

ITEM 2

Aim of the experiment

A scientific investigation to determine the refractive index of the glass block provided.

Variables for the experiment

Independent variable :- The angle of incidence, i .

Dependent variable :- The angle of refraction, r .

Fixed variable :- The distance of the normal line from one side of the glass block

Hypothesis

The refractive index of the glass block is 1.52.

List of apparatus

soft board

white sheet of paper

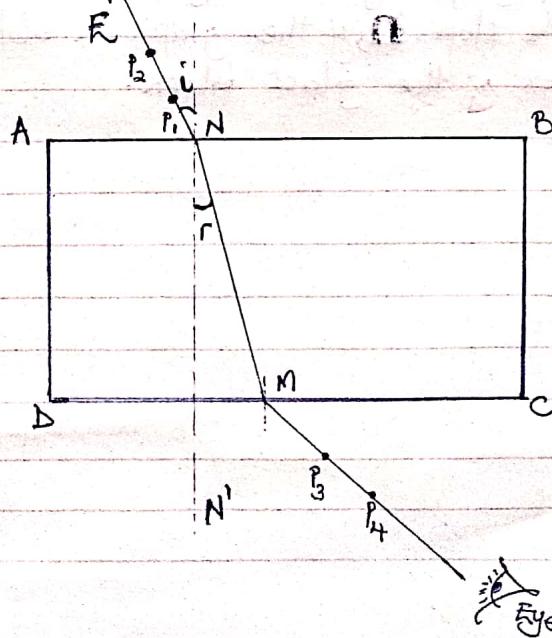
glass block

4 optical pins

A mathematical set

4 drawing pins

Experimental set-up



Procedures

The soft board is placed on a table.

The white sheet of paper is fixed on the soft board using drawing pins.

The glass block is placed in the middle of the white sheet of paper and its outline traced and labelled as ABCD.

A normal line NN' is drawn at a point AN = 2.0 cm from end A of the glass block.

A line EN at an angle of incidence, $i_i = 10^\circ$ is drawn.

Pins P_1 and P_2 are fixed along line EN.

The images of P_1 and P_2 are viewed from the opposite side DC of the glass block.

The other pins P_3 and P_4 are fixed such that they are in line with the images of P_1 and P_2 as seen through the glass block.

The glass block and the pins are removed.

The positions of P_3 and P_4 are joined to meet face DC of the glass block at point M.

Point M is joined to N.

The angle of refraction, r , is measured and recorded using a protractor.

The procedures are repeated for different values of $i = 20^\circ, 30^\circ, 40^\circ, 50^\circ$ and 60° .

The results are tabulated in a suitable table including values of $\sin i$ and $\sin r$.

A graph of $\sin i$ against $\sin r$ is plotted.

The slope, m , of the graph is obtained and it is the refractive index of the glass block.

Data Presentation

TABLE OF RESULTS

$i(^{\circ})$	$r(^{\circ})$	$\sin i$	$\sin r$
10	8	0.174	0.139
20	12	0.342	0.208
30	18	0.500	0.309
40	25	0.643	0.423
50	29	0.766	0.485
60	32	0.866	0.530

Risks / errors

Mitigations / Precautions

Data Analysis

Slope, n , = change in $\sin i$

change in $\sin r$

$$= \frac{(93 \times 0.01)}{(53 \times 0.01)}$$

$$= \frac{0.93}{0.53}$$

$$n = \underline{1.75}$$

Conclusion

∴ The refractive index of the glass block is 1.75

Recommendation:

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UCE

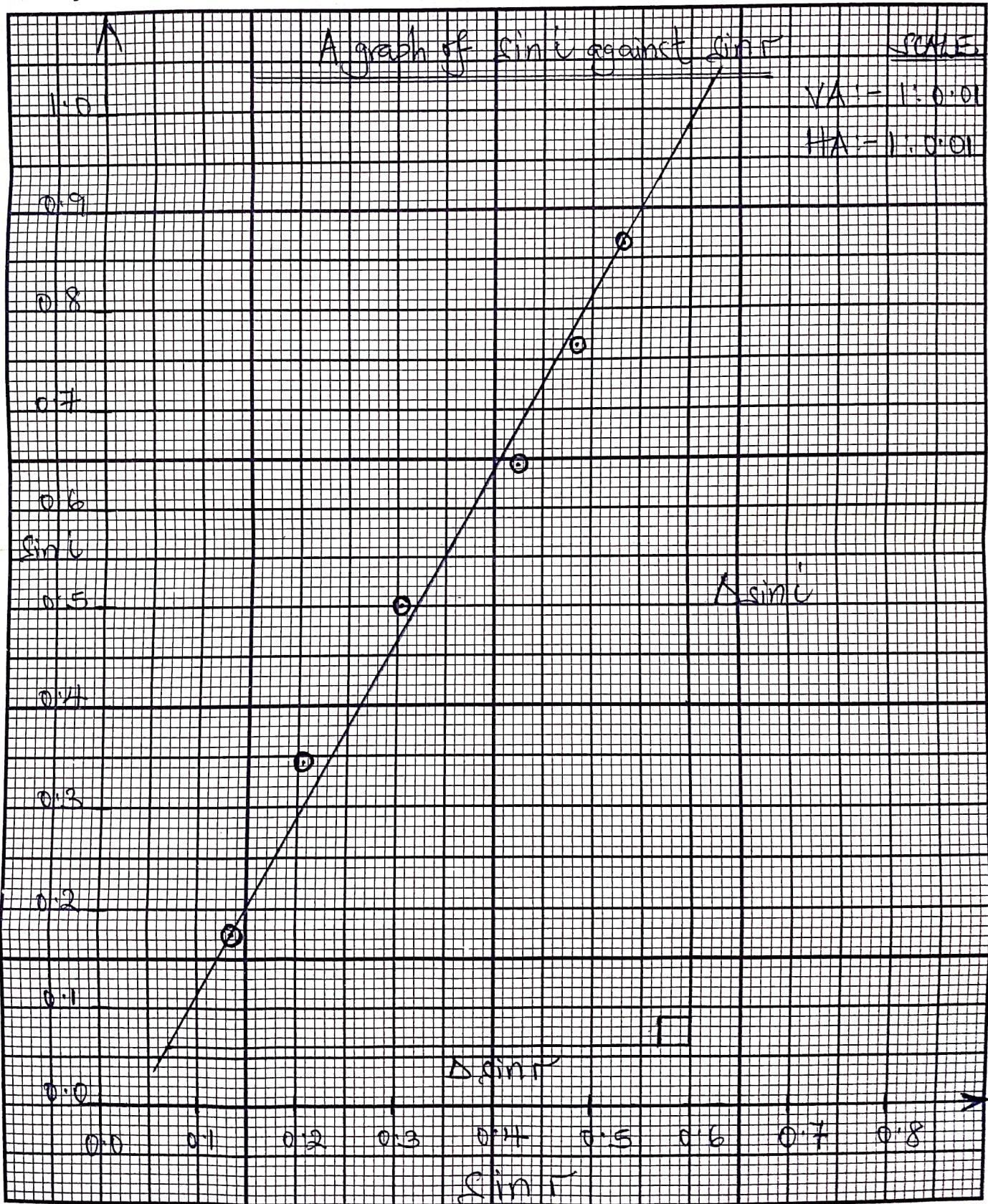
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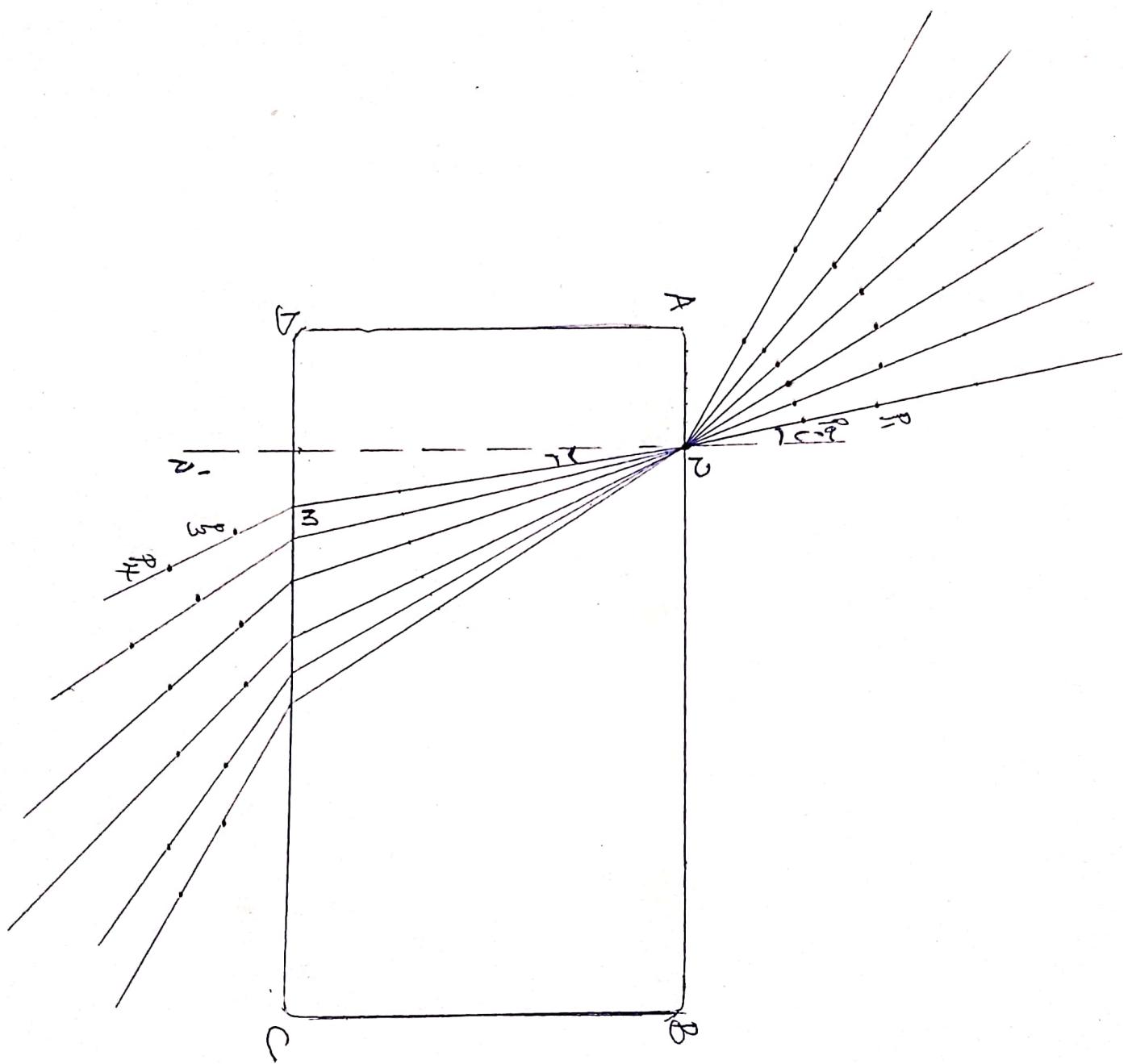
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Subject Paper code







ITEM 2

Aim of the experiment.

A scientific investigation to determine the refractive index of the glass block provided.

Variables for the experiment.

Independent variable:- The angle of incidence, i .

Dependent variable:- The distance, x .

The distance, y .

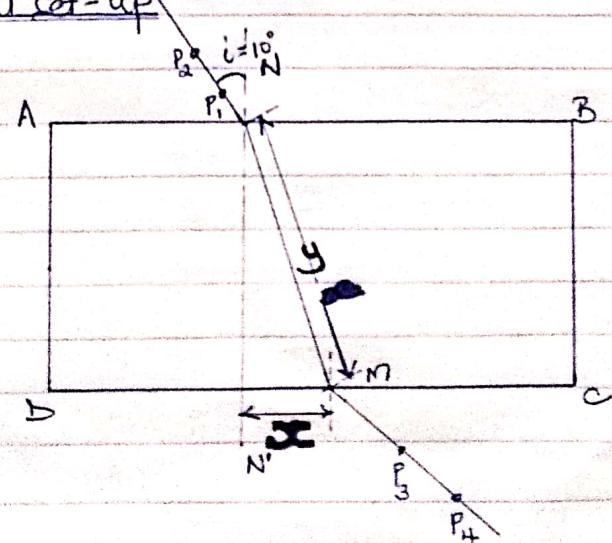
Fixed variable:- The distance of the normal line

Hypothesis

The refractive index of the glass block is between 1.42 - 1.69.

List of apparatus:

Experimental set-up



Procedures for the experiment

1. ~~Wash the glassware.~~
2. ~~Set up the apparatus.~~
3. ~~Measure the initial volume of water.~~
4. ~~Put the bulb in the water.~~
5. ~~Observe the change in volume.~~
6. ~~Repeat the experiment with different volumes of water.~~
7. ~~Calculate the percentage error.~~
8. ~~Draw a graph of change in volume vs initial volume.~~
9. ~~Find the relationship between them.~~

Data Presentation

TABLE OF RESULTS

$i(^{\circ})$	$x(cm)$	$y(cm)$	$\sin i$	$\frac{x}{y}$
10	1.0	6.6	0.174	0.15
20	1.4	6.7	0.342	0.21
30	2.2	7.0	0.500	0.31
40	3.1	7.4	0.643	0.42
50	3.7	7.6	0.766	0.49
60	4.2	8.0	0.866	0.53

Risks/Errors

Mitigations | Precautions

Data Analysis

$$\begin{aligned}\text{Slope, } n, &= \frac{\text{change in } \sin i}{\text{change in } x/y} \\ &= \frac{(94 \times 0.01)}{(52 \times 0.01)} \\ &= \underline{0.94} \\ &\quad 0.52 \\ n &= \underline{1.74}\end{aligned}$$

Conclusion

∴ The refractive index, n , of the glass block is 1.74.

Recommendation

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