UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

PHYSICS **5054/41**

Paper 4 Alternative to Practical **May/June 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 **10** printed pages and **2** blank pages.

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[Turn over

1 A student performs an experiment to find a value for the specific latent heat of vaporisation of water.

An electric kettle, half-filled with water, is placed on a top-pan balance, as shown in Fig. 1.1.

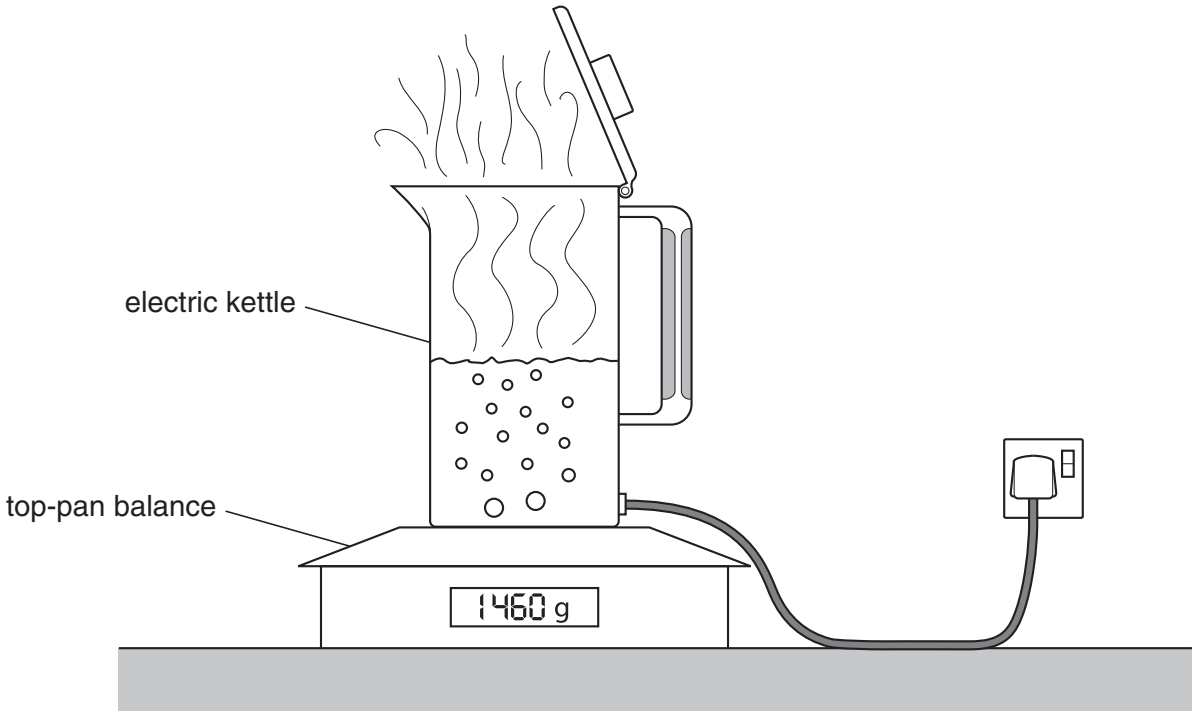


Fig. 1.1

The kettle is switched on with the lid open.

When the water is boiling steadily, a stopwatch is started and the reading on the top-pan balance is recorded.

The total mass M of the kettle and water is measured every 60 seconds. The readings are recorded in the table of Fig. 1.2.

time t/s	M/g	m/g
0	1460	0
60	1410	50
120	1359	101
180	1308	
240	1258	
300	1208	
360	1157	

Fig. 1.2

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(a) A column for the total loss in mass *m* of water is also shown in Fig. 1.2.

Complete this column. [1]

(b) On Fig. 1.3, plot a graph of *m*/g on the *y*-axis against *t*/s on the *x*-axis.

Draw the line of best fit.

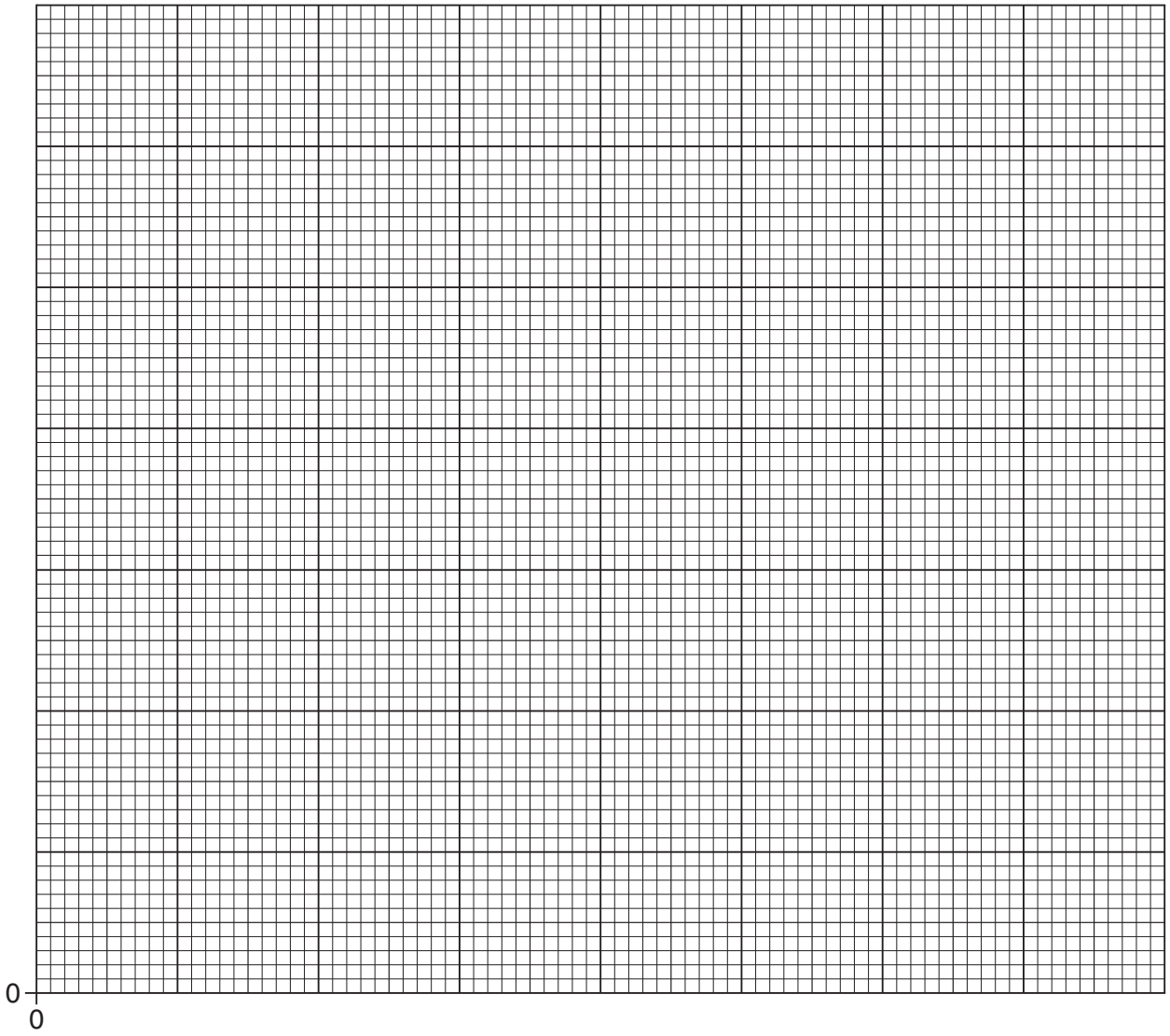


Fig. 1.3

[4]

(c) Describe the relationship between *m* and *t*.

.....

..... [1]

(d) Determine the gradient of the graph.

Show your working clearly.

gradient = ... [1]

(e) The specific latent heat L of vaporisation of water is given by the relationship

$$L = \frac{2020}{\text{gradient of the graph}}.$$

Calculate L.

L = ... J/g [1]

(f) The mass of the empty kettle is 860 g.

By using your graph, or otherwise, estimate how long it takes from the start of timing for the kettle to boil dry.

time to boil dry = ... [2]

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(g) The student is careful not to touch the kettle during the experiment.

Suggest two reasons why this is sensible.

1. .....

.....

2. .....

.....

[2]

(h) During the experiment, some steam condenses on the lid and water drips back into the kettle.

Explain what effect this has on the value obtained for *L*.

.....

.....

..... [1]

2 A group of students is asked to perform an experiment to take readings to plot a distance-time graph for a cyclist.

(a) Estimate the time taken for a cyclist to cycle 100 m.

..... [1]

(b) The cyclist will cycle 100 m around a flat track, as shown in Fig. 2.1.

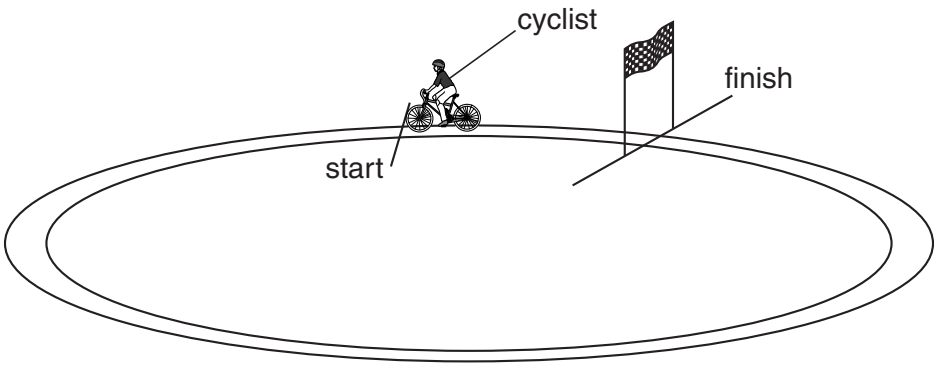


Fig. 2.1

(i) Name a suitable measuring instrument to measure

1. the length of the track, ...

2. the time taken by the cyclist. .....

[1]

(ii) The speed of the cyclist will change as she travels around the track.

Describe how the students can take readings to plot a distance-time graph for the cyclist.

.....

.....

.....

.....

..... [3]

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(c) (i) The cyclist in **(b)** starts from rest and accelerates until she reaches a constant speed.

On Fig. 2.2, sketch her distance-time graph. Label this A.

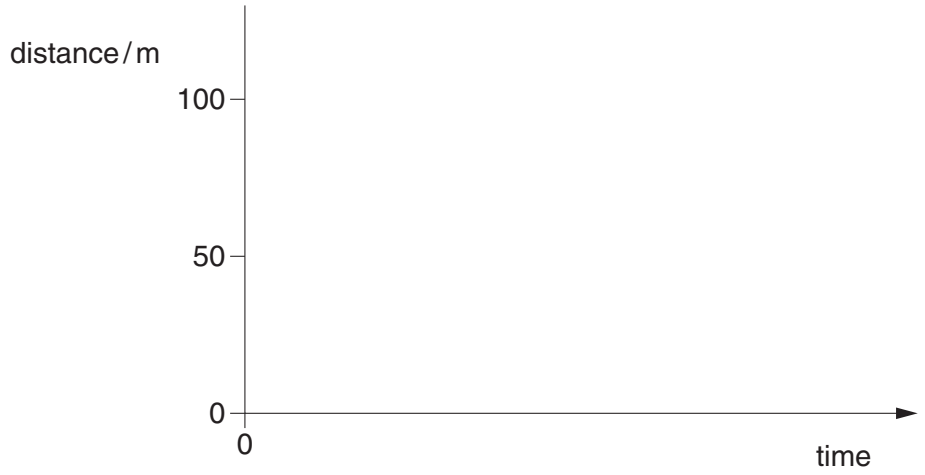


Fig. 2.2

[2]

(ii) A second cyclist starts from rest, but he accelerates for the first 50 m and then decelerates for the last 50 m. He takes the same total time to cycle the 100 m as the first cyclist.

On Fig. 2.2, sketch the distance-time graph for the second cyclist. Label this B. [2]

3 A student takes two resistors A and B from a drawer labelled 220 Ω.

The two resistors have different coloured bands, as shown in Fig. 3.1.

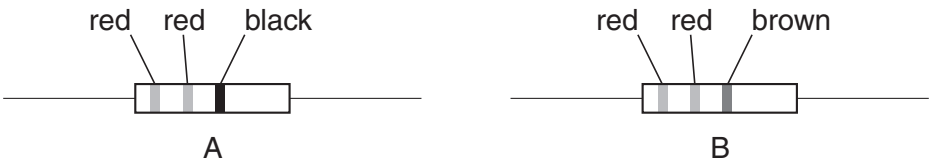


Fig. 3.1

(a) The resistor colour code is shown in Fig. 3.2.

colour band	*value*
black	0
brown	1
red	2
orange	3
yellow	4
green	5
blue	6
violet	7
grey	8
white	9

Fig. 3.2

(i) State which resistor was in the wrong drawer.

.....

(ii) Use the resistor colour code to give the resistance of the resistor stated in **(i)**.

.....
[1]

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(b) (i) The student takes five more resistors from the drawer.

The student checks the resistance of each resistor, using an ammeter and a voltmeter.

In the space below, draw a circuit diagram of the circuit that he uses.

[2]

(ii) The measured resistance, in ohms, of the five resistors is

218, 220, 219, 223, 221.

The student concludes that all five resistors were in the correct drawer.

Explain why the measured resistances are not all exactly equal to 220 Ω.

.....

..... [1]

4 An experiment is performed to demonstrate the repulsion of like charges.

Two identical plastic rods A and B are each rubbed at one end with identical cloths.

Rod A is then suspended from a cotton thread so that it can swing freely, as shown in Fig. 4.1.

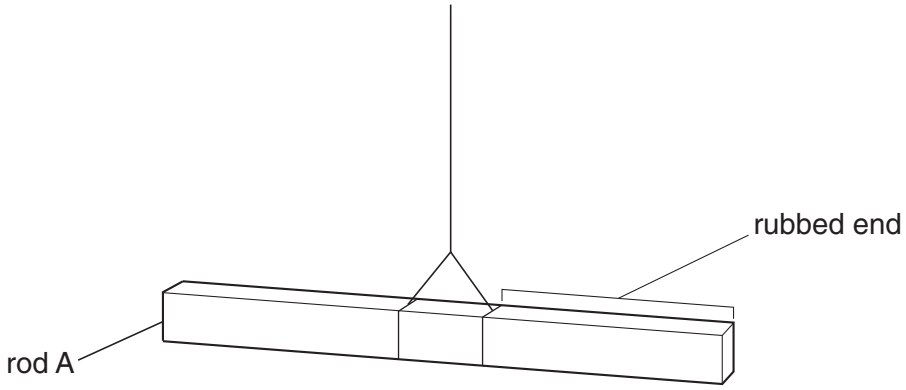


Fig. 4.1

(a) (i) On Fig. 4.1, draw the position of the rubbed end of rod B so that the force produced on rod A is as large as possible. [1]

(ii) Describe and show on Fig. 4.1 the direction in which rod A will move.

.....

..... [1]

(b) Explain why the rods are rubbed with cloths of the same material.

.....

..... [1]

(c) The rods are left on a bench for a day after rubbing.

Explain why the experiment does not now work.

.....

.....

..... [1]

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