

**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).

maktaba.tetea.org



1. Simple Pendulum Experiment

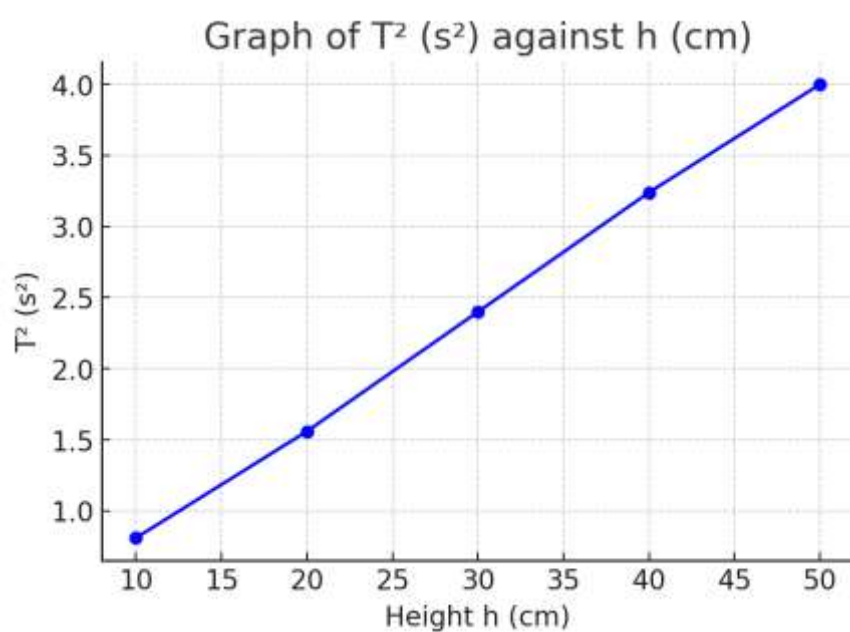
We are studying the relationship between the square of the time period (T^2) and the height h from the table to the middle of the pendulum bob.

(a) Observations

Let us assume the following sample times for 20 oscillations:

h (cm)	t for 20 osc (s)	$T = t/20$ (s)	T^2 (s ²)
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

$$\begin{aligned}\text{Slope, } S &= \Delta T^2 / \Delta h \\ &= (4.00 - 0.81) / (50 - 10) \\ &= 3.19 / 40 = 0.0798 \approx \mathbf{0.080 \text{ s}^2/\text{cm}}\end{aligned}$$

(d) Intercept

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

(e) Formula

Equation given:

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

Thus intercept = Sk .

From intercept = 0.5 and slope = 0.08:

$$0.5 = 0.08k \rightarrow k \approx 6.25 \text{ cm}.$$

(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:

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

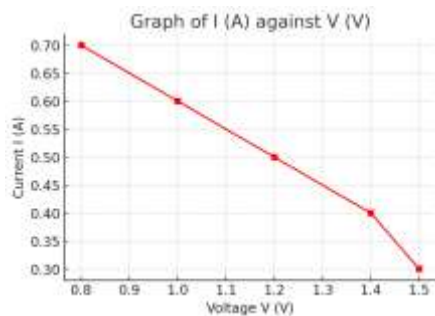
So a graph of I against V is a straight line with:

- 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

$$\begin{aligned}\text{Slope, } S &= \Delta I / \Delta V \\ &= (0.7 - 0.3) / (0.8 - 1.5) \\ &= 0.4 / (-0.7) \approx -0.57\end{aligned}$$

Since slope = $-1/r$

$$r = -1 / \text{slope} = -1 / (-0.57) \approx \mathbf{1.75 \, \Omega}$$

(d) Intercept

$$I\text{-intercept} = E/r$$

From graph, intercept $\approx 1.0 \, \text{A}$.

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