**Name: ………………………………………………Adm No……………Class….……...**

**232/3 Candidate’s Signature: ………………..**

**PAPER 3**

 **SEPTEMBER, 2022. Date: ……………………………**

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

**THE MURANG’A EXTRA COUNTY SCHOOLS JOINT EXAMINATIONS (MECS)**

**PHYSICS PRACTICAL FORM 4**

**PAPER 3**

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

**Instructions to Candidates**

1. *Write your name and admission number in the spaces provided.*
2. *Answer* ***ALL*** *questions in the spaces provided in the question paper.*
3. *You are supposed to spend the first* ***15 minutes*** *of the* $ 2\frac{1}{2} hours$ *allowed for this paper reading the whole paper carefully before commencing the work.*
4. *Marks are given for a clear record of the observations actually made, their suitability, accuracy and the use made of them.*
5. *Candidates are advised to record their observation as soon as they are made.*
6. *Non programmable silent electronic calculators may be used.*
7. ***This paper consists of 7 printed pages.***
8. ***Candidates should check the questions to ascertain that all the pages are printed as indicated and that no questions are missing.***
9. ***Candidates should answer the questions in English.***

 **For Examiner’s Use Only**

**Question 1**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | B | d | e | f | g | h |
| **Maximum Score** | 1 | 5 | 5 | 3 | 3 | 3 |
| **Candidate’s Score** |  |  |  |  |  |  |

 **TOTAL**

**Question 2**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | b | d | e | f | g | h | i | j | k |
|  **Maximum Score** | 1 | 3 | 1 | 3 | 2 | 1 | 3 | 4 | 2 |
|  **Candidate’s Score** |  |  |  |  |  |  |  |  |  |

**TOTAL**

 **GRAND**

 **TOTAL**

You are provided with the following:

* 2 new dry cells size D.
* A cell holder.
* A switch.
* An ammeter (0 – 1A)
* A voltmeter (0 – 5V)
* 6 connecting wires, 3 with crocodile clips.
* Nichrome wire mounted on the metre rule labelled X.
* A micrometer screw gauge (to be shared).

**Proceed as follows:**

1. Connect the circuit as shown in the figure below.

**A**

**V**

**L**

**X**

1. Measure the voltage, E before closing the switch.

**E = …………………………………………………………** (1mk)

1. Adjust the length L of the wire 0.2m, close the switch S and read the value of current and record in the table below.

 (d) Repeat the procedure in (c) above for the value of length, **L** and fill the table for $\frac{1}{I}$.(5mks)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Length (m) | **0.2** | **0.3** | **0.4** | **0.5** | **0.6** | **0.7** |
| Current I(A) |  |  |  |  |  |  |
| $$\frac{1}{I}(A^{-1})$$ |  |  |  |  |  |  |

(e) On the grid provided plot a graph of $\frac{1}{I}$ (y axis) against L. (5mks)

 (f) Determine the gradient of the graph. (3mks)

 (g) (i) Measure the diameter of the wire in three points using micrometer screw gauge. (1mk)

 d1 = ………………… d2 = ……………… d3 = ……………….…

 Averaged **d** = ……………………………………………………………………….….. (1mk)

 (ii) Determine the cross-section area, A of the wire. (1mk)

 (h) From the equation $\frac{1}{I}=\frac{KL}{AE}+\frac{Q}{E}$ determine;

 (i) the value of K. (2mks)

 (ii) the value of Q. (1mk)

**QUESTION 2**

**PART A**

1. ***You are provided with the following:*** Triangular glass prism

Four optical pins Thermometer

250 ml beaker Plain paper

Soft board Stopwatch

source of boiling water Four office pins

 ***Proceed as follows***

1. Fix the plain paper on the soft board using the office pins.
2. On the plain paper, draw line XY. Mark a point M on its midpoint. Draw a normal N at M to XY. Draw line RM such that angle RMN = 50°.

***(This paper will be collected at the end of the experiment)*** (1mk)



1. Place the glass prism such that one edge AB of the prism is in line with XY. Accurately draw the outline ABC of the prism

1. Place optical pins **P1** and **P2** on the line RM
2. Through edge BC observe the images of **P1** and **P2**. Fix **P3** and **P4** so that **P1**, **P2, P3** and **P4** lie on straight line.
3. Remove the pins; construct straight line from **P4** through **P3** to meet side BC at D, join M to D.
4. Measure angle **r1.** (1mk)

 **r1** = ………………………………..

1. Produce **P4P3** to meet RM produced. Measure angle **d**. (1mk)

  **d**………………………………..

1. Draw the normal at D and measure the angle **r2.** (1mk)

 **r2** ……………………………….

1. Given that R= **r1**+ **r2**. Calculate **R**  (1mk)

1. Given that$ n=\frac{\sin(\left(\frac{R+d}{2}\right))}{\sin(\left(\frac{R}{2}\right))}$, find the value of n. (3mks)
2. Given that $n\sin(k=1)$, find the value of **k** (2mks)
3. What Physical property does **n** represent? (1mk)

**PART B**

**(Read all the instruction before starting this part)**

1. (I) Using the thermometer, measure and record the temperature of the room, $θ.$

$θ$………………………………………………$℃.$(1mk)

 (II) Using the 250 ml beaker, collect 200 ml of hot water from the boiling source. Place the thermometer into the hot water and wait until it cools to $80 ℃$ the start the stopwatch and record time **t1** it takes to cool to $75 ℃$**.**

**t1 ………………………………………………………………….** seconds. (1mk)

1. Wait until the water cools to $70 ℃$and then start the stopwatch and record the time **t2** it takes the waterto cool to$65 ℃$

 **t2** ………………………………………….. seconds. (1mk)

1. Determine the rate of temperature change $ρ$and $β$in the two intervals.

(i) $ρ=\frac{77.5-θ}{t\_{1} }$(2mks)

 (ii)  $β=\frac{67.5-θ}{t\_{2} }$(2mks)

1. State with reason how the rate of change of temperature between $50 ℃$and$45 ℃$compares with$ρ$

 (2mks)