**Name: …………………………………………………………… Index No. …………………………**

**School: …………………………………………………………. Candidate’s Sign. …………………**

**232/3**

**PHYSICS**

**PAPER 3**

**TIME: 2 ½ HOURS**

**FORM 4**

**INSTRUCTIONS TO CANDIDATES:**

* *Write your* ***name*** *and* ***index number*** *in the spaces provided above.*
* *Sign and write the* ***date*** *of the examination in the spaces provided above.*
* *You are supposed to spend the first* ***15*** *minutes of the* ***2 ½*** *hours allowed for this paper reading the whole paper carefully before commencing your work.*
* *Marks are given for a clear record of the observation actually made, their suitability, accuracy and the use made of them.*
* *Candidates are advised to record their observations as soon as they are made*
* *Non-programmable silent electronic calculators* ***may be*** *used.*
* *Candidates should check the question paper to ascertain that all the pages are printed andthat no questions are missing.*

**For Examiner’s Use Only.**

|  |  |  |
| --- | --- | --- |
| Question | Maximum score | Candidate’s score |
| 1 | 20 |  |
| 2 | 20 |  |
| Total | 40 |  |

*This paper consists of 6 printed pages candidates should check the questions to ascertain that all pages are printed as indicated and that no questions are missing*

**QUESTION 1**

You are provided with the following apparatus

* A glass block
* Soft board
* Plain paper
* Four optical pins
* Four thumb pins
* A protractor
* A ruler
	1. Fix the plain paper on the soft board using the four thumb pins.
	2. Place the glass block on the plain paper *(that is fixed on the soft board)* Let the glass block rest on the paper from the broader face.
	3. Trace the glass block using a pencil.
	4. Remove the glass block.

Mark point X on one of the longer side of the traced glass block as shown in the diagram below. Point X should be 2 cm from edge A.

* 1. Construct a normal at X, to emerge through line DC. Let this normal meet line DC at point M.
	2. Mark point N along the emergent normal, 5 cm from M.
	3. Construct line NP to meet the normal at N at 900. Line NP is 10 cm.
	4. Using a protractor, construct an incident ray RX at an angle of incidence **i**= 100. Fix two pins P1 and P2 along RX.
	5. Replace the glass block to the traced figure.
	6. View the path of the incident ray RX through the glass block from face DC. Using other two pins P3 and P4, fix them to seem to align themselves with images of P1 and P2.
	7. Remove the glass block and draw the emergent ray through P3 and P4.
	8. Measure the distance of the emergent ray from point N along line NP as shown in the diagram below.



* 1. Record the corresponding values of d, $Sin i$ and $Sin^{2}i$ in the table below.
	2. Repeat the procedure for other values of $i$. **(8 marks)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Angle of incidence **i**0 | 10 | 20 | 30 | 40 | 50 | 60 |
| Distance d (cm) |  |  |  |  |  |  |
| Sin **i** |  |  |  |  |  |  |
| Sin2**i** |  |  |  |  |  |  |

* 1. i) On the grid provided, plot the graph of Sin2i*(vertical axis)* against d. **(5 marks)**

 ii) Calculate the gradient of the graph. **(3 marks)**

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p) What is the equation of the graph **(2marks)**

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q) Give the value of d when $i=80 ^{0}$ **(2marks)**

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**QUESTION 2**

You are provided with the following:

 - Two new dry cells

 - An ammeter 0 – 1A

 - A voltmeter 0 – 5V

 - A resistance wire labelled XY on mm scale

 - Jockey or crocodile clip

 - 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

 

(b) Close the switch and place the jockey in contact with the resistance wire such that the length, L, of the 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 below.

(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) |  |  |  |  |  |  |  |
| (A-1) |  |  |  |  |  |  |  |

 **(7marks)**

(d) Plot a graph of (y axis) against R **(5 marks)**

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

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(f) Given that I and R of the graph are related by the equation , use your graph to determine the values of :

 E = **(2 marks)**

 ………………………………………………………………………………………………………………………………………………………………………………………………………………

 r = **(3 marks)**

………………………………………………………………………………………………………………………………………………………………………………………………………………