THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

031/2B **PHYSICS 2B**

(For Both School and Private Candidates)

Time : 3 Hours **ANSWERS** **Year : 2020**

Instructions

1. This paper consists of **two (2)** questions.
2. Non-programmable calculators may be used.
3. Communication devices and any unauthorised materials are **not** allowed in the examination room.
4. Write your **Examination Number** on every page of your answer booklet(s).

Question 1

You are provided with a retort stand with its accessories, two pieces of wood, a thread, pendulum bob, stop watch and a meter rule.

(a) Hang the pendulum bob on one end of a 90 cm length of thread and clamp the other end firmly between two small pieces of wood as shown in Figure 1.

(b) Displace a pendulum bob to a small distance and release it such that, it begins to swing to and fro motion. Determine the time t for twenty (20) complete oscillations and hence the corresponding periodic time, T.

(c) Repeat the procedures in 1 (b) for the values of L=70 cm, 50 cm, 30 cm and 10 cm. Questions

(i) Construct a table of results that includes the values of T^2

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

(iii) From the graph determine the slope G

(iv) Find the value of the acceleration due to gravity, g

(v) Give two importance of the value obtained in 1(iv) in daily life activities

Table of results

L (cm)	t for 20 osc (s)	T (s)	T^2 (s^2)
90	38.0	1.90	3.61
70	34.0	1.70	2.89
50	28.0	1.40	1.96
30	22.0	1.10	1.21
10	12.5	0.63	0.40

The graph of L against T^2 is a straight line through the origin.

Slope $G = \Delta L / \Delta T^2 = (90 - 10) / (3.61 - 0.40) = 80 / 3.21 = 24.9 \approx 25$ cm/s²

From pendulum theory $T^2 = (4\pi^2 / g) L$. Hence $g = 4\pi^2 \times$ slope. Converting slope to metres gives 0.25 m/s².

$g = 39.48 \times 0.25 = 9.87$ m/s² ≈ 9.8 m/s²

Importance of g in daily life:

It is used in engineering and construction to design safe buildings, bridges and lifts.

It is used in motion and projectile calculations such as free fall and satellite launching.

Question 2

You are provided with a resistance box R, a dry cell E, a switch S, a jockey J and a centre-zero galvanometer. Determine the value of the unknown resistance X by means of a metre bridge as follows:

(a) Set up the circuit as shown in Figure 2.

(b) Set R =1Ω, close the switch, slide the jockey over the metre bridge wire until the galvanometer reads zero. Read and record the length L_1. Also read and record the corresponding length L_2.

(c) Repeat the procedures in 2 (b) for values of R = 2Ω, 3Ω, 5Ω and 7Ω and record the values for L_1 and L_2 in each case.

(i) Tabulate your results including the values of L_2/L_1

(ii) Plot a graph of R against L_2/L_1

(iii) Find the slope S of the graph

(iv) Determine the value of the unknown resistance X by showing clearly how you arrive at your answer

Table of results

R (Ω)	**L_1 (cm)**	**L_2 (cm)**	**L_2/L_1**
1	40	60	1.50
2	50	50	1.00
3	55	45	0.82
5	62	38	0.61
7	70	30	0.43

The graph of R against L_2/L_1 is a straight line.

Slope $S = \Delta R / \Delta(L_2/L_1) = (7 - 1) / (0.43 - 1.50) = 6 / (-1.07) = -5.61 \approx 5.6$

Relation $R = X (L_1/L_2)$. Hence slope = X.

Unknown resistance $X \approx 5.6\ \Omega$