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 : 2021**

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).

1. Simple Pendulum Experiment

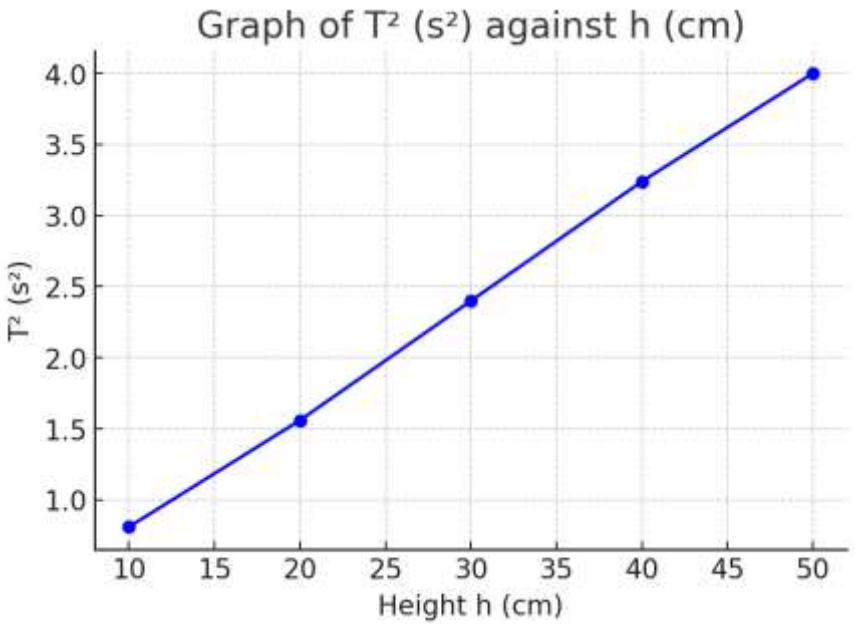
We are studying the relationship between the square of the time period (T^2) and the height h from the table to the middle of the pendulum bob.

(a) Observations

Let us assume the following sample times for 20 oscillations:

h (cm)	t for 20 osc (s)	T = t/20 (s)	T² (s²)
10	18.0	0.90	0.81
20	25.0	1.25	1.56
30	31.0	1.55	2.40
40	36.0	1.80	3.24
50	40.0	2.00	4.00

(b) Graph



(c) Slope

Slope, $S = \Delta T^2 / \Delta h$

$= (4.00 - 0.81) / (50 - 10)$

$= 3.19 / 40 = 0.0798 \approx$ **$0.080\ s^2/cm$**

(d) Intercept

Extrapolating to $h = 0$, T^2 intercept $\approx 0.5\ s^2$.

(e) Formula

Equation given:

$T^2 = -(S\ h) + (S\ k)$

Thus intercept = Sk.

From intercept = 0.5 and slope = 0.08:

$0.5 = 0.08k \rightarrow k \approx 6.25$ cm.

(f) Physical meaning

- k represents the effective length correction of pendulum beyond measured h.
- It accounts for the distance between pivot and actual centre of oscillation.

2. E.m.f and Internal Resistance of a Cell

We use the relation between current (I) and voltage (V):

$V = E - Ir$

Rearranging:
$I = (-1/r)V + (E/r)$

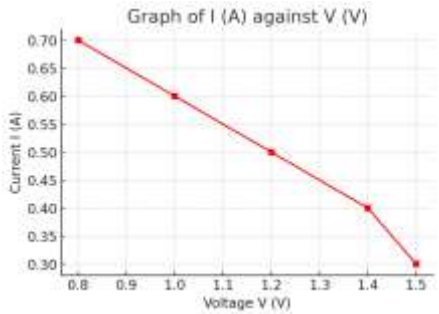
So a graph of *I against V* is a straight line with:

- slope = $-1/r$
- intercept = E/r

(a) Sample Data

I (A)	V (V)
0.3	1.5
0.4	1.4
0.5	1.2
0.6	1.0
0.7	0.8

(b) Graph



(c) Slope

Slope, $S = \Delta I / \Delta V$

$= (0.7 - 0.3) / (0.8 - 1.5)$

$= 0.4 / (-0.7) \approx -0.57$

Since slope $= -1/r$

$r = -1 / \text{slope} = -1 / (-0.57) \approx$ **1.75 Ω**

(d) Intercept

I-intercept $= E/r$

From graph, intercept ≈ 1.0 A.

So $E = (\text{I-intercept} \times r) = 1.0 \times 1.75 =$ **1.75 V**