ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
General Certificate of Education Advanced Level

PHYSICS   9188/4
PAPER 4   Practical Test

JUNE 2011 SESSION   2 hours 30 minutes

Candidates answer on the question paper.
Additional materials:
  As listed in Instructions to Supervisors
  Electronic calculator
  Graph paper

TIME   2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page
and on any separate answer paper used.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.
In Questions 1 and 2, you are expected to record all your observations as soon as these
observations are made, and to plan the presentation of the records so that it is not necessary
to make a fair copy of them. The working of the answers is to be handed in. Marks are
mainly given for a clear record of the observations actually made, for their suitability and
accuracy, and for the use made of them. **Routine** precautions and theory are **not** wanted in
Questions 1 and 2. You should, however, record any **special** precautions you have taken
so as to aid accuracy. At the end of the examination, fasten any separate answer paper
used securely to the question paper.

INFORMATION FOR CANDIDATES

Questions 1 and 2 carry 18 marks each and question 3
carries 14 marks.
Squared paper and Mathematical tables are available.
Additional paper and graphs should be submitted **only** if
it becomes **necessary** to do so.
You are advised to spend approximately one hour on each of
Questions 1 and 2 and 30 minutes on Question 3

FOR EXAMINER'S USE	
1	
2	
3	
TOTAL	

You are reminded of the need for good English and clear presentation in your answers.

This question paper consists of 10 printed pages and 2 lined pages.

It is recommended that you spend about 60 minutes on this question.

1   In this experiment you will be required to investigate the relationship between the depression, h, of the end of a centilever and the mass, m, causing it.

Set up the apparatus as shown in **Fig. 1.1** with the length, L, fixed at 94.5 cm.
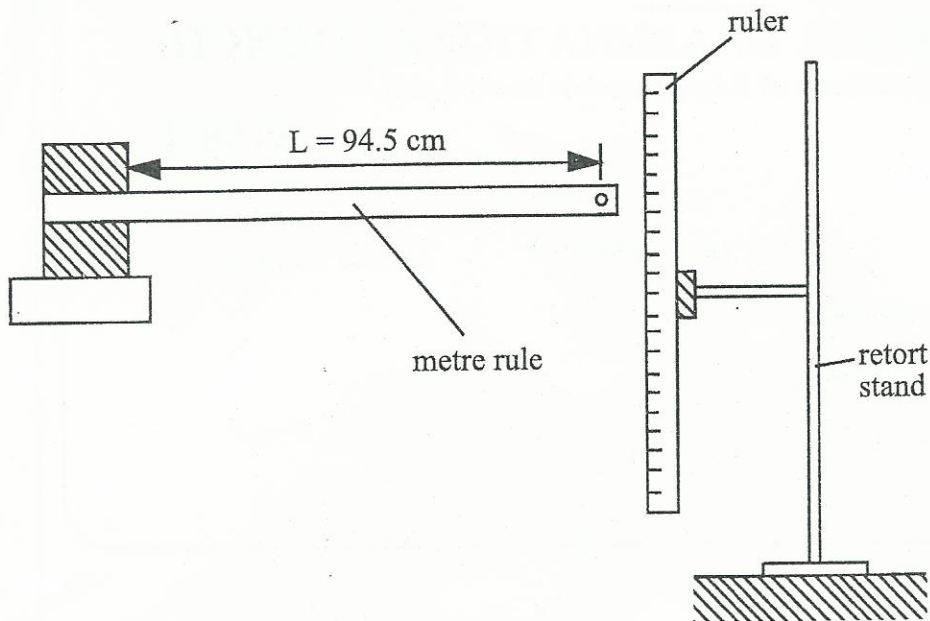

Fig. 1.1

(a)   (i)   Measure and record the width, w, and thickness, t, of the ruler.

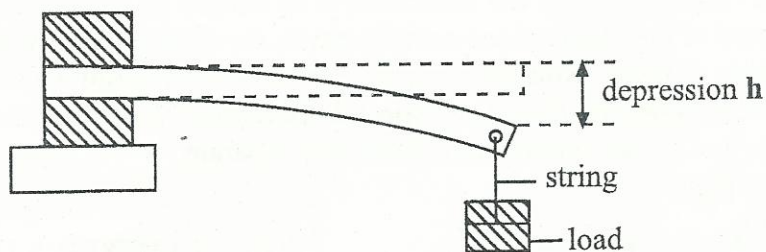(ii)   Suspend a mass of 50 g as shown in **Fig. 1.2**. Measure and record depression, h.

Fig. 1.2

(iii)   Increase the mass by 50 g. Measure and record depression, h.

(iv)   Repeat (iii) for four further different mass values.

(c)   Theory suggests that,

$$h = \frac{4mgL^3}{Ewt^3} + Q,$$

where E and Q are constants.

(i)   Plot a suitable graph to enable you to determine the value of E and
          Q

(ii)   Find the values of E and Q. $[g = 9.81 \ ms^{-2}]$

(iii)   State **two** precautions that should be taken in this experiment.

DO NOT WRITE ON THIS SPACE

[Turn over

It is recommended that you spend about 60 minutes on this question.

2   In this experiment you will investigate the discharge of a capacitor through a Resistor, R, in order to determine its capacitance, C.

Set up the circuit shown in **Fig. 2.1**.
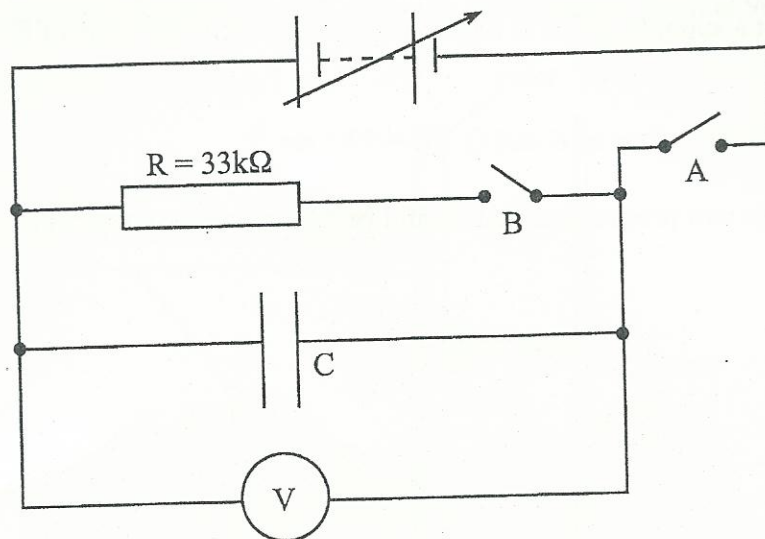

Fig. 2.1

(a)   (i)   Set the power supply to about 9.0 V.

(ii)   With switch B open, close switch A and record the maximum value, V_o, on the voltmeter.

(iii)   Open switch A, close switch B and quickly start the stopwatch.

(iv)   Read and record the voltmeter reading, V_t, after a time, t, of 10.0 s.

(v)   Vary the power supply voltage and repeat steps (a)(ii) to (iv) until you have a total of six sets of readings.

Include $\log V_t$ and $\log V_o$ in your table of results.

(b)   Theory suggests that

$$\log V_t = A \log V_o - \frac{10}{RC}, \text{ where A is a constant and } R = 33 \text{ k}\Omega.$$

(i)   plot a graph of $\log V_t$ (y-axis) against $\log V_o$ (x-axis)

(ii)   Use your graph to determine the values of A and C.

It is recommended that you spend about 30 minutes on this question.

3   A physics student notices that whenever there are power cuts the supply cables tend to move. The student suspects that forces may be acting between the cables. The student suspects that the forces may depend on the

(i)   current in the cables,

(ii)   distance between the cables and

(iii)   mass of the cables.

Design a laboratory experiment to investigate how the force experienced by the cables varies with the three factors above.

You are supplied with the following equipment (You may also use any other equipment that is usually found in a school laboratory).

power supply
forcemeter
long copper cables of different diameters
half metre rule
aluminium foils of different thicknesses
variable resistor
ammeter.

DO NOT WRITE ON THIS SPACE