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 : 2024**

Instructions

1. This paper consists of sections A, B and C.
2. Answer all questions in section A and B and **one (1)** question from section C.
3. Non-programmable calculators may be used.
4. Communication devices and any unauthorised materials are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).

1. You are required to determine the mass m of a given solid body.

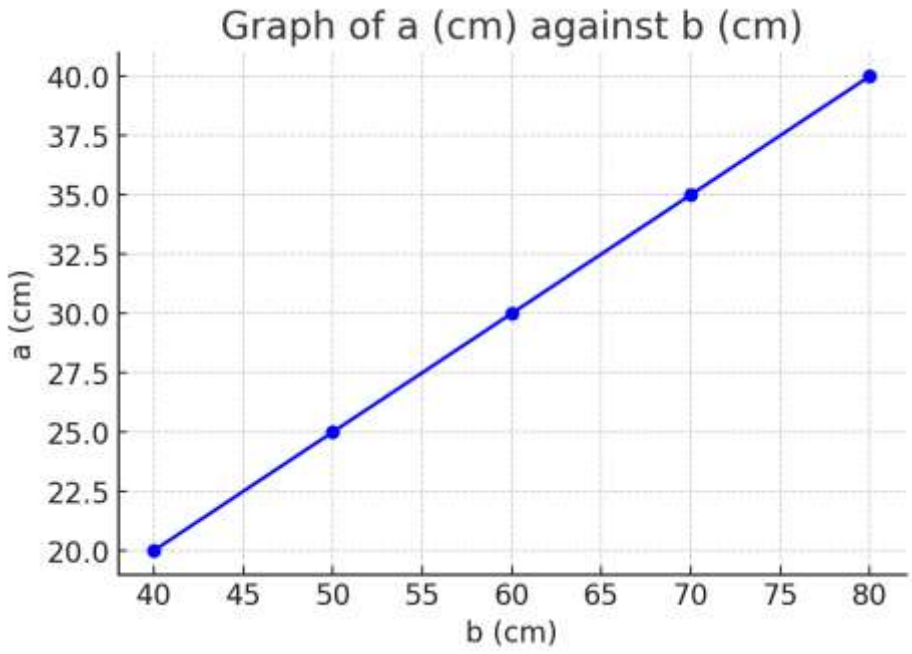
(a) & (b) The setup is already described: pivot metre rule at midpoint, balance with 50 g at distance *a* and solid body *m* at distance *b*.
The principle of moments applies:

$50 \times a = m \times b$
Therefore,
$m = (50 \times a) / b$

(c) Suppose the following observations were obtained:

a (cm)	**b (cm)**
20	40
25	50
30	60
35	70
40	80

(ii) **Graph of a against b**
When plotted, the graph is a straight line passing through the origin.



(iii) **Nature of Graph**

The graph is linear, showing that a $\propto$ b.

(iv) **Slope of the graph**

Slope = $\Delta a / \Delta b = (40 - 20) / (80 - 40) = 20 / 40 = 0.5$

(v) **Relative density of metre rule**

If the metre rule balanced at midpoint, the mass distribution is uniform, hence relative density ≈ 1 compared to water.

(vi) **Mass of the given body m**

From the relation $m = (50 \times a) / b$,

Using any pair e.g. a = 20, b = 40:

$m = (50 \times 20) / 40 = 25$ g

Thus the mass of the given body is **25 g**.

2. You have been provided with electrical apparatus to determine an unknown resistance R.

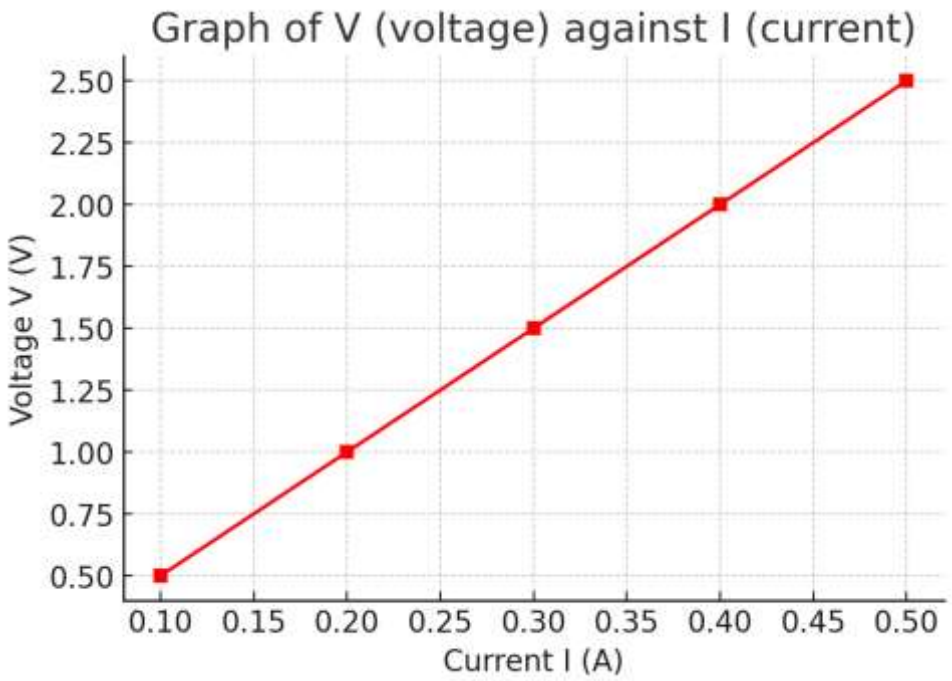
(a) **Circuit diagram**

- Ammeter in series with cell, key, variable resistor Rh, and resistor R.
- Voltmeter connected in parallel across R.

(b) & (c) Suppose the following readings were recorded:

Current I (A)	**Voltage V (V)**
0.1	0.5
0.2	1.0
0.3	1.5
0.4	2.0
0.5	2.5

(ii) **Graph of V against I**



(iii) **Nature of Graph**

It is linear, confirming Ohm's Law ($V \propto I$).

(iv) **Slope of Graph**

Slope = $\Delta V / \Delta I = (2.5 - 0.5) / (0.5 - 0.1) = 2.0 / 0.4 = 5.0$

(v) **Unknown resistance R**

R = slope = 5 Ω

(vi) **Why high currents are unsuitable**

High currents may overheat R, damage the apparatus, or alter resistance due to heating effects.

(vii) **How to minimize error when calculating R**

Take multiple readings of V and I, plot a best-fit line, and determine R from the slope instead of a single reading.