Name.....Index NO.....

232/3 Candidate`s Signature.....

PHYSICS Date.....

(PRACTICAL)

Paper 3 Term 2 Year 2024

$2\frac{1}{2}$ hours

Kenya Certificate of Secondary Education (KCSE)

Instructions to candidates

a) *Write your name and index number in the spaces provided above.*
b) *Sign and write the date of examination in the spaces provided above.*
c) *Answer all the questions in the spaces provided in the question paper.*
d) *You are supposed to spent the first 15 minutes of the $2\frac{1}{2}$ hours allowed for this paper reading the whole paper carefully before commencing your work.*
e) *Marks are given for a clear record of the observations actually made, their suitability, accuracy and the use made of them.*
f) *Candidates are advised to record their observations as soon as they are made*
g) *Non-progmmable silent electronics calculators may be used.*
h) *This paper consists of 9 printed pages.*
i) *Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.*
j) *Candidates should answer the questions in English.*

For Examiner`s Use Only

Question 1	a	b	d	e	f(i)	f(ii)	g	Total
Maximum Score	1	1	5	5	3	3	2	
Candidate's Score								

QUESTION 2	a	b	d	e	f(i)	f(ii)	i	j	k(i)	k(ii)	k(iii)	Total
Maximum Score	2	2	1	2	1	3	4	1	1	1	2	
Candidate's Score												

GRAND TOTAL

QUESTION ONE

1. You are provided with the following:

- ✓ An ammeter
- ✓ A voltmeter
- ✓ Two cells (size **D**)
- ✓ A cell holder
- ✓ A switch
- ✓ A wire labelled **L** mounted on a millimeter scale
- ✓ A micrometer screw gauge (to be shared)
- ✓ Six connecting wires at least four with crocodile clips

Proceed as follows:

a) Using a micrometer screw gauge, measure and record the diameter **d** of the wire **L**. (1 mark)

d = 0.30 ± 0.02 .....mm 2 d.p a must ½

d = ...m Correct conversion to 5d.p. ½

b) Place the two cells **in series** in the cell holder and use the voltmeter to measure the total electromotive force (emf) E_0 of the battery. (1 mark)

E_0 = 3.0 ± 0.2 .....V 1 d.p a must. 1

c) Starting with the switch open, connect the circuit as shown in **figure 1 below**. **P** and **Q** are points on the wire **L** such that **PQ** is 60 cm. (**PQ** should remain 60 cm throughout the experiment)
N is a point on the wire such that **PN** is 10cm (0.1 m)

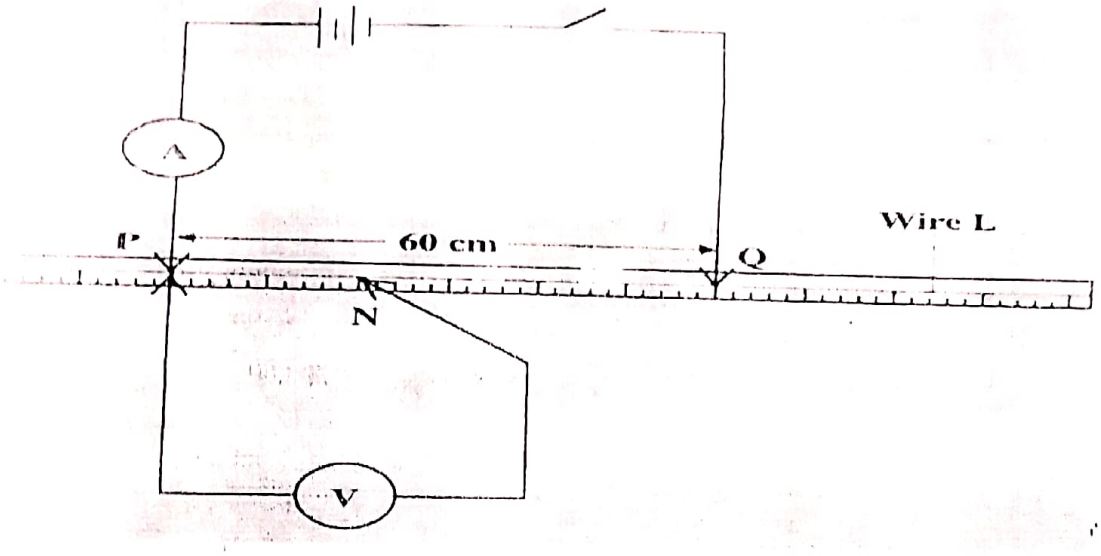


Figure 1

(d) (i) Close the switch and record the current I. (1 mark)

I = 0.30 ± 0.1 A. 2 d.p a short ✓1

(ii) Measure and record in **table 1** the potential differences across **PN**.

(iii) Measure and record the potential difference across **PN** for the other values of **PN** shown in **table 1** and complete the table. *(The current is expected to remain constant)*

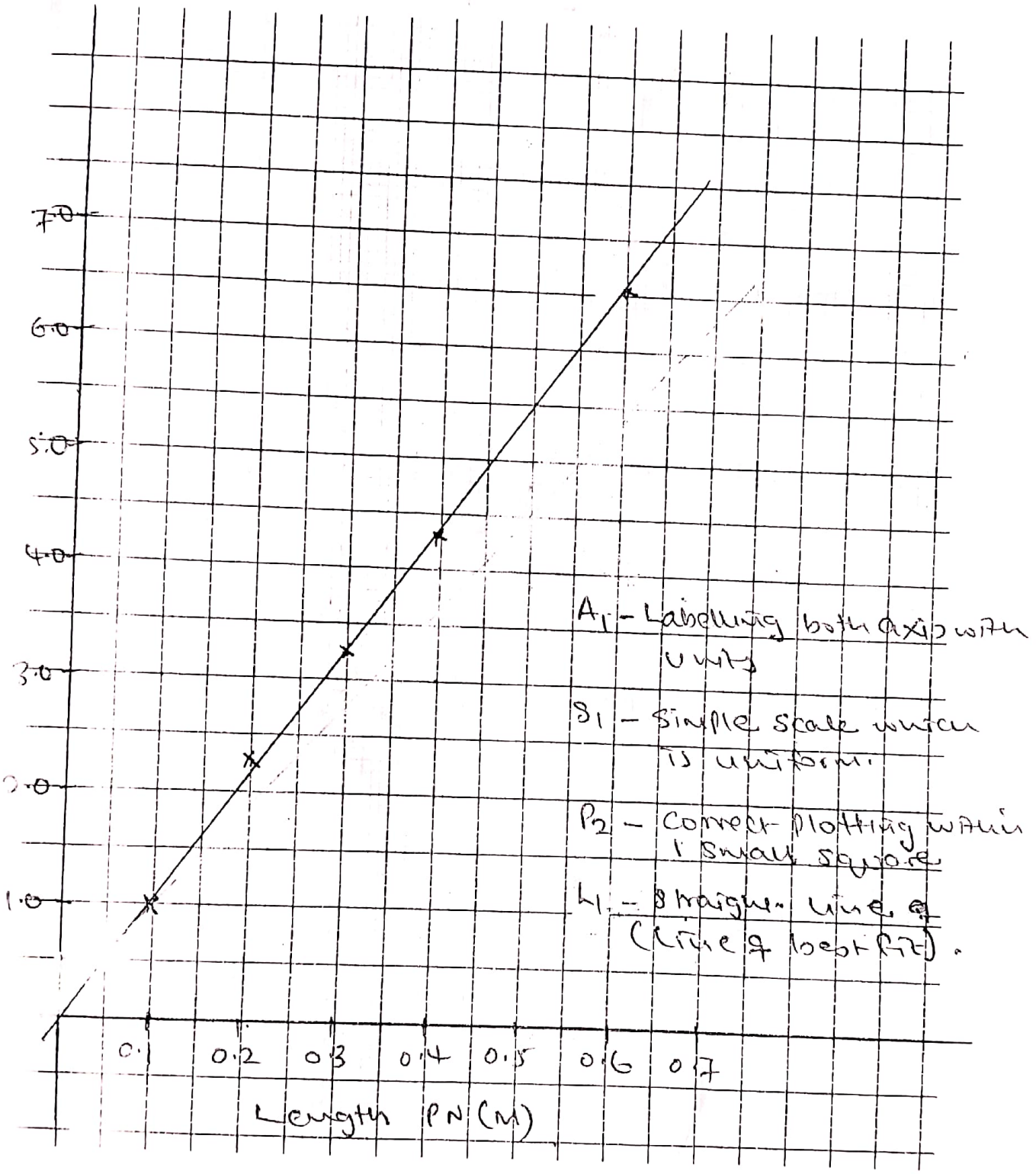
Hint: *The switch should be crossed only when reading the voltmeter.*

Table 1 **(4 marks)**

Length PN (m)	0.1	0.2	0.3	0.4	0.5	0.6
p.d (V)	0.3	0.7	1.0	1.3	1.6	2.0
Resistance $(\frac{v}{1})\Omega$	Correct evaluation to 45.5					

✓3 MKS ± 0.3 ✓1MK.

(e) On the grid provided, plot a graph of resistance (y-axis) against length. (5 mark)



A_1 – Labelling both axis with units

S_1 – Single scale which is uniform.

P_2 – Correct plotting within 1 small square

L_1 – Straight line of (Line of best fit).

f) From the graph, determine:

(i)the slope **S** and its units.

(3 marks)

$S = \frac{\Delta y}{\Delta x}$

- Correct evaluation y-interval ✓1
- Correct evaluation x-interval ✓1
- Correct answer with units to 4 S.f ($-2\,m^{-1}$). ✓1

(ii) the constant **K** and its units given that

$$S = \frac{4k}{\pi d^2}$$

(3 marks)

- Correct substitution ✓1
- Correct evaluation ✓1
- Correct answer with units to 4 S.f ($-2\,M$). ✓1

g) Determine constant t given that

$$t = \frac{E_0 - v_n}{I}$$

Where **Vn** is the **p.d** at **PN** = 0.6 m.

(2 marks)

- Correct substitution from the table. ✓1
- Correct evaluation to 4 S.f. ✓1

QUESTION TWO

2. You are provided with the following:
   - ✓ Triangular glass prism
   - ✓ Four optical pins
   - ✓ Some sellotape
   - ✓ A soft board
   - ✓ A plain sheet of paper

Proceed as follows:

PART A

a) Fix the plain sheet of paper on the soft board using some sellotape. Place the triangular prism on the paper and trace its outline on the sheet of paper. Remove the prism and use a ruler to extend the three sides of the outline. See **Figure2**.

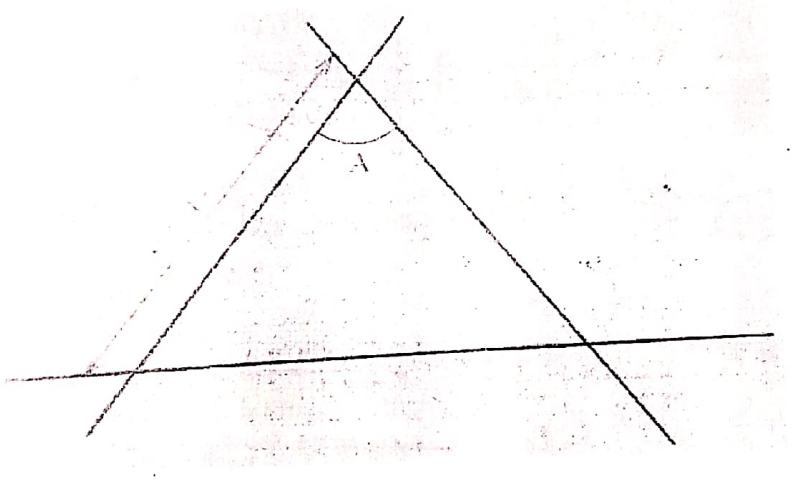


Figure 2

Measure angle A and the length l.

A = 60 ± 2^{o} ✓1 (1 mark)

l = 5.0 ± 0.2 cm ✓1 1 d.p a must. (1 mark)

NB: The plain sheet of paper must be submitted together with the question paper.

b) At a point about a thirdway along one side of the outline from angle A, draw a normal. (2 marks)

c) Draw a line at angle i = 40° to the normal. Stick two pins P_1 and P_2 vertically on this line. **(see Figure 3)**

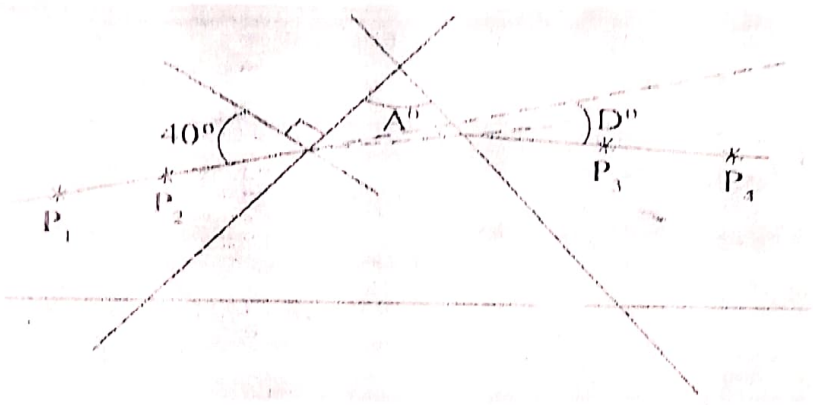


Figure 3

Place the prism accurately on the outline. By viewing through the opposite side, stick the two pins P_3 and P_4 vertically such that they are in line with the two images of pins P_1 and P_2.

d) Remove the prism and the pins. Draw a line joining the marks made by P_3 and P_4. Extend lines P_1P_2 and P_3P_4 to intersect. Hence measure the angle of deviation D.

D = ..41 ± 2°.. ✓1 (1 mark)

e) For two other values of the angle i shown in **Table 2** locate and measure the corresponding angles of deviation. Complete **Table 2**.

Table 2 (2 marks)

i	40°	50°	60°
D	41 ± 2	39 ± 2	37 ± 2 ✓ 2MKS

f) (i) Determine the average value D_m of D. (1 mark)

..... ✓½

- Show average ✓½
- Correct evaluation ✓½

.....

.....

(ii) Determine the constant K using the equation;

$$k = \frac{\sin\left(\frac{A+D_m}{2}\right)}{\sin\frac{A}{2}}$$ (3 marks)

.....

- Correct substitution ✓1

.....

- Correct evaluation ✓1

.....

- Accuracy (1.45 – 1.55) ✓1

.....

PART B

You are provided with the following:

- ✓ 100 ml beaker
- ✓ A meter rule
- ✓ Source of light
- ✓ A screen

Proceed as follows:

g) Place the 100 ml beaker on a meter rule and pour 80 cm^3 of water into it. Arrange a lamp (source of light) and a screen on either side of the beaker. **(see figure 4)**

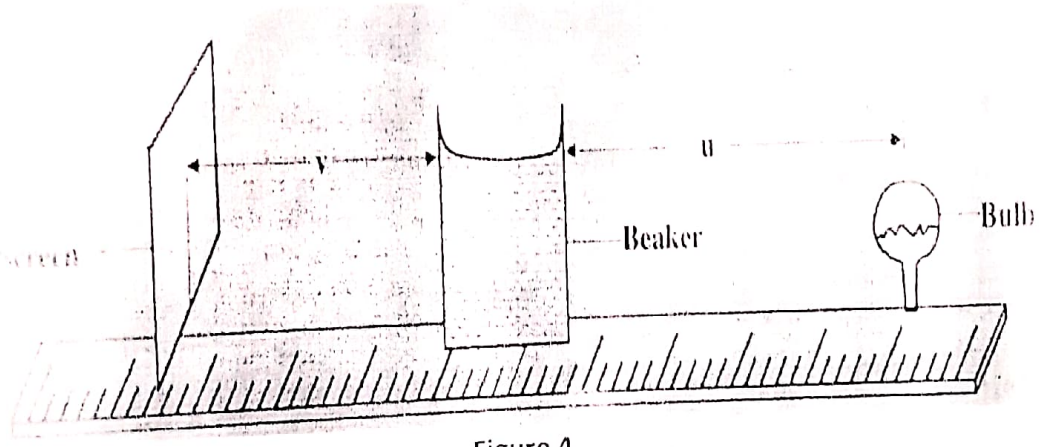


Figure 4

h) Adjust the position of the lamp on the metre rule so that its centre is a distance u = 12 cm from the beaker. Switch on the light. Adjust the position of the screen until a

well focused vertical line *(the image of filament)* is formed on the screen. Measure and record in **table 3** the image distance **V** between the screen and the beaker.

i) Repeat part (b) for the values of **u** shown in **table 3** and complete the table.

Table 3 (4 marks)

Distance u (cm)	12	16	20
Distance V (cm)	5.0	4.5	4.0
$y = \frac{Uv}{U+v}$	Correct evaluation to 4S.F		

3 MKS
1 D.P MK
1 MK

j) Determine **m**, the mean value of **y** using the values in **table 3**. (1 mark)

m = ... - Show average ½
- Correct evaluation to 4.S.F ½

k) (i) With the meter rule outside the beaker, measure the height **h** of the water meniscus above the bench. (1 mark)

h = 5.0 ± 0.5 cm 1 D.P a mark ½

(ii) Determine the value of **P** given that (1 mark)

$P = \frac{5}{\sqrt{h}}$

- Correct substitution either in CM or MT ½
- Correct evaluation to 4S.F. ½

(iii) Hence determine the value of f given that $f = \frac{P}{2m} + 1$ to one decimal place. (2 marks)

- Correct substitution ½
- Correct evaluation ½
- Correct answer to 1D.P. ½

THIS IS THE LAST PRINTED PAGE.

K.C.S.E 232/3 TERM II 2024.