THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

031/2B **PHYSICS 2B**

ACTUAL PRACTICAL B

(For Both School and Private Candidates)

Time: 2:30 Hours **ANSWERS** **Year: 2013**

Instructions

1. This paper consists of two questions.

2. Answer all questions.

1. You are provided with a Pendulum bob, Stop watch/clock, Thread, Tape measure, Retort stand and clamp. Proceed as follows:
Set the apparatus as shown in Figure 1.

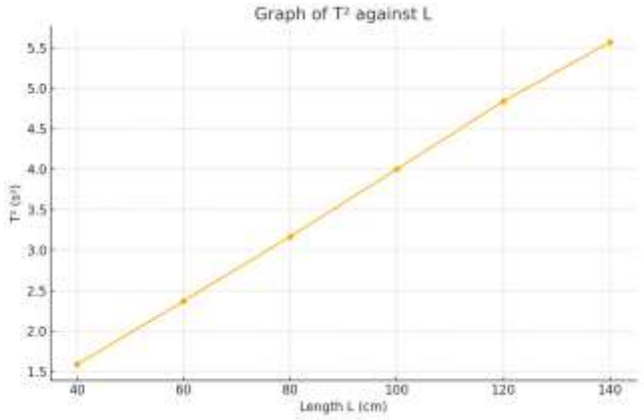
(a) Adjust the thread to length (L) of the pendulum to 140 cm. Set the bob into oscillations by displacing it to a small angle and releasing it. Record the time (t) taken for 10 complete oscillations.

t = 23.6 s
T = 23.6 / 10 = 2.36 s
$T^2 = 5.57\ s^2$

(b) Repeat (a) above for the length of the pendulum L = 120 cm, 100 cm, 80 cm, 60 cm, and 40 cm. Record your results in a suitable table including periodic time T and T^2.

L (cm)	t (s)	T (s)	T^2 (s^2)
140	23.6	2.36	5.57
120	22.0	2.20	4.84
100	20.0	2.00	4.00
80	17.8	1.78	3.17
60	15.4	1.54	2.37
40	12.6	1.26	1.59

(c) Plot a graph of T^2 against L.



(d) Determine the slope of your graph.

Slope $S = \Delta T^2 / \Delta L = (5.57 - 1.59) / (140 - 40) = 3.98 / 100 = 0.0398\ s^2/cm$

Convert to m: $S = 0.0398 \times 100 = 3.98\ s^2/m$

(e) From the graph, state the relation between T and L.

$T^2 \propto L$ or $T \propto \sqrt{L}$

(f) Using graph, find the time taken by the bob to oscillate when the length of the pendulum L = 50 cm.

From the graph at L = 50 cm, $T^2 \approx 1.98$
$T = \sqrt{1.98} \approx 1.41$ s

(g) Given that $1/L = (2\pi)^2 / gT^2$, calculate the acceleration due to gravity g.

Use the slope $S = T^2 / L = 3.98\ s^2/m$
So $g = 4\pi^2 / S = 39.48 / 3.98 \approx 9.92\ m/s^2$

(h) Suggest the aim of this experiment.
To determine the relationship between period and length of a simple pendulum and to determine the acceleration due to gravity.

(i) State any two sources of error.

- Reaction time while using stopwatch
- Large angle of swing leading to deviation from simple harmonic motion

2. You are provided with a Source of power 3V, Rheostat, Ammeter, Resistor, Voltmeter, Key and connecting wires. Proceed as follows:
Set the apparatus as shown in Figure 2.

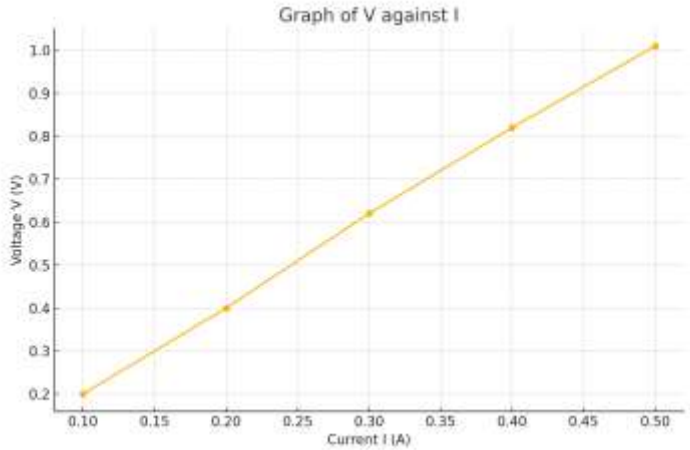
(a) Name the special symbols used in the circuit in Figure 2.

V – Voltmeter
A – Ammeter
R – Resistor
Rh – Rheostat
E – Power source
K – Key (switch)

(b) (i) Close the switch and adjust the Rh by sliding slowly from one end.
(ii) Read and record the values of V and I.
(iii) Repeat the experiment by changing the position of slider on Rh for four (4) different positions and tabulate your results.

I (A)	V (V)
0.10	0.20
0.20	0.40
0.30	0.62
0.40	0.82
0.50	1.01

(c) (i) Plot a graph of V against I.



(ii) What is the shape of your graph?

A straight line through origin.

(iii) Determine the slope of your graph.

Slope $S = \Delta V / \Delta I = (1.01 - 0.20) / (0.50 - 0.10) = 0.81 / 0.40 = 2.025\ \Omega$

(iv) What is the physical meaning of the slope obtained in 2 (c)(iii)?

It represents the resistance of the resistor R.

(v) From the graph, determine the value of p.d. when the current is 0.25 A.

Use slope: $V = 2.025 \times 0.25 = 0.506$ V

(vi) What is the relationship between V and I across R?

$V \propto I$ (Ohm's Law)

(vii) Why is this experiment not an accurate method of calculating resistance?

Due to internal resistance of the power source and possible contact resistance.

(viii) State the law governing this experiment.

Ohm's Law: V = IR

(d) What is the aim of this experiment?

To determine the resistance of a conductor using voltmeter and ammeter.

(e) State one source of error and how to minimize it.

Source: Loose wire connections
Minimization: Ensure tight and clean connections at all terminals