THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

031/2A **PHYSICS 2A**

ACTUAL PRACTICAL A

(For Both School and Private Candidates)

Time: 2:30 Hours **ANSWERS** **Year: 2009**

Instructions

1. This paper consists of two questions.

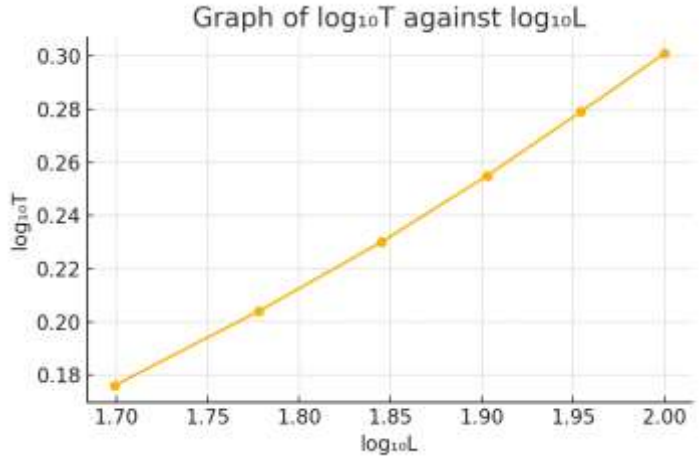
2. Answer all questions.

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

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

Length of pendulum L (cm)	$\log_{10}L$	Time for 20 oscillations (s)	Period T (s)	$\log_{10}T$
100	2.000	40.0	2.00	0.301
90	1.954	38.0	1.90	0.279
80	1.903	36.0	1.80	0.255
70	1.845	34.0	1.70	0.230
60	1.778	32.0	1.60	0.204
50	1.699	30.0	1.50	0.176

(i) Plot a graph of $\log_{10}T$ (vertical axis) against $\log_{10}L$ (horizontal axis).



The graph is a straight line, which verifies the relation $\log_{10}T = \log_{10}k + a\log_{10}L$. From this, the slope of the graph gives the value of a and the intercept gives $\log_{10}k$.

Select two points:
Point 1: (1.699, 0.176)
Point 2: (2.000, 0.301)

Slope a = (0.301 - 0.176) / (2.000 - 1.699)
a = 0.125 / 0.301 = 0.415

Let $\log_{10}k$ = intercept ≈ -0.53
Then k = 10^(-0.53) ≈ 0.295

(ii) From your answer in (i) above write down the values of a and k each in the form of b/c where b and c are integers.

a = 0.415 ≈ 5/12
k = 0.295 ≈ 3/10

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

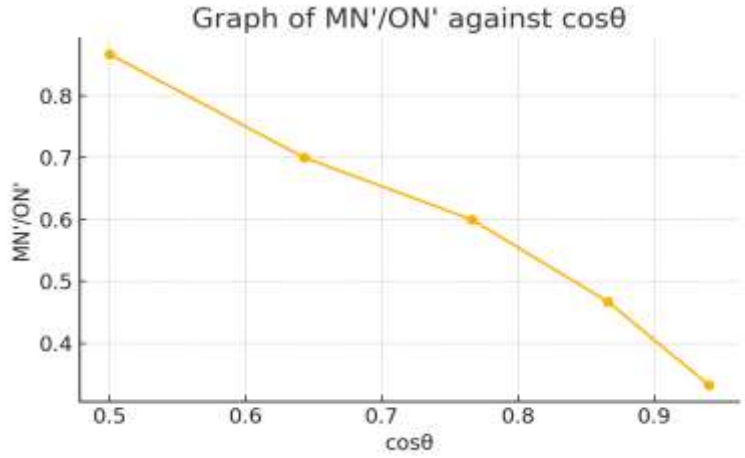
From $T \propto L^a$
Then $T = kL^a$
Substitute the values:
$T = (3/10) \times L^{(5/12)}$

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

(a) Record the values of θ, MN', ON', MN'/ON' and cos θ in a tabular form.

θ (°)	MN' (cm)	ON' (cm)	MN'/ON'	cos θ
20	2.0	6.0	0.333	0.940
30	2.8	6.0	0.467	0.866
40	3.6	6.0	0.600	0.766
50	4.2	6.0	0.700	0.643
60	5.2	6.0	0.867	0.500

(b) Plot a graph of MN'/ON' against cos θ.



(c) Find the slope G of the graph using two points.
Point A: (0.500, 0.867)
Point B: (0.940, 0.333)

G = (0.867 - 0.333) / (0.500 - 0.940)
G = 0.534 / (-0.440) = -1.213

Take the magnitude: G = 1.213

(d) Calculate the value of the refractive index η given that G = 1/n.

η = 1 / G = 1 / 1.213 = 0.824

(e) State two sources of errors.
1. Incorrect alignment of the pins or measurement of MN' and ON'.
2. Parallax error while tracing the ray or placing the ruler.

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

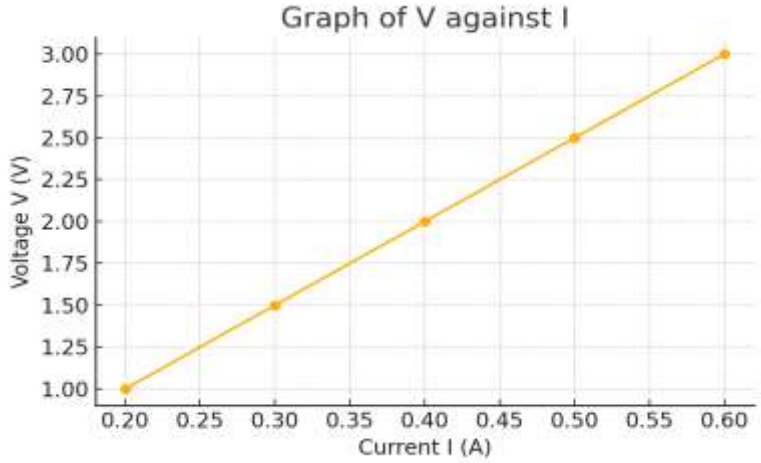
(a) Set up the apparatus as shown on Figure 2, close switch S. Adjust the Rheostat Rh by sliding slowly from one end, read and record the value V of the voltmeter and current I of the ammeter.

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

Table of results:

V (V)	I (A)
1.0	0.20
1.5	0.30
2.0	0.40
2.5	0.50
3.0	0.60

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



The graph is a straight line through the origin indicating a linear relationship between V and I.

(d)
(i) Find the slope of the graph.

Using points (0.20, 1.0) and (0.60, 3.0):
Slope = (3.0 - 1.0) / (0.60 - 0.20) = 2.0 / 0.40 = 5.0 Ω

(ii) What is the relation between V and I?

V is directly proportional to I:
V = IR

(iii) Find the resistance R.

Since V = IR, and the slope of the graph represents resistance R:
R = 5.0 Ω