X25 copies

Candidate Name | Centre Number | Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

PHYSICS 9188/4

PAPER 4 Practical Test

JUNE 2012 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
You are reminded of the need for good English and clear presentation in your answers.

FOR EXAMINER'S USE	
1	
2	
3	
TOTAL	

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

[Turn over

For Examiner's Use

1 In this experiment you are required to determine the mass of a metre rule.

(a) Set up the apparatus as in **Fig.1.1.** The angle θ should be less than 90° throughout the experiment.

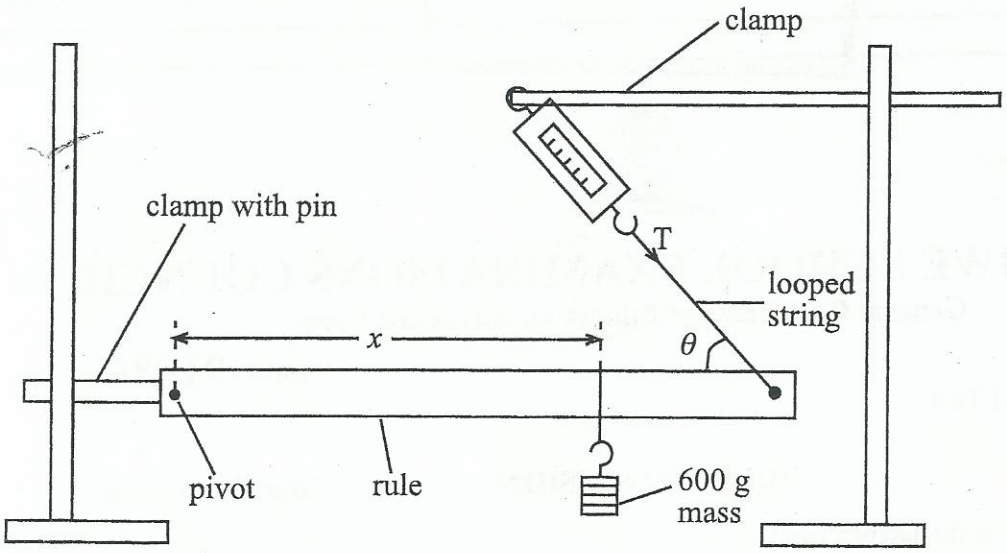


Fig.1.1.

(i) Starting with $x = 55.0$ cm, adjust the apparatus so that the rule is horizontal. Record x, the forcemetre reading, T, and the angle θ.

(ii) Change x, in the range 55.0 cm, $\leq x \leq 99.0$ cm and adjust the apparatus so that the rule is again horizontal. Record x, T and θ.

(iii) Repeat **(a)(ii)** for five further sets of values.

(iv) Include values of $T\sin\theta$ in your table of results.

(b) **(i)** Describe how you would ensure that the rule is horizontal?

(ii) Calculate the percentage uncertainty in the least value of θ in your table.

(c) Theory suggests that T is related to x by the equation,

$T\sin\theta = 4.91M + Ax$,

where A is a constant and M is the mass.

(i) Plot a graph of $T\sin\theta$ (y-axis) against x (x-axis).

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

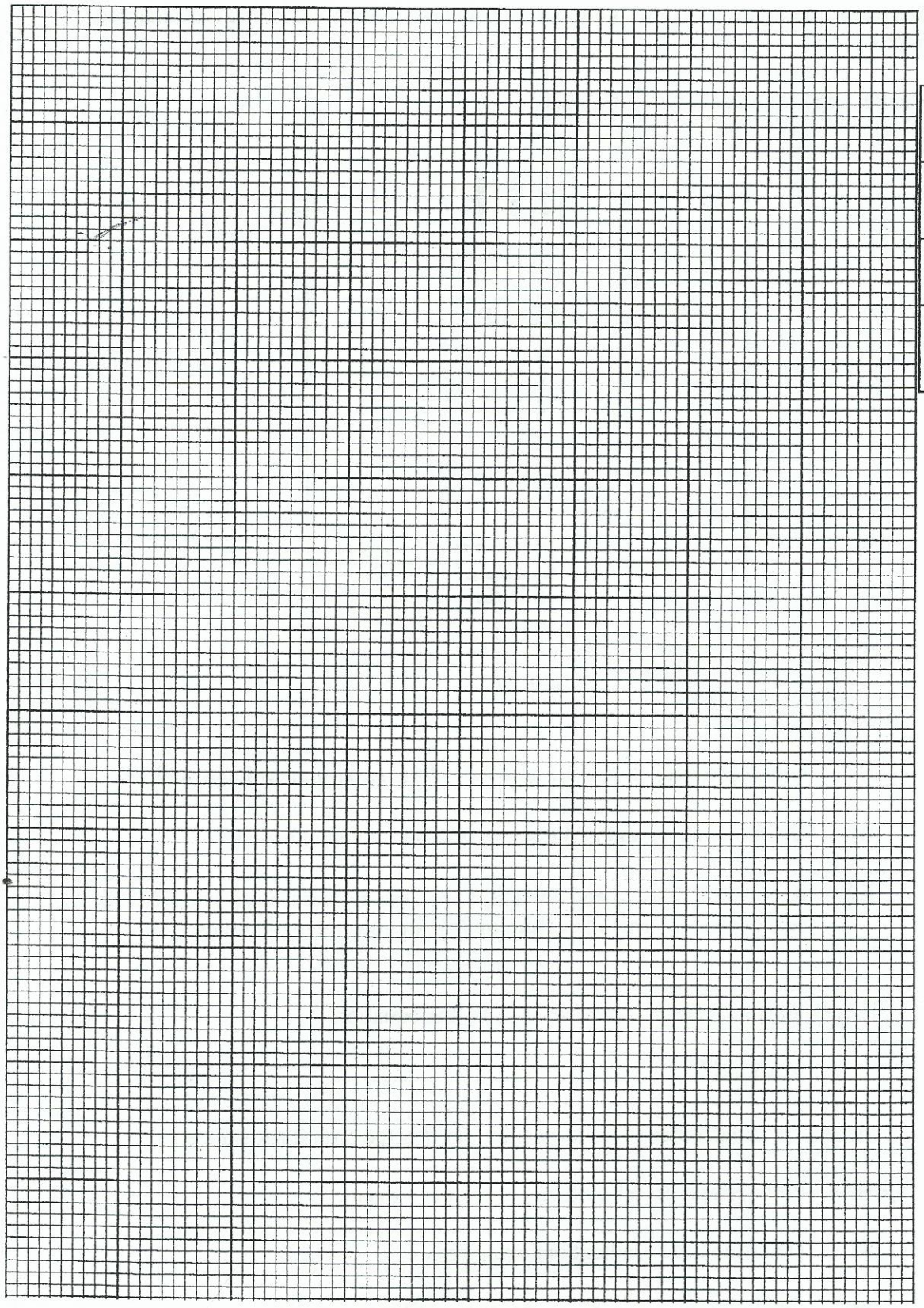
(iii) Suggest the significance of the constant A.

Measurements and calculations

M

R

A



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2 In this experiment you will determine the resistance of a voltmeter using a discharged capacitor.

For Examiner's Use

Set up the apparatus as shown in **Fig. 2.1**

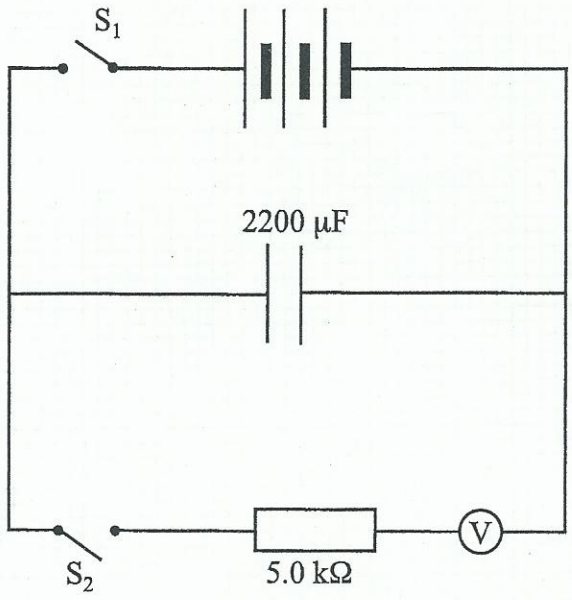


Fig 2.1

(a) **(i)** Close switches S_1 and S_2 and record the maximum voltage attained.

(ii) Open switch S_1 and at the same time start the stop watch,

(iii) Record the time, t, and voltage, V, as time increases until you have six sets of values. Include values of lnV in your table of values.

(b) Theory suggests that V is related to , t, by the equation

$$V = V_o e^{-t/CR},$$

where C is capacitance of the capacitor and R is the circuit resistance.

(i) Plot a graph of lnV (y-axis) against t (x-axis).

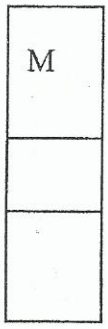
(ii) Determine the gradient and intercept.

(iii) Calculate the value of the resistance of the voltmeter.

(iv) Use your values in **(b) (ii)** to calculate the value of V_o.

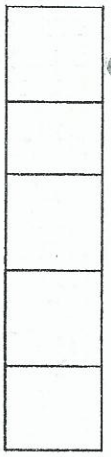
Measurements and calculations

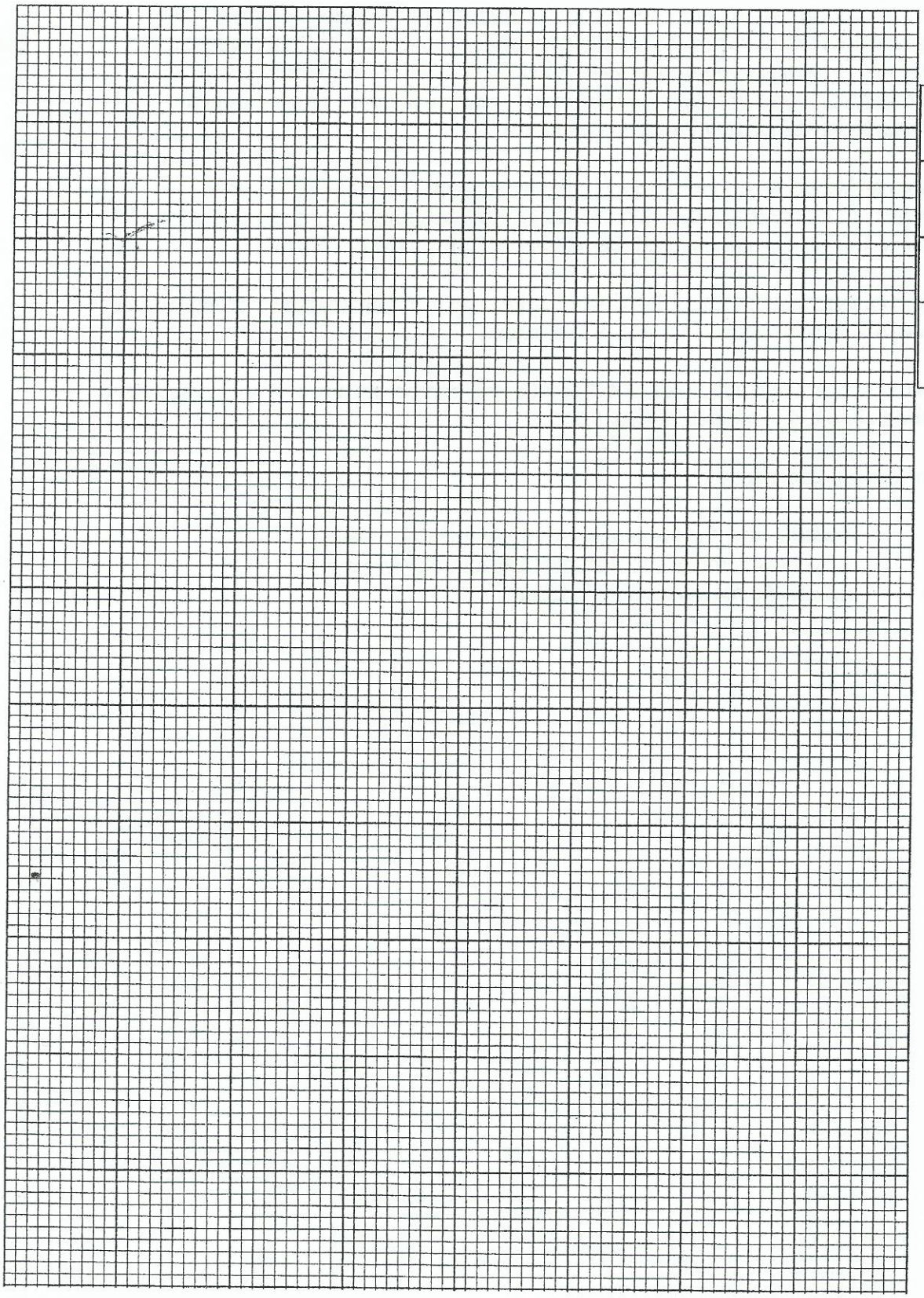
M



R

A





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3 *Current carrying conductors have associated magnetic fields around them. The magnetic field caused by current carrying conductors exert forces on magnetic materials. It is believed that the force exerted depends on the amount of current flowing, the number of turns of the conductor and the distance of the magnetic material from the current carrying conductor.*

For Examiner's Use

Design an experiment to investigate how the strength of the magnetic force experienced by the magnetic material varies with the current in the conductor, distance from the conductor and the number of turns in the conductor.

It may be assumed that the following apparatus are available together with any other standard apparatus found in a school laboratory:

iron rod, forcemeter, solenoids of different sizes, iron probe, power source, rheostat, plotting compass, ammeter, conductors

Your design report should

(i) describe how the measurements are going to be made,
(ii) show how some of the variables are controlled, and
(iii) outline the precautions to be taken.