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: 2020**

Instructions

1. This paper consists of two questions.

2. Answer all questions.

1. You are provided with a retort stand, a string of 140 cm, stopwatch, 50 g mass, cork pad, and metre rule.

Proceed as follows:

(a) Set up the apparatus as shown in Figure 1.

The pendulum is constructed using the string, with the 50 g mass suspended from the retort stand. The length L is measured from the point of suspension to the center of the mass.

(b) Start with the length L = 10 cm. Displace and release the 50 g mass to allow oscillation. Determine the time t taken for n = 20 oscillations.

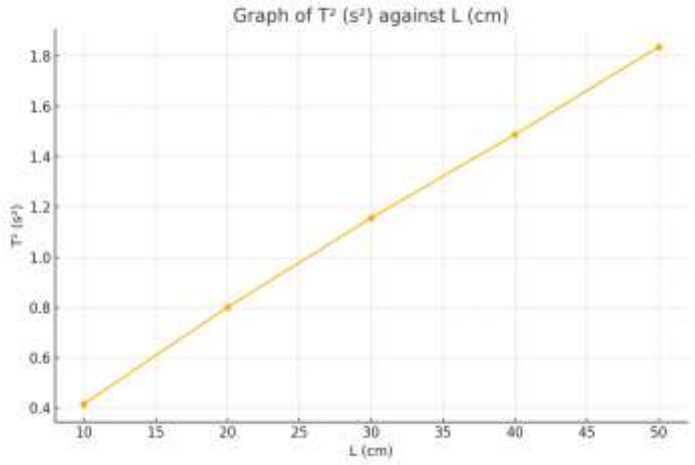
Time recorded: t = 12.9 s.
T = t / 20 = 0.645 s
T^2 = 0.416 s^2

(c) Repeat the procedures in 1 (b) for the values of L = 20 cm, 30 cm, 40 cm and 50 cm.

(i) Tabulate your results including the values of T^2.

L (cm)	t (s)	T (s)	T^2 (s^2)
10	12.9	0.645	0.416
20	17.9	0.895	0.801
30	21.5	1.075	1.156
40	24.4	1.220	1.488
50	27.1	1.355	1.836

(ii) Plot a graph of T^2 (sec^2) against the length L (cm)



(iii) Find the slope of the graph

Using two points:
Point A: (L = 20, T^2 = 0.801)
Point B: (L = 50, T^2 = 1.836)
Slope = (1.836 − 0.801) / (50 − 20)
Slope = 1.035 / 30 = 0.0345 s^2/cm

(iv) Determine the value of Z given that, $T^2 = (4\pi^2 / Z)\ L - c$

Comparing to $T^2 = S \times L - c$,
Slope $S = 4\pi^2 / Z$
$Z = 4\pi^2 / S = 39.478 / 0.0345 \approx 1144.1$

(v) What is the significance of Z?

Z represents the restoring constant of the system. It is used to relate the length of the pendulum to the square of its period in harmonic motion.

(vi) State the aim of this experiment.

The aim of the experiment is to determine the value of Z, a constant related to the oscillatory motion of a pendulum.

2. You are provided with 2 dry cells connected in series, E, a resistance box R, a voltmeter V and a key K.

(a) Arrange the apparatus as shown in Figure 2.

Circuit setup includes the voltmeter across the terminals of the cells and a resistance box R in series with the cells.

(b) Set R = 1 Ω in the resistance box, close the key, read and record the value of V on voltmeter.

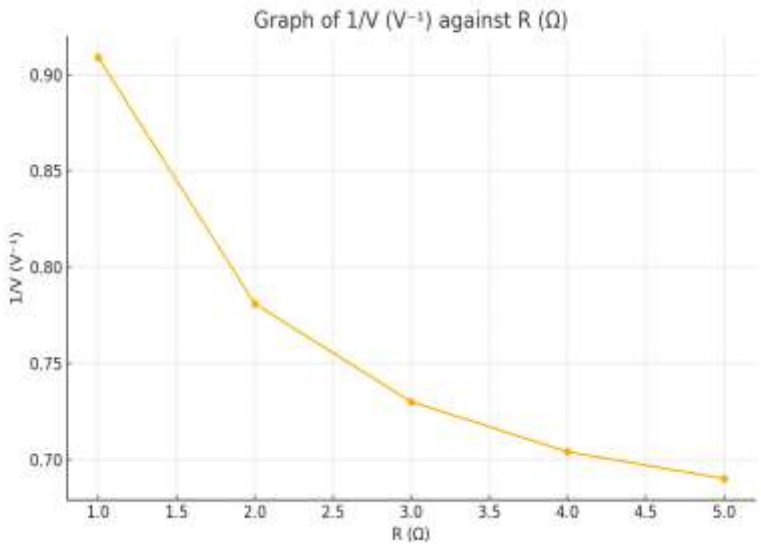
Reading: V = 1.10 V

(c) Repeat the procedure in 1 (b) for values of R = 2 Ω, 3 Ω, 4 Ω and 5 Ω and record the values of corresponding V in each case

(i) Tabulate your results including the values of 1/V

R (Ω)	V (V)	1/V (V^{-1})
1	1.10	0.909
2	1.28	0.781
3	1.37	0.730
4	1.42	0.704
5	1.45	0.690

(ii) Plot a graph of 1/V against R



(iii) Find the slope S of the graph

Using two points:
Point A: (R = 1, 1/V = 0.909)
Point B: (R = 5, 1/V = 0.690)
Slope = (0.690 − 0.909) / (5 − 1)
Slope = −0.219 / 4 = −0.05475 V^{-1}/Ω

(iv) Record 1/V intercept as P and R intercept as Q

From the graph:
1/V intercept P = 0.96
R intercept Q = 5.6

(v) Determine the value of the ratio P/Q, then state how the value obtained is related to the slope S of the graph

$P/Q = 0.96 / 5.6 \approx 0.171$
This ratio represents the magnitude of the slope of the graph. It should approximately match the absolute value of the slope calculated in (iii), confirming the linear relationship.