THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

031/2A

PHYSICS 2A
ALTERNATIVE A PRACTICAL
(For both School and Private candidates)

TIME : 2:30 Hours *Friday, 9th October 2009 a.m.*

Instructions

1. This paper consists of **three (3)** questions.
2. Answer **two (2)** questions including question **number 1.**
3. Whenever calculations are involved show your work clearly.
4. Marks for questions are indicated at the end of each question.
5. Electronic calculators and cellular phones are **not** allowed in the examination room.
6. Write your **Examination number** on every page of your answer booklet(s).

This paper consists of 4 printed pages.

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1. In this experiment you are required to find the relationship between the length of a simple pendulum and its period. Proceed as follows:

   (a) Suspend a simple pendulum of length L = 100cm. Displace the pendulum through a small angle so that it swings parallel to the edge of the bench or table, determine the time for 20 oscillations. Continue reducing the length of the pendulum by 10 cm each time and obtain a total of six readings.

   (b) Record you readings in a table as shown below.

Length of pendulum L (cm)	$Log_{10}L$	Time for 20 oscillation	Period T	$Log_{10}T$

Assuming that $T \alpha L^a$, we have $T = kL^a$ and taking logarithms to base ten on both sides we get $\log_{10}T = a \log_{10}L + \log_{10}k$.

   (i) Plot a graph of $\log_{10}T$ (vertical axis) against $\log_{10}L$ (horizontal axis) hence determine the values of a and k each correct to one decimal place.

   (ii) From your answer in (i) above write down the values of a and k each in the form of $\frac{b}{c}$ where b and c are integers (i.e. whole numbers).

   (iii) From the assumption and your answer in (ii) deduce the form of the equation governing the motion of the simple pendulum.

(25 marks)

2. The aim of the experiment is to determine the refractive index η of a given glass block.

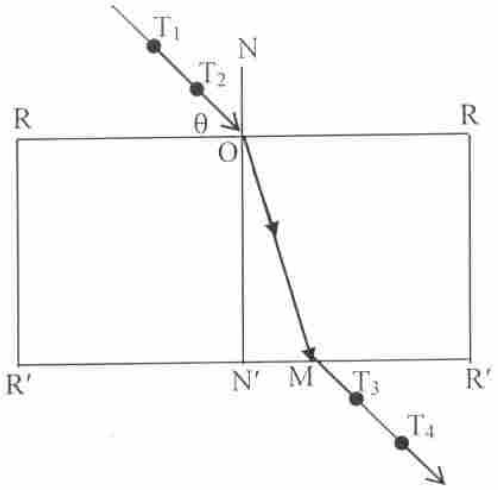


Figure 1

Place the rectangular glass block on the white paper on a drawing board. Using a pencil trace the outline of the block. Remove the glass block and draw a normal NOM near the left end of the block (Figure1).

Using a protractor and a pencil measure $\theta = 20^{o}$, draw a line making the angle 20^{o} with the surface RR of the block. Erect two pins T_1 and T_2 on this line and at a suitable distance from one another. Return the block and erect the pins T_3 and T_4 at positions such that they lie in a straight line with pins T_1 and T_2 as seen through the block. Now remove the block and draw a complete path of the ray (Figure 1).

Measure the length MN′ and ON′: Repeat the procedure for values of $\theta = 30^{o}$, 40^{o} and 60^{o} respectively. In each case make a drawing on a fresh part of the drawing paper.

(a) Record the values of θ, MN′, ON′, $\frac{MN'}{ON'}$ and cos θ in a tabular form.

(b) Plot a graph of $\frac{MN'}{ON'}$ against cos θ.

(c) Find the slope G of the graph.

(d) Calculate the value of the refractive index η; given that $G = \frac{1}{\eta}$.

(e) State two sources of errors. **(25 marks)**

3. The aim of this experiment is to verify Ohm's law.

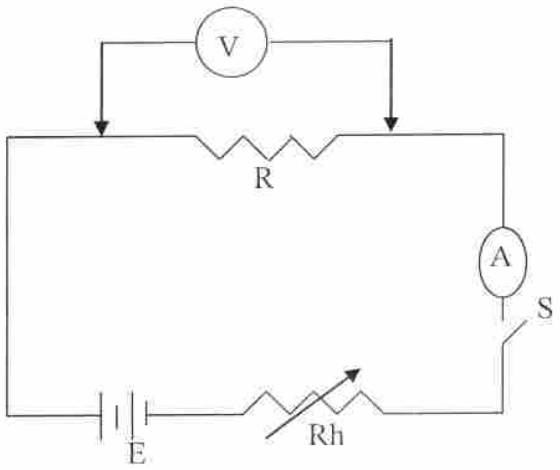


Figure 2

(a) Set up the apparatus as shown on Figure 2, close switch S. Adjust the Rheostart Rh by sliding slowly from one end, read and record the value V of the voltmeter and current I of the ammeter.

(b) Repeat the experiment by changing the Rheostat slider to obtain about five pair of readings.

NB: Adjust the Rheostat until when the pointer is exactly on the division of the metre scale.

Table of results

V(v)							
I(A)							

(c) Plot a graph of V (vertical axis) against I (horizontal axis).

(d) (i) Find the slope of the graph.
(ii) What is the relation between V and I?
(iii) Find the resistance R. **(25 marks)**