UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

6591272541

PHYSICS **5054/42**

Paper 4 Alternative to Practical **May/June 2012**

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

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1 A student investigates the cooling of water.

Some of the apparatus is set up as shown in Fig. 1.1.

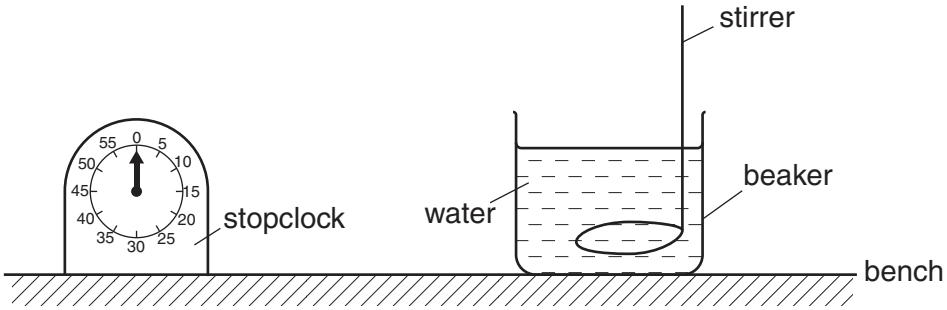

Fig. 1.1

A volume of 100 cm^3 of boiling water is poured into the beaker. The student starts the stopclock when the temperature of the water is 90 °C.
The water is allowed to cool and its temperature θ is recorded every 2 minutes.

(a) (i) On Fig. 1.1, draw the thermometer in the most suitable position for measuring the temperature of the water as it cools. [1]

(ii) Suggest a reason why the thermometer should be held in a clamp.

.....

.....[1]

(iii) Describe how the student avoids parallax error when reading the thermometer.

.....

.....[1]

(b) (i) The stopclock measures to the nearest second. Suggest why, in this experiment, the student does not need to use a digital stopwatch measuring to 0.01 s.

.....

.....[1]

(ii) Explain why the student places the stopclock close to the beaker.

.....

.....[1]

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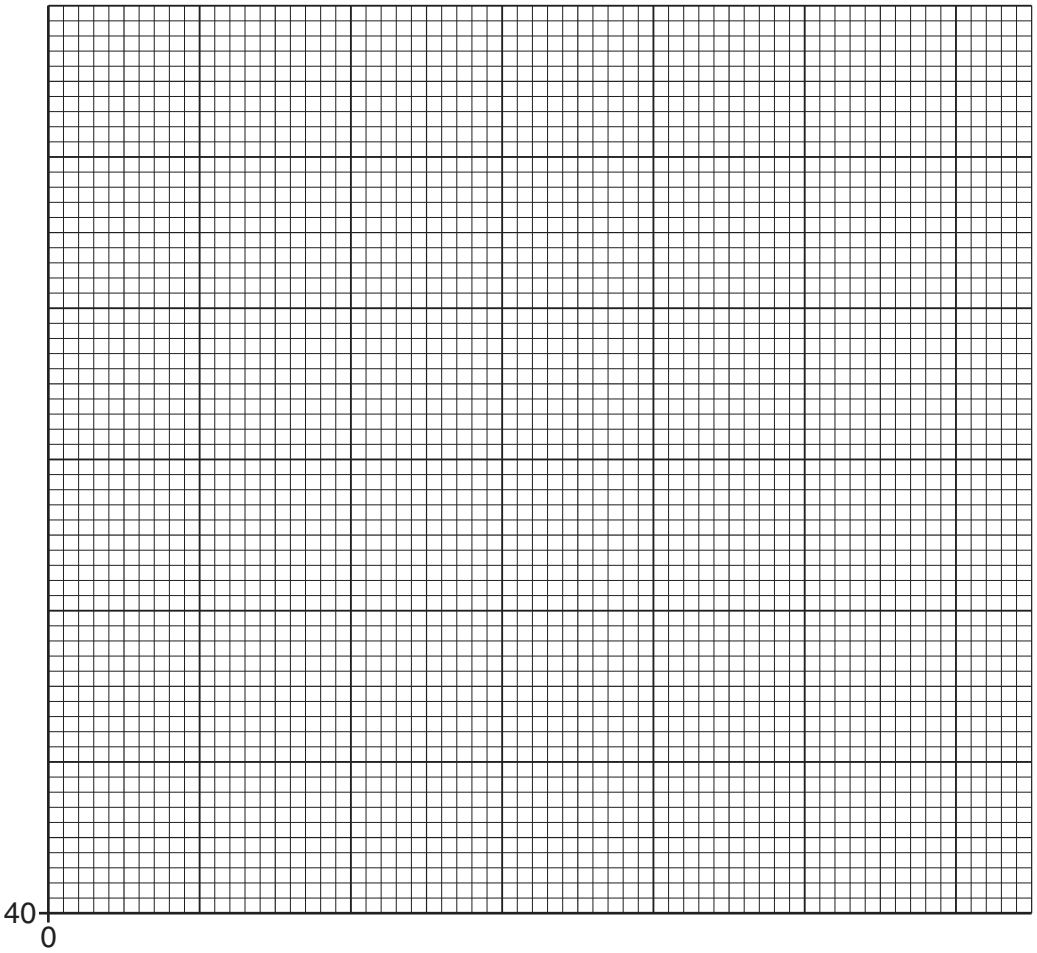
(c) The student records his results in a table. Fig. 1.2 shows the student's results.

time t / minutes	θ / °C
0	90
2	76
4	69
6	65
8	61
10	58
12	55

Fig. 1.2

(i) On Fig. 1.3, plot the graph of θ / °C on the *y*-axis against t / minutes on the *x*-axis.
Start your graph from $\theta = 40$ °C and $t = 0$.
Draw a curved line of best fit.



[4]

Fig. 1.3

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(ii) Explain why the temperature of the water does not fall to 0 °C.

.....

.....[1]

(iii) Use your graph to determine the time taken for the temperature of the water to fall from 90 °C to 80 °C.

time taken = ...[1]

(d) The experiment is repeated with the same volume of water in a wider beaker, as shown in Fig. 1.4.

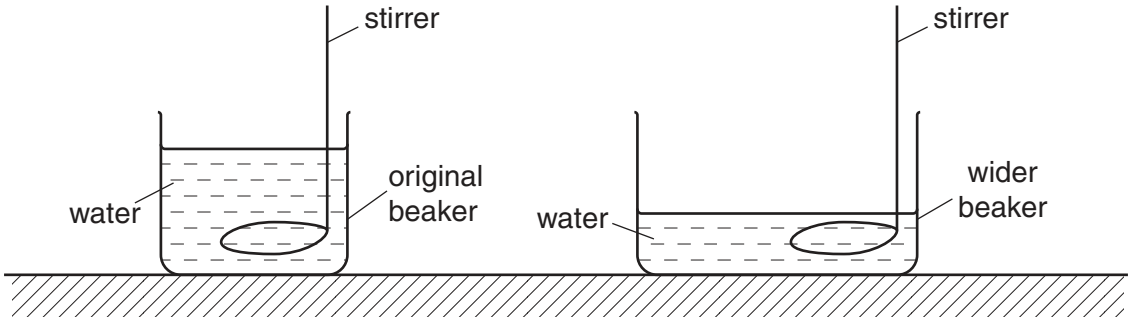

Fig. 1.4

State and explain the effect of using the wider beaker on the time taken for the temperature of the water to fall from 90 °C to 80 °C.

.....

.....

.....

.....[2]

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2 A student uses a pendulum to obtain a value for the acceleration of free fall *g*.
Fig. 2.1 shows the pendulum hanging from a fixed support.

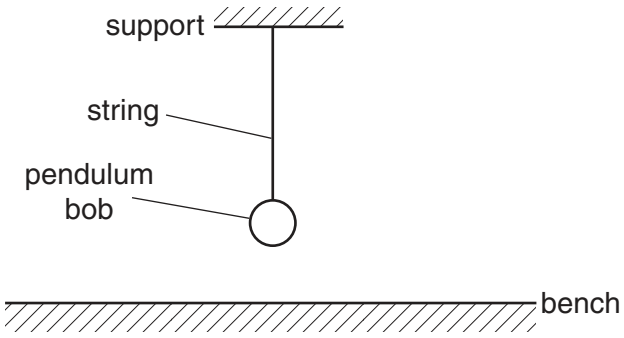

Fig. 2.1 (not to scale)

(a) The length l of the pendulum is measured from the support to the centre of mass of the bob.

(i) On Fig. 2.1, mark and label the length l of the pendulum. [1]

(ii) Describe a method of measuring l accurately.

.....

.....

.....[1]

(b) Three measurements are taken of the time for 20 complete swings of the pendulum.
Explain how to find the average time T for one complete swing.

.....

.....[1]

(c) The value obtained for l is 0.450 m and for T is 1.33 s.

Using the relationship

$$g = \frac{4\pi^2 l}{T^2}$$

calculate a value for *g*. Give your answer to 3 significant figures.

g = ... m/s^2 [2]

(d) Suggest an improvement to this experiment.

.....

.....

.....

.....[1]

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3 **(a)** A student connects a cell, a switch and three resistors to make a circuit.
The resistors are labelled A, B and C.

Resistors A and B, the cell and the switch are all in series.
Resistor C is in parallel with the cell.

(i) In the space below, draw the circuit diagram.

[2]

(ii) On your circuit diagram, draw the symbol for a voltmeter, connected to measure the voltage across resistor A. [1]

(b) A student connects the circuit shown in Fig. 3.1.
X, Y and Z are three identical lamps.

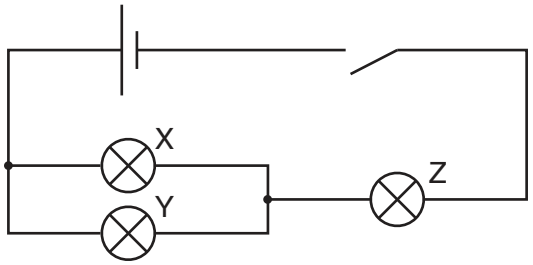

Fig. 3.1

The student closes the switch. Lamp Z lights dimly. Lamp X and lamp Y do not light.

Tick TWO of the following which are possible explanations.

both lamp X and lamp Y are faulty	
only lamp X is faulty	
only lamp Y is faulty	
the cell is running down	
a connecting lead from the cell is broken	
the current in lamp X and in lamp Y is too small	

[2]

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4 **(a)** A student finds an old magnet at the back of a drawer containing other magnets. He designs an experiment to find out if it is still magnetised.

(i) He brings a plotting compass near to end A of the old magnet, as shown in Fig. 4.1.

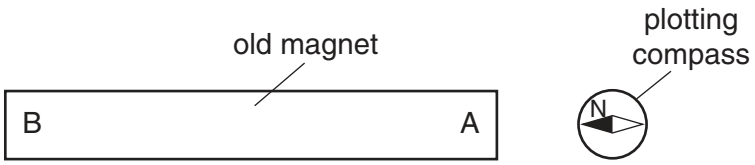

Fig. 4.1

State the polarity of end A of the old magnet.

.....[1]

(ii) The plotting compass is then brought near to end B, as shown in Fig. 4.2.

Fig. 4.2

State the polarity of end B.

.....[1]

(iii) Suggest a possible explanation for the student's results.

.....

.....[1]

(b) Describe how the student can use the plotting compass to plot the shape of the magnetic field around a new magnet. You may use a diagram in your explanation.

.....

.....

.....

.....[3]

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