UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

**PHYSICS** **5054/03**

Paper 3 Practical Test

May/June 2005

**2 hours**

Additional Materials: As specified in the Confidential Instructions

**READ THESE INSTRUCTIONS FIRST**

Follow the instructions on the front cover of the Answer Booklet.
Write your answers in the spaces provided in the Answer Booklet.

Answer **all** questions.
For each of the questions in Section A, you will be allowed to work with the apparatus for a maximum of 20 minutes. For the question in Section B, you will be allowed to work with the apparatus for a maximum of 1 hour.
You are expected to record all your observations as soon as these observations are made.
An account of the method of carrying out the experiments is **not** required.
At the end of the examination, hand in only the Answer Booklet.

This document consists of **5** printed pages, **3** blank pages and an enclosed Answer Booklet.

## Section A

Answer **all** questions in this section.

**1** *In this experiment you will make some measurements on a glass beaker in order to find an approximate value for the density of glass.*

You have been provided with a glass beaker, a metre rule, a length of string and a marker pen. You have access to a balance.

**(a)** Wind the string around the glass beaker as many times as possible. Do not allow the turns of the string to cross each other. Determine the length $l$ of the string corresponding to four circumferences of the beaker. You may mark points on the string with the marker pen if you wish. Record $l$ on page 3 of your Answer Booklet. [1]

**(b)** Calculate the external diameter $D$ of the glass beaker given that

$$D = \frac{l}{4\pi}.$$ [1]

**(c)** Place the metre rule across the top of the beaker and estimate a value for the internal diameter $d$ of the main part of the beaker. Now measure the height $h$ of the whole beaker. [1]

**(d)** Use the balance to measure the mass $M$ of the beaker. Hence determine an approximate value for the density of glass given that

$$\text{approximate density} = \frac{8M}{\pi D\,(D-d)\,(D+4h)}.$$ [2]

**2** *In this experiment you will measure how quickly water cools in two beakers of water.*

You have been provided with a 100 $cm^3$ glass beaker, a 250 $cm^3$ glass beaker, a supply of hot water, a thermometer held in a clamp and stand, a plastic stirrer and a stopwatch.

**(a)** Pour the very hot water into the 100 $cm^3$ beaker up to the mark that has been made by the Supervisor. Observe the thermometer and record, on page 4 of your Answer Booklet, the time taken for the temperature of the water to fall from 80 °C to 75 °C. [1]

**(b)** Lift the stand and put it down again so that the thermometer is in the 250 $cm^3$ beaker. Pour very hot water into the 250 $cm^3$ beaker up to the mark that has been made by the Supervisor. Record the time taken for the temperature of the water to fall from 80 °C to 75 °C. [1]

**(c)** State two precautions that you took to ensure that the times recorded were as accurate as possible. [2]

**(d)** The volume of water in each beaker is the same. State the beaker in which the water cools more rapidly. Give a reason for your answer. [1]

**3** *In this experiment you will make some measurements on an electrical circuit that contains a filament lamp.*

You have been provided with a variable power supply, a switch, an ammeter, a voltmeter, a filament lamp and some connecting leads.

**(a)** The Supervisor has set up a circuit. Close the switch and record the potential difference $V$ across the filament lamp and the current $I$ in the circuit. Record your readings in the table on page 5 of your Answer Booklet. Insert appropriate units in the table. Open the switch in the circuit as soon as you have recorded your readings. [1]

**(b)** Calculate the resistance $R$ of the filament lamp using $R = V / I$. [1]

**(c)** Repeat parts **(a)** and **(b)** for two higher power supply voltages of up to but not more than 6 V. Record your readings of $V$ and your values of $R$ in the table. [2]

**(d)** Comment on the results you have obtained with particular reference to the resistance of the filament lamp. [1]

## Section B

**4** *In this experiment you will investigate how the time for one oscillation of a simple pendu depends on the height of the pendulum bob above the bench.*

You have been provided with a simple pendulum that has been set up by the Supervisor, a metre rule, a marker so that you can judge when the pendulum bob passes through the centre of the oscillation, a set square and a stopwatch. **You must not adjust the height of the boss that is holding the clamp at the top of the pendulum at any stage during the experiment.**

**(a)** Record, on page 6 of your Answer Booklet, the vertical height $h$ of the centre of the pendulum bob above the bench surface. Explain with the aid of a diagram how you ensured that the height measured was vertical. [2]

**(b)** Displace the pendulum bob approximately 2 cm to the left of its rest position and determine the time $T$ for one complete oscillation. One complete oscillation is illustrated in Fig. 4.1. The time $T$ is best determined by measuring the time for 10 oscillations and then dividing this time by 10. [2]

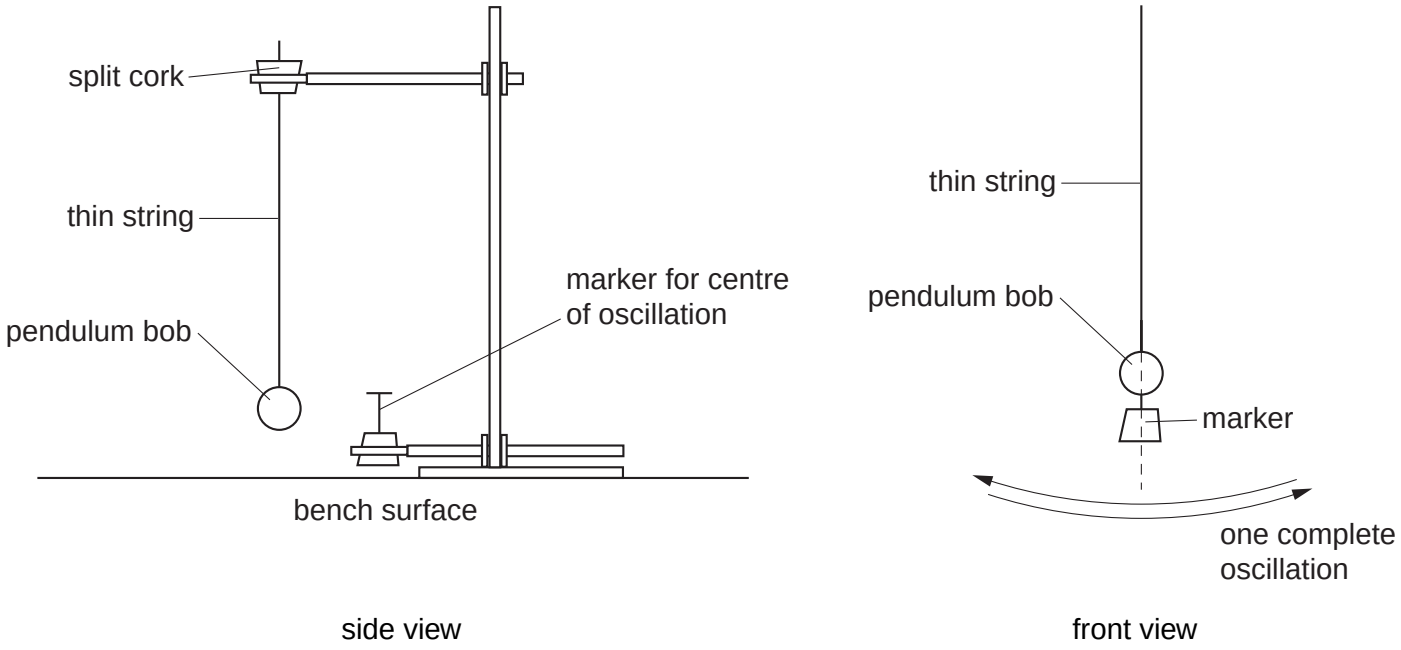


**Fig. 4.1**

**(c)** Repeat parts **(a)** and **(b)** for 5 further values of the height $h$ of the pendulum bob above the bench. Record all your values of $h$, 10 $T$ and $T$ in the table on page 6 of your Answer Booklet. In order to change $h$, the top of the pendulum (split cork) should be kept in the same position and the length of the pendulum should be adjusted. This can be done by loosening the jaws of the clamp, pulling the string through the cork and then retightening the jaws of the clamp. [3]

**(d)** Calculate and record in your table values for $T^2$. [1]

**(e)** Using the grid on page 7 of your Answer Booklet, plot a graph of $T^2/s^2$ on the $y$-axis against $h/\text{cm}$ on the $x$-axis. [4]

**(f)** Determine the gradient $G$ of your graph. [3]

**BLANK PAGE**

**BLANK PAGE**

**BLANK PAGE**

| Centre Number | Candidate Number | Name |
|---|---|---|
| | | |

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

**PHYSICS** **5054/03**

Paper 3 Practical Test

May/June 2005

**2 hours**

ANSWER BOOKLET

**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 in the spaces provided on this Answer Booklet.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
All of your answers should be written in this Answer Booklet: scrap paper must **not** be used.

Answer **all** questions.
Graph paper is provided in this Answer Booklet. Additional sheets of graph paper should be used only if it is necessary to do so.
At the end of the examination, fasten any additional answer paper used securely to this Answer Booklet.

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

| For Examiner's Use | |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| Total | |

This document consists of **6** printed pages and **2** blank pages.

**BLANK PAGE**

## Section A

**1** **(a)** determination of $l$

**(b)** calculation of $D$ given that $D = \dfrac{l}{4\pi}$

**(c)** record of $d$

record of $h$

**(d)** record of $M$

calculation of approximate density using

$$\text{approximate density} = \frac{8M}{\pi D\,(D - d)\,(D + 4h)}$$

**2** **(a)** record of cooling time for 100 $cm^3$ beaker

**(b)** record of cooling time for 250 $cm^3$ beaker

**(c)** precaution 1

precaution 2

**(d)** beaker in which the water cools more rapidly

reason

**3** **(a) (b)** and **(c)**

| *V* / | *I* / | *R* / |
|---|---|---|
| | | |
| | | |
| | | |

space for working

**(d)** comment on the results

## Section B

**4** **(a)** record of *h*

explanation and diagram showing how you ensured that the height measured was vertical

**(b)** determination of *T*

**(c)** and **(d)**

| | | | |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**(e)** using the grid on page 7, plot a graph of $T^2/s^2$ on the *y*-axis against $h/\text{cm}$ on the *x*-axis

**(f)** determination of *G*

**BLANK PAGE**