**Name: Adm No**

**232/3 Candidate’s Signature:**

**PAPER 3**

**DECEMBER 2021. Date:**

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

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

**PHYSICS PRACTICAL**

**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 8 printed pages.***
8. ***Candidates should check the questions to ascertain that all the pages are printed as indicated and that no question are missing.***
9. ***Candidates should answer the questions in English.***

 **For Examiner’s Use Only**

**Question 1**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | d | e | f | g | h | i | j |
| **Maximum Score** | 6 | 5 | 2 | 2 | 2 | 1 | 2 |
| **Candidate’s Score** |  |  |  |  |  |  |  |

 **TOTAL
Question 2**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | b | c | d | e | f | h | i | j |
|  **Maximum Score** | 1 | 5 | 5 | 2 | 1 | 3 | 2 | 1 |
|  **Candidate’s Score** |  |  |  |  |  |  |  |  |

**TOTAL**

 **GRAND**

 **TOTAL**

**QUESTION 1 (20 marks)**

1. You are provided with the following;
* A galvanometer
* A dry cell and a cell holder
* A switch
* A wire labelled Y mounted on a piece of wood.
* Eight connecting wires each with a crocodile clip at one end.
* A resistance wire labelled AB mounted on a millimeter scale.
* Six 10 Ohm carbon resistors
* A jockey or crocodile clip
* Micrometer screw gauge (to be shared)

***Proceed as follows:***

1. Set up the circuit as shown in figure below, with X being one of the 10 ohms carbon resistors.

Nichrome wire mounted on a Millimeter scale

Wire Y

B

A

X

G

$$L$$

P

1. Close the switch. Tap the jockey at various points on the wire AB and locate point P at which the galvanometer shows zero deflection, measure and record in table below the length, $l$ where $l$= PB.
2. Repeat the procedure in (b) using X as two 10Ω resistors, three resistors, four resistors, five resistors and six resistors. **X is the effective resistance for the parallel combination i.e.** $X= \frac{10}{n}$where **n** is the number of resistors in parallel.
3. Record your readings in table below. (6mks)

 **TABLE**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Number of **10Ω**Carbon resistor | **One**  | **Two** | **Three** | **Four** | **Five** | **Six** |
| X (Ω) |  |  |  |  |  |  |
| $L$ (cm) |  |  |  |  |  |  |
| $\frac{1}{X}$ $(Ω$-1) |  |  |  |  |  |  |
| $$\frac{1}{L} \left(cm^{-1}\right) $$ |  |  |  |  |  |  |

1. Plot a graph of $\frac{1}{L}$ (y-axis) against $\frac{1}{X}$ . (5mks)



1. Determine the slope m of the graph. (2mks)

1. Given that $\frac{1}{L} = \frac{R}{KX} + \frac{1}{K}$ where K = 100cm. Use the graph to determine R. (2mks)

1. Measure the diameter d and the length $l$ of wire Y. (2mks)

 $l$ =…..……..…………………………..….m

 d = ………….…………………………….. m

1. Determine its cross-sectional area A of the wire Y. (1mk)

 A =………………………………………… m2

1. Determine the resistivity $ρ$ of the wire Y given that its Resistance, $R=ρ \frac{l}{A} . $ (2mks)

**QUESTION 2 (20 marks)**

**PART A**

**You are provided with the following;**

* Meter rule
* Retort stand, clamp and boss
* A spring and with a pointer
* Three masses (a 100 g and two 50g masses)
* Stop watch

**Proceed as follows**

1. Set the apparatus as shown below.

pointer

Metre rule

spring

stand

M

1. Hang the unloaded spring and record the pointer readings

***xo****………………………………………………………….………………………….*m*.* (1mk)

1. (i) Load a mass of 150 g and determine the extension of the spring, ***e1****.*

***e1***…………………………………………………………………………….m. (1mk)

1. Displace the 150 g mass slightly downwards and release it to oscillate vertically. Time 20 oscillations and obtain time t1.

 **t1** ………………………………………………….. (1mk)

1. Find periodic time T1

**T1**…………………………………………………. (1mk)

1. Use the equation $T=2π\sqrt{\frac{e}{p}}$ to find the value of P1. (2mks)
2. (i) Load a mass of 200 g and determine the extension of the spring, ***e2****.*

***e2***…………………………………………………………………………….m. (1mk)

1. Displace the 200 g mass slightly downwards and release it to oscillate vertically. Time 20 oscillations and obtain time t2.

**t2** ………………………………………………….. (1mk)

1. Find periodic time T1

**T2**…………………………………………………. (1mk)

1. Use the equation $T=2π\sqrt{\frac{e}{p}}$ to find the value of P2. (2mks)

1. Find the average of P

$P\_{av}=\frac{P2+p1}{2}$ (2mks)

**PART B**

**Apparatus**

* Lens and a lens holder.
* A candle
* Screen
* A metre rule.

**Procedure**

1. Focus a distant object and estimate the focal length, **f** of the lens

**f** …………………………………………. mm. (1mk)

1. Set up the apparatus as shown below.

P

Candle

screen

lens

s

d

P’

1. Set the distance **s= 60 cm.**
2. Adjust the position of the lens to position **p** where a magnified sharp image is formed on the screen**.** Recordposition P.

**P =**………………………………………. cm. (1mk)

1. Maintaining distance **s,** adjust the lens to position **P’**where a diminished sharp image is formed on the screen. Record position, **P’.**

**P’ =** ……………………………………… cm. (1mk)

1. Find distance **d,** between the originalposition and final position of lens

**d =** ………………………………………... cm (1mk)

1. Using the formula $s^{2}-d^{2}=4qs$. Find the value of **q.** (2mks)
2. What physical quantity do **q** represent (1mk)