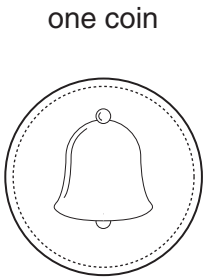



**Fig. 3.2** (actual size)

**(a)** Record the reading from the newton meter to find the weight $W_{20}$ of the 20 coins.

$W_{20}$ = ..... N [1]

**(b)** A full-size diagram of a single coin is shown in Fig. 3.2.

Measure accurately the diameter $d$ of the coin.

$d$ = ..... cm [1]

**(c)** The average thickness $t$ of a coin is 0.19 cm.

Describe how to measure $t$ accurately.

.....

.....

.....[2]

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**(d)** The density $\rho$ of the metal used in the coin is given by the relationship

$$\rho = \frac{20\ W_{20}}{\pi d^2 t}\ .$$

Calculate $\rho$.

*For Examiner's Use*

$\rho$ = ..... g/cm$^3$ [1]

**(e)** Copper has a density of 8.96 g/cm$^3$. State and explain whether the coin is made of pure copper.

.....[1]

**4** A student is given two identical steel bar magnets A and B, as shown in Fig. 4.1. The student is asked to determine which magnet is the stronger.

*For Examiner's Use*




**Fig. 4.1**

The student is given a list of apparatus available for use in the experiment.

List of available apparatus

| | | |
|---|---|---|
| metre rule | magnet | pencil |
| 20 cm ruler | newton meter | plain paper |
| clamp stand | plotting compass | lined paper |
| clamp | iron bar | graph paper |
| boss | iron paper clips | thin cotton |

**(a)** Describe how to determine which magnet is the stronger.
You should include a diagram to show how your apparatus is used.

Apparatus chosen: .....

Diagram:

Explanation:

.....

.....

.....

.....

.....[3]

**(b)** The student finds an iron bar that looks identical to the magnets. The magnets and the bar become mixed up.

*For Examiner's Use*

Describe how the student, using only the magnets and iron bar, could determine which of the three is the iron bar.

.....

.....

.....[1]

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