**232/3**
**PHYSICS**
**PAPER 3**
**PRACTICAL**
**JULY/AUGUST 2014**

**MWALA DISTRICT FORM IV JOINT EXAMINATION 2014**
**Kenya Certificate of Secondary Education**
**PHYSICS**
**PAPER 3**
**CONFIDENTIAL**

## INSTRUCTIONS TO SCHOOLS

Each student should be provided with following apparatus:

### Question 1

Meter rule

Cotton thread 10cm long

Two 10g masses

Two 20g masses

Knife edge 20cm high

A triangular prism ($60^0$, $60^0$, $60^0$)

4 optical pins

Plain paper

Some plasticine

Soft board

### Question 2

2 dry cells

Ammeter (0 – 1A)

Voltmeter (0 – 5V)

Resistant wire (SWG 28) on a mm scale

Jockey or crocodile clip

Cell holder

Switch

6 connecting wires (at least) three with crocodile clips at one end)

***This paper consists of 1 printed page***

**Name**_____ **Index No.** _____

**Candidates signature** _____

**Date** _____

**232/3**
**PHYSICS**
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**PRACTICAL**
**JULY/AUGUST 2014**
**2 ½ HOURS**

**MWALA DISTRICT FORM IV JOINT EXAMINATION 2014**
**Kenya Certificate of Secondary Education**
**PHYSICS**
**PAPER 3**
**2 ½ HOURS**

**INSTRUCTIONS TO CANDIDATES**
- Write your name and index number in the spaces provided
- Sign and write the date of the examination in the spaces provided
- This paper consists of two questions
- You are supposed to spend the first 15 minutes of the 2 ½ hours allowed for this paper reading the whole paper carefully
- Marks are given for clear working of the observation actually made, accuracy and use of them
- All working must be clearly shown
- Non-programmable silent electronic calculators and KNEC mathematical tables may be used.

**FOR EXAMINER'S USE ONLY**

| **Questions** | **Maximum score** | **Student score** |
|---|---|---|
| 1 | 20 | |
| 2 | 20 | |
| Total | 40 | |

***This paper consist of 7 printed pages***

***Turn Over***

**Question one**

**PART A**

You are provided the following apparatus

- A metre rule
- 10cm long cotton thread
- Masses, two of 10g and two of 20g
- Knife edge 20cm high

**Proceed as follows**

(a) Arrange the apparatus as shown in figure 1 below

(b) Balance the metre rule on the knife edge, adjust the metre rule until it balances horizontally when there is no mass on it. The knife edge is now at the position of centre of gravity (cog) when there is no mass on it.

(c) Record the position of (cog)

Position of c.o.g = _____cm (1mk)

Fig 1

(d) Now hang a mass on the metre rule by use of the thread at the 1cm mark. Adjust the knife edge until the metre rule balances again at a new mark. Record the length $d_1$ and the corresponding length $d_2$ as shown above

(i) Repeat the procedure for different masses and complete the table 2 shown below.

Table 2

| Mass, m(g) | 10 | 20 | 30 | 40 | 50 | 60 |
|---|---|---|---|---|---|---|
| Distance $d_1$ (cm) | | | | | | |
| Distance $d_2$ (cm) | | | | | | |
| 10g x distance $d_2$ = (gcm) | | | | | | |

(7mks)

(ii) Plot a graph of $md_2$ against $d_1$ (5mks)

(iii) Calculate the slope S of the graph (2mks)

**PART B**

You are provided with
- Prism
- 4 optical pins
- Plain paper
- Some plasticine
- Soft board

Set up the apparatus as in figure 2 below

(a) Using a protractor, measure angle A of the prism _____ (1mk)

Place the prism on a plain paper and trace its outline with a pencil. Attach some plasticine to the prism to indicate the prism angle A construct a normal at point T along LM. Draw an incident ray to strike the prism at $40^0$. Stick pins $P_1$ and $P_2$ to define the incident ray. View $P_1$ and $P_2$ from the opposite face (MN). Insert pins $P_3$ and $P_4$ so that they appear to be in line with images of $P_1$ and $P_2$. Remove the prism and join $P_3$ to $P_4$ to give emergent ray. Extrapolate the emergent ray into the prism so as to meet the extrapolated incident ray to Q.

(b) Measure angle D _____ (1mk)

(c) Calculate the value of n, where $n = \dfrac{\cos\left(90^0 - \frac{(A + D)}{2}\right)}{\sin \frac{A}{2}}$ (3mks)

**Question 2**

You are provided with the following
- Two new dry cells
- An ammeter 0 – 1A
- A voltmeter 0 – 5V
- Jockey or crocodile clip
- A cell holder
- Switch
- Six connecting wires at least three with crocodile clips at one end

(a) Set up the circuit as shown in figure 4
X Y

(b) Close the switch and place the jockey in contact with the resistance wire such that the length, L, of wire XY = 0.20m. Measure and record the current, I, through the wire XY and the p.d, V, across it and enter the results in table 1

(c) Repeat procedure (b) above for the other values of L given. Read and record the corresponding values of I and V

| L (cm) | 0.2 | 0.4 | 0.5 | 0.6 | 0.7 | 0.9 | 1.0 |
|---|---|---|---|---|---|---|---|
| p.d (V) | | | | | | | |
| I (A) | | | | | | | |
| R ( Ω ) | | | | | | | |
| $\frac{I}{I\ (A^{-1})}$ | | | | | | | |

Table 1 (7mks)

(d) Plot a graph of $^{I}/_{I}$ (y axis) against R (5mks)

(e) Determine the slope, S, of your graph (3mks)

(f) Given that I and R of the graph are related by the equation $\frac{1}{I} = \frac{R}{E} + \frac{r}{E}$, use your graph to

Determine the values of

E = (2mks)

r = (3mks)

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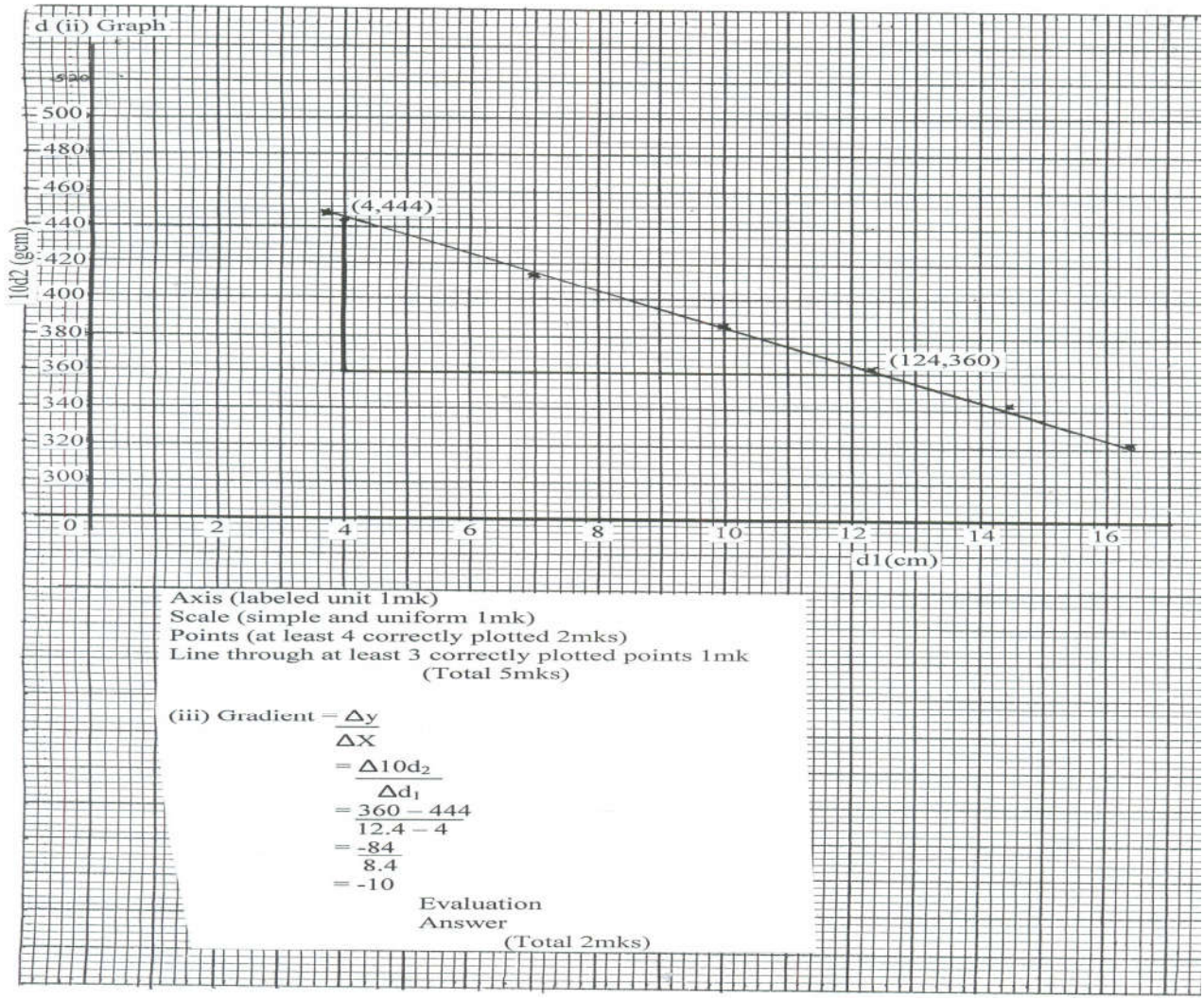
**MARKING SCHEME**

**Question 1**

**PART A**

(c) c.o.g = 50.0 + 0.5cm

| Mass, m(g) | 10 | 20 | 30 | 40 | 50 | 60 | |
|---|---|---|---|---|---|---|---|
| Distance $d_1$ (cm) | 3.70 | 7.00 | 10.00 | 12.30 | 14.40 | 16.40 | $\pm$ 0.01 3 mks |
| Distance $d_2$ (cm) | 44.80 | 41.50 | 38.50 | 36.20 | 34.20 | 32.20 | $\pm$ 0.01 3mks |
| 10g x distance $d_2$ (gcm) | 448 | 415.0 | 385.0 | 362.0 | 322.0 | | 1mk |



**PART B**

$A = 60^0 \surd 1$

$D = 37^0 \surd 1$ (evidence required)

$$n = \frac{\text{Cos}\,(90^0 - A + D)}{\text{Sin}\,\frac{A}{2}}$$

$$= \frac{\text{Cos}(90^0 - \frac{60^0 + 37^0}{2})}{\text{Sin}\,\frac{60\surd 1}{2}}$$

$$= \frac{\text{Cos}\,(90^0 - 48.5^0)}{\text{Sin}\,30^0}\surd 1$$

$$= \frac{\text{Cos}\,41.5^0}{\text{Sin}\,30^0}$$

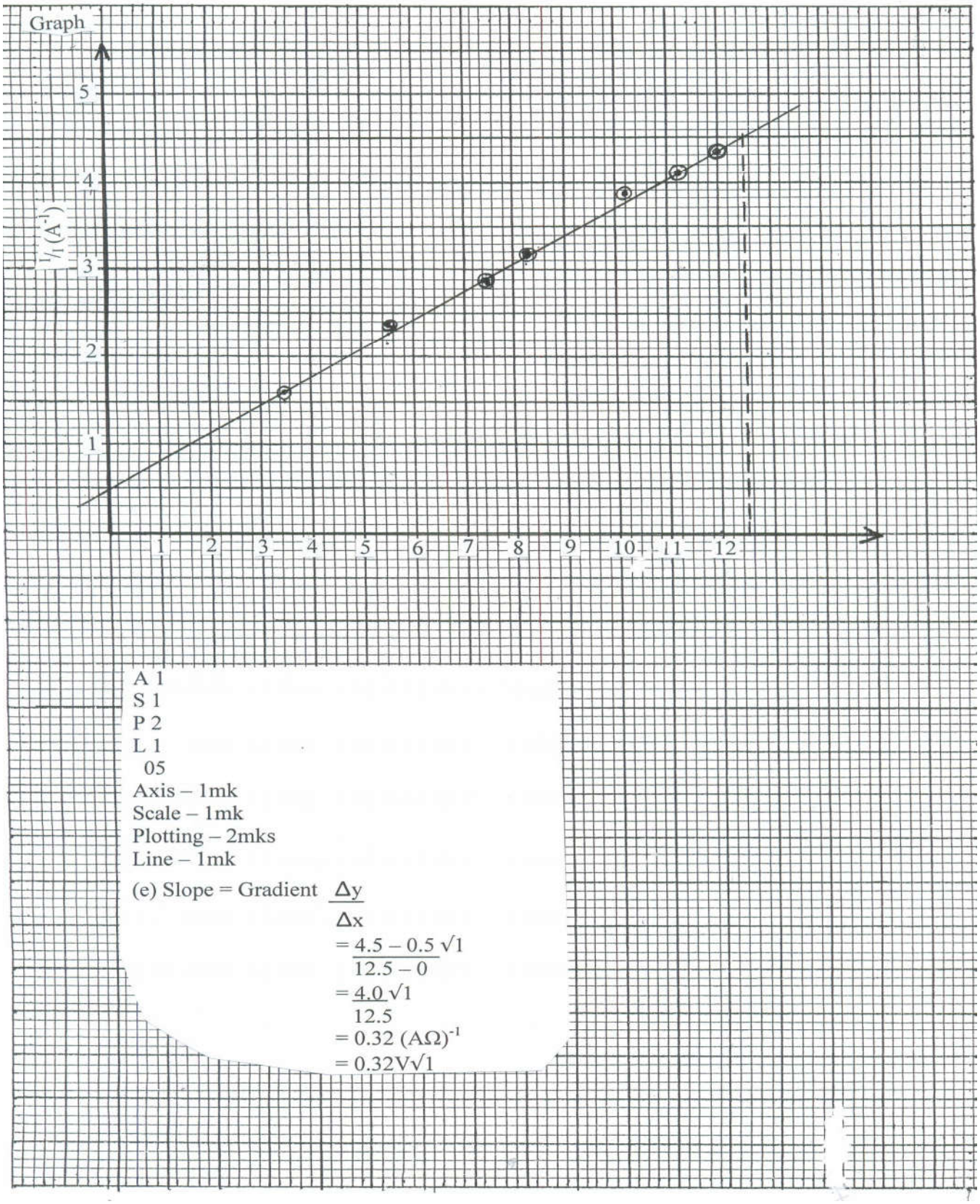
$$= \frac{0.7489}{0.5}$$

$= 1.49\surd 1$

**Question 2**

Table 1

| L (cm) | 0.2 | 0.4 | 0.5 | 0.6 | 0.7 | 0.9 | 1.0 | |
|---|---|---|---|---|---|---|---|---|
| p.d (V) | 2.10 | 2.40 | 2.50 | 2.60 | 2.65 | 2.70 | 2.75 | 2mks |
| I (A) | 0.62 | 0.42 | 0.34 | 0.32 | 0.26 | 0.24 | 0.23 | 2mks |
| R ( Ω ) | 3.39 | 5.71 | 7.35 | 8.12 | 10.19 | 11.24 | 11.96 | 2mks |
| $^1/_I$ ($A^{-1}$) | 1.61 | 2.38 | 2.94 | 3.13 | 3.85 | 4.17 | 4.35 | |




A 1
S 1
P 2
L 1
05
Axis – 1mk
Scale – 1mk
Plotting – 2mks
Line – 1mk

(e) Slope = Gradient $\frac{\Delta y}{\Delta x}$

$= \frac{4.5 - 0.5}{12.5 - 0}$ √1

$= \frac{4.0}{12.5}$ √1

$= 0.32\ (A\Omega)^{-1}$

$= 0.32V$√1

(f) $\frac{1}{I} = \frac{R}{E} + \frac{r}{E}$

From the graph $\frac{1}{I} \propto R$

Therefore using $y = mx + c$

$\frac{1}{I}\left(\frac{I}{E}\right) R + \frac{r}{E}$

$\frac{1}{E}$ is the gradient √1

$\frac{1}{E} = 0.32$

$E = \frac{1}{0.32}$

$\frac{r}{E}$ is the y – intercept √1

$\frac{r}{E} = 0.5$ √1

But E = 3.125

∴r = 0.5 x 3.125

= 1.5625 Ω√1