UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE
NAME

CENTRE
NUMBER

CANDIDATE
NUMBER

PHYSICS   **5054/04**

Paper 4 Alternative to Practical   **May/June 2007**

                                                                               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.

For Examiner's Use	
1	
2	
3	
4	
Total	

This document consists of **8** printed pages.

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1   A chain of paper-clips is suspended from a horizontal pin, as shown in Fig. 1.1.
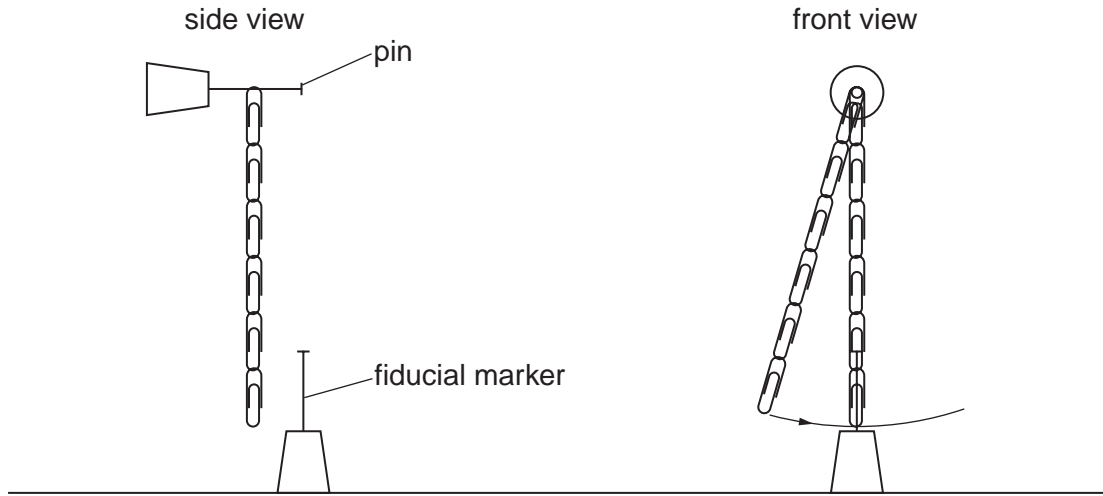

Fig. 1.1

The bottom paper-clip is pulled to one side and then released.

A student measures the time T for one oscillation of the chain of paper-clips, which is about 1 second.

To obtain an accurate value for T, the following instructions are supplied by the teacher.

  •   Measure the time for more than one oscillation.

  •   Repeat each reading several times.

  •   Count the oscillations from the centre of the swing.

(a) (i) Suggest a suitable number of oscillations for each reading.

number = ... [1]

(ii) Explain why this is a suitable number of oscillations.

....

.... [1]

(b) Explain why it is important to repeat each reading.

....

.... [1]

(c) Explain why it is important to count the oscillations from the centre of the swing.

....

.... [1]
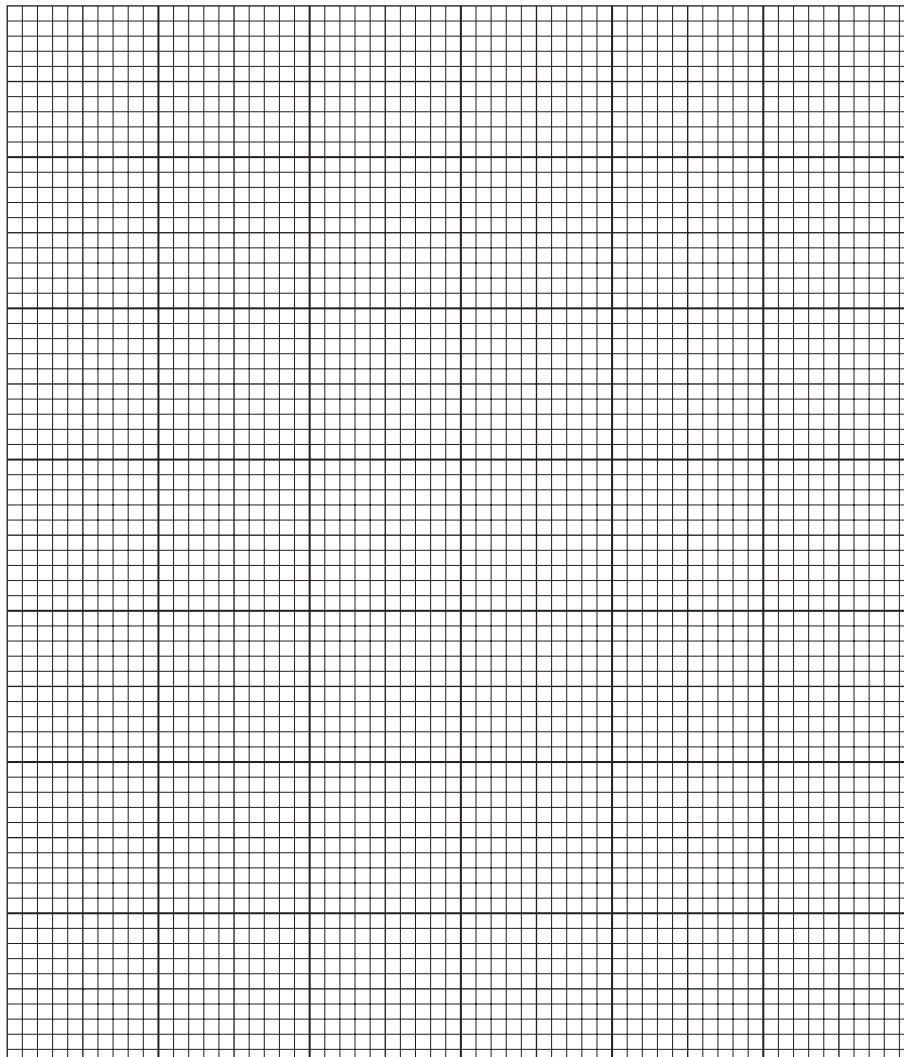
(d) The student removes several paper-clips from the chain and repeats the experiment. The following readings are obtained.

number N of paper-clips in chain	T/s
22	1.37
18	1.24
14	1.09
10	0.93
6	0.73

Suggest a reason why the smallest number of paper-clips in the chain is 6.

....

.... [1]

(e) On the grid below, plot the graph of T on the y-axis against N on the x-axis. Draw a smooth curve of best fit. [4]

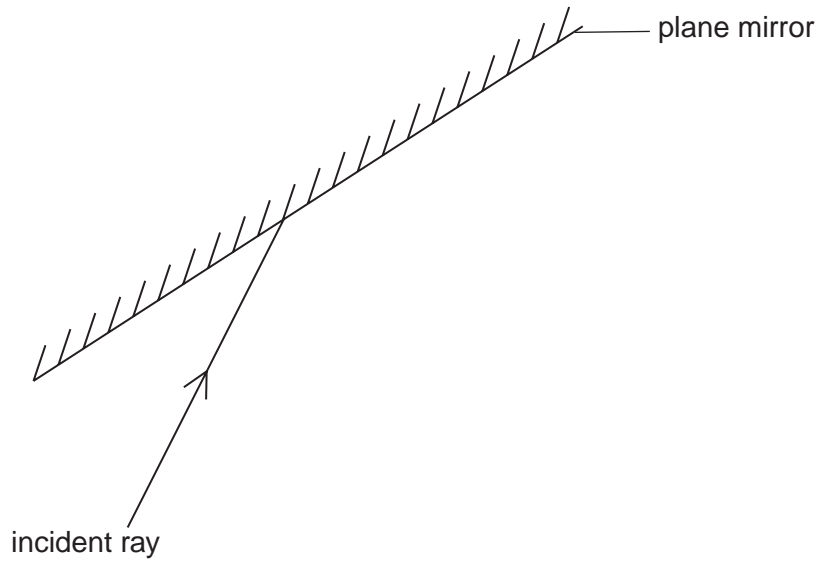**2** **(a)** Fig. 2.1 shows a ray of light incident on a plane mirror.

Fig. 2.1

(i) On Fig. 2.1, draw the normal at the point where the ray strikes the mirror. [1]

(ii) Measure the angle of incidence.

angle of incidence = ... [1]

(b) A student investigates the effect on the reflected ray when the plane mirror is rotated.

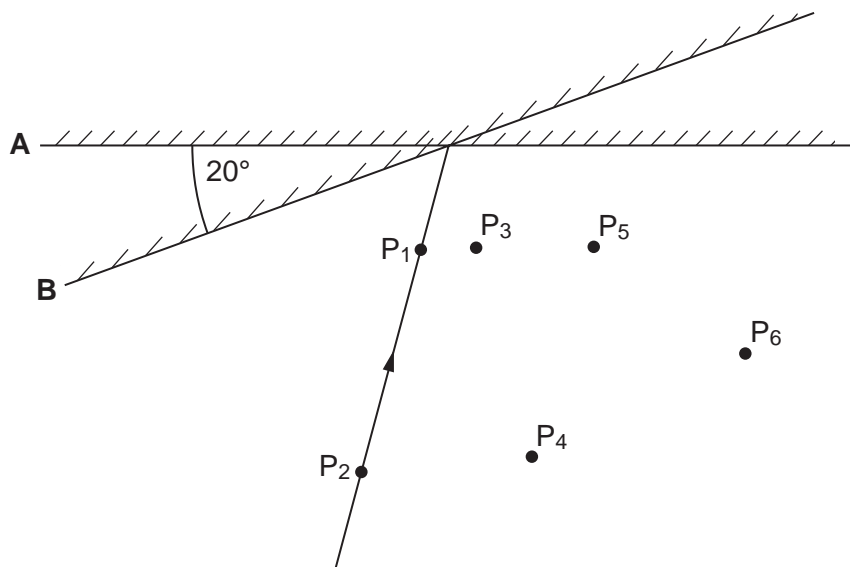Pins P₁ and P₂ are placed on the incident ray as shown in Fig. 2.2.

Fig. 2.2

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(i) The mirror is originally in position **A**.

Pins P$_3$ and P$_4$ are placed on the reflected ray.

On Fig. 2.2, draw the reflected ray from the mirror in position **A**. [1]

(ii) The mirror is then rotated through 20° to position **B**.

Pins P$_5$ and P$_6$ are placed on the new reflected ray.

On Fig. 2.2, draw the reflected ray from the mirror in position **B**. [1]

(iii) Measure the angle *y* between the two reflected rays.

y = ... ° [1]

(iv) It is suggested that

$$y = cz$$

where *c* is a constant and *z* is the angle between mirror position **A** and mirror position **B**.

Determine *c*.

c = ... [1]

(v) Describe how to extend the experiment to check that the relationship in **(iv)** is correct.

....

....

.... [2]

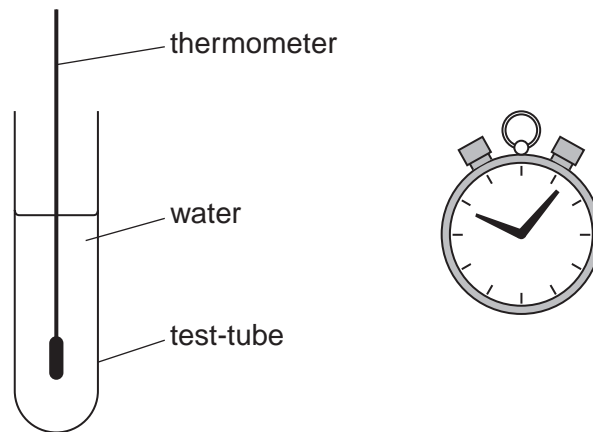**3** Fig. 3.1 shows the apparatus used to investigate the cooling of some water.

Fig. 3.1

The initial temperature of the water is 90 °C and the temperature of the room is 20 °C.

(a) A student uses the thermometer and stopwatch to take readings and records them in a table. Write the column headings in the table. [2]

(b) The student plots the results on a graph.

On the axes below,

(i) label the axes,

(ii) sketch the expected shape of the graph,

(iii) include any known values on the axes. [3]

(c) Students are usually advised to repeat all readings as they perform an experiment. Explain why this is **not** possible in this experiment.

....

.... [1]

(d) Describe two practical ways to make the readings more accurate.

1. ....

....

2. ....

.... [2]

4 The apparatus shown in Fig. 4.1 and in Fig. 4.2 is used in an experiment.
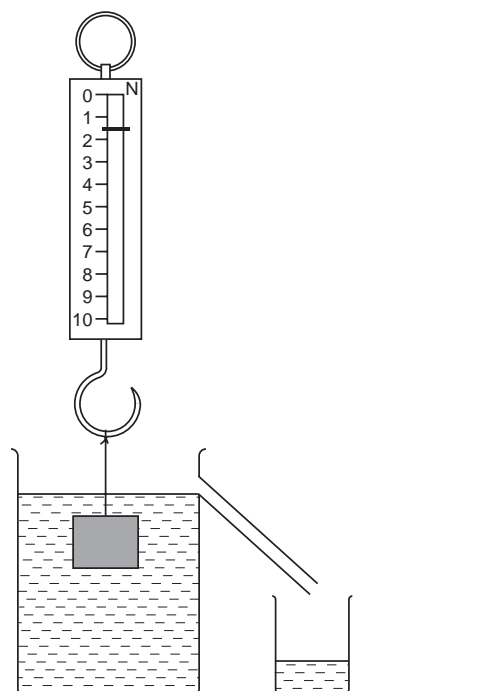
Fig. 4.1   **Fig. 4.2**

(a) (i) Name the measuring instrument in Fig. 4.1.

.... [1]

(ii) Use Fig. 4.1 to measure the weight W_1 of the block in air.

W_1 = ... N [1]

(iii) Use Fig. 4.2 to measure the apparent weight W_2 of the block in water.

W_2 = ... N [1]

(b) The length l in cm of one side of the cube is given by the formula

$$l^3 = 100(W_1 - W_2).$$

Calculate the value of l.

l = ... cm [1]

(c) Explain why it is important to measure W_1 before measuring W_2.

....

.... [1]

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