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: 2004**

Instructions

1. This paper consists of two questions.

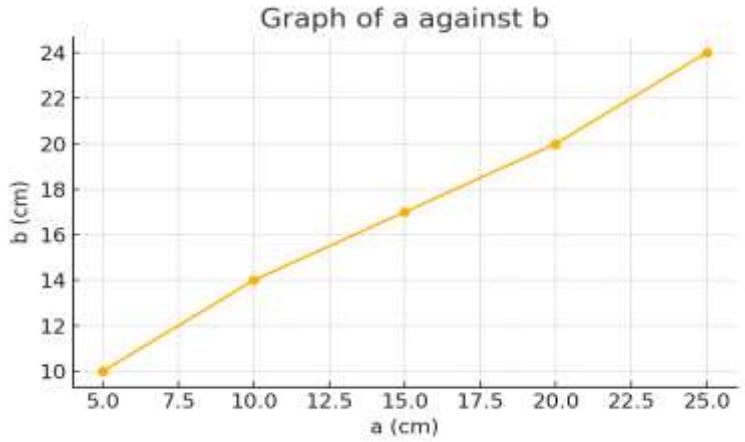
2. Answer all questions.

1. The aim of this experiment is to determine the mass of a given dry cell, size “AA”.

(c) By fixing a = 5 cm from C, find its corresponding length b, from C.
Let recorded values be:

a (cm)	b (cm)
5	10.0
10	14.0
15	17.0
20	20.0
25	24.0

(e) Draw a graph of “a” against “b” and calculate its slope G



Using (5, 10.0) and (25, 24.0):
$G = \Delta b / \Delta a = (24.0 - 10.0) / (25 - 5) = 14 / 20 = 0.70$

(f) Calculate X from the equation:
$50 = b_o / a_o \times (20 + X)$
From table: when $a_o = 10$ cm, $b_o = 14$ cm

$50 = 14/10 \times (20 + X)$
$50 = 1.4 \times (20 + X)$
$50 / 1.4 = 20 + X$
$35.714 = 20 + X$
$X = 15.71$ g

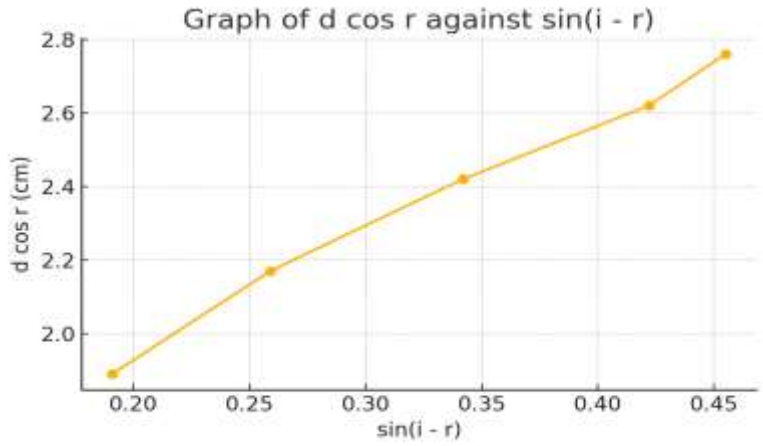
Mass of dry cell = 15.71 g

2. The aim of this experiment is to determine the width of a glass block.

(d) Tabulate your results:

i (°)	r (°)	d (cm)	d cos r (cm)	sin(i - r)
30	19	2.0	2.0 × cos19 = 1.89	0.191
40	25	2.4	2.4 × cos25 = 2.17	0.259
50	30	2.8	2.8 × cos30 = 2.42	0.342
60	35	3.2	3.2 × cos35 = 2.62	0.422
70	38	3.5	3.5 × cos38 = 2.76	0.455

(i) Plot a graph of d cos r against sin(i - r)



(ii) Find the gradient of the graph
Using: (0.191, 1.89) and (0.455, 2.76)
Gradient G = (2.76 - 1.89) / (0.455 - 0.191) = 0.87 / 0.264 ≈ 3.30 cm

(iii) Measure the width of the glass block
Width = Gradient = 3.30 cm

(iv) How is the gradient of the graph and the width of the glass block related?
The gradient of the graph is equal to the width of the glass block.

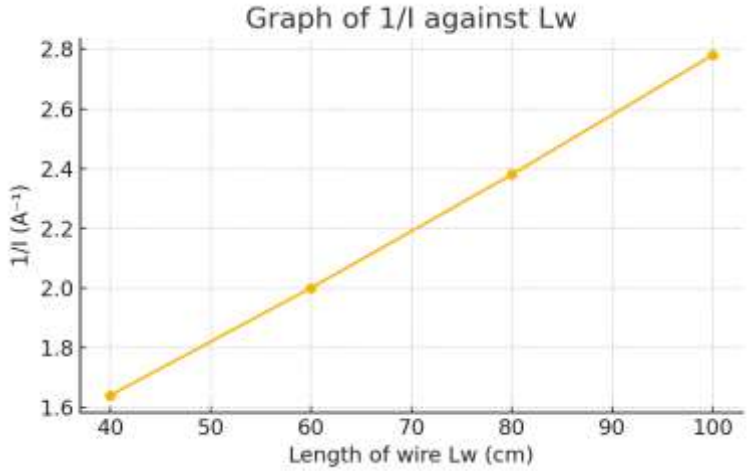
3. Determine the resistivity ρ of the wire labelled W and the internal resistance r of the battery provided.

(b) Tabulate your results as shown in table 2 below:

Length Lw of wire (cm)	Current I (A)	1/I (A^{-1})
40	0.61	1.64
60	0.50	2.00

| 80 | 0.42 | 2.38 |
| 100 | 0.36 | 2.78 |

(c) (i) Plot a graph of 1/I (vertical) against Lw (horizontal)



(ii) Determine the slope G
Using (40, 1.64) and (100, 2.78):
G = (2.78 - 1.64) / (100 - 40) = 1.14 / 60 = 0.019 A^{-1}/cm

(iii) Determine the intercept Y on the vertical axis
From extrapolation of the graph, Y ≈ 0.86 A^{-1}

(d) Measure and record the diameter at four different places on the wire.
Let mean diameter d = 0.50 mm = 0.050 cm

(e) Given $G = 4\rho / (\pi d^2 E)$ and $Y = (R + r) / E$
Let E = 3.0 V, R = 2 Ω

(i) Find resistivity ρ of the wire

Using:
G = 0.019 A^{-1}/cm
d = 0.050 cm
E = 3.0 V

$\rho = (G \times \pi \times d^2 \times E) / 4$
$\rho = (0.019 \times 3.142 \times 0.0025 \times 3.0) / 4$
$\rho = (0.000447) / 4$
$\rho \approx 1.12 \times 10^{-4}$ Ωcm

(ii) Find internal resistance r of the battery

From $Y = (R + r) / E$
$Y = 0.86\ A^{-1}$
$0.86 = (2 + r) / 3$
$2 + r = 2.58$
$r = 2.58 - 2 = 0.58\ \Omega$