

6. DETERMINATION OF THE REFRACTIVE INDEX OF LIQUID'S USING HOLLOW PRISM

AIM :-

To determine the refractive index of liquid's using hollow prism.

APPARATUS REQUIRED:-

Hollow prism, liquid's whose refractive index has to found out, a wooden board fixed with white sheet, pin's.

FORMULA :-

Refractive index of the given liquid is

$$\mu = \frac{\sin i}{\sin r} = \frac{\sin \left(\frac{A + \delta_m}{2} \right)}{\sin \left(\frac{A}{2} \right)}$$

Where,

μ = refractive index of the liquid.

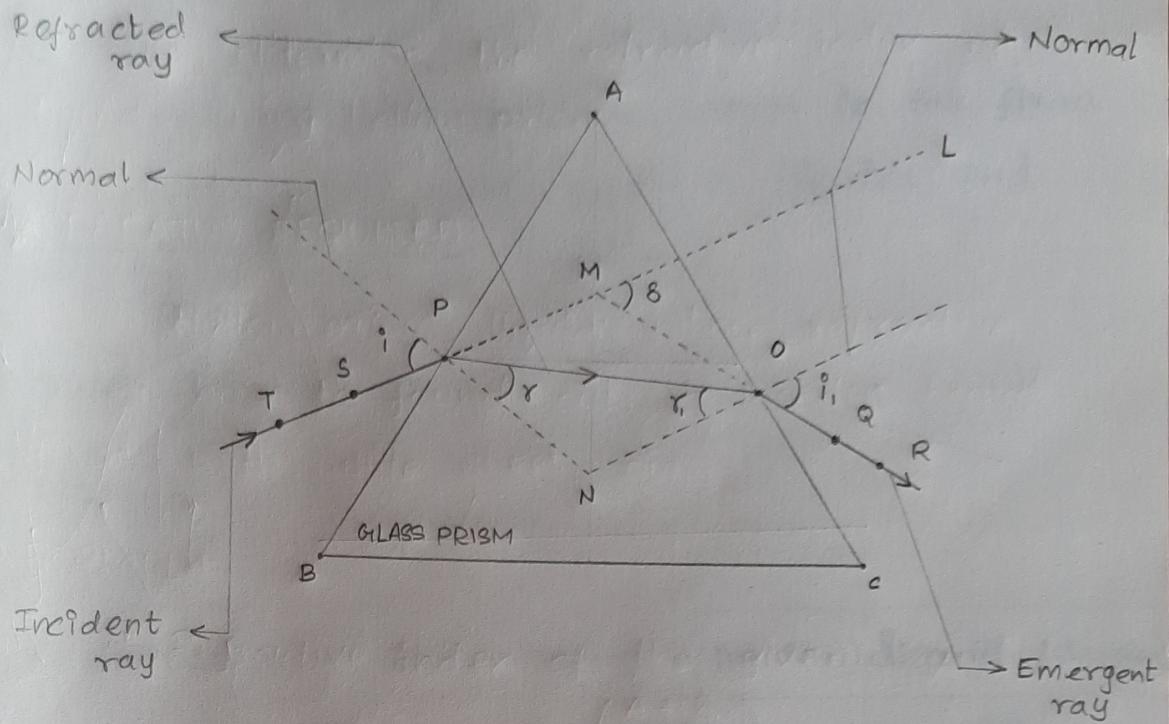
δ_m = the angle of minimum deviation.

r = angle of refraction.

i = angle of incidence.

A = angle of prism.

DIAGRAM :-



PROCEDURE :-

- * Fix a white sheet of paper on the drawing board with help of drawing pins.
- * Keep the prism and mark the outline of it as ABC.
- * Drop a normal PQ on the side AB.
- * Draw the angle of incidence in accordance with the normal PQ and place 2 pins so that they appear to be in the straight line.
- * Place the prism filled with given sample of liquid, on the marked outline ABC.

* Now, take the pins and place them on the side AC so that all the 4 pins appears to be in same line.

* Remove the prism and draw the line joining the points so obtained.

* Mark the diagram as shown in the figure.

* Repeat this with different liquids and different angle of incidence.

OBSERVATION TABLE :-

Water :-

S.NO	A° (angle of prism)	i° (angle of incidence)	d° (angle of deviation)
1	60	30	25
2	60	35	22
3	60	40	20
4	60	45	22
5	60	50	25
6	60	55	28 (23.6666)

$$\mu = \frac{\sin\left(\frac{60+22}{2}\right)}{\sin\left(\frac{60}{2}\right)} = \frac{\sin 42^\circ}{\sin 30^\circ}$$

$$\therefore M = 1.306$$

(1.3333)

S.No	A° (angle of prism)	i° (angle of incidence)	δ_m° (angle of deviation)
1.	60	30	45
2.	60	35	42
3.	60	37.5	40
4.	60	39	42
5.	60	40	45 (42.8)

Benzaldehyde:

$$\mu = \frac{\sin\left(\frac{60+40}{2}\right)}{\sin\left(\frac{60}{2}\right)} = \frac{\sin 50^\circ}{\sin 30^\circ}$$

$$\mu = 1.504 \quad \begin{aligned} \sin(50) &= 0.76604 \\ (1.53208) & \quad \sin(30) = 0.5 \end{aligned}$$

S.No	A° (angle of prism)	i° (angle of incidence)	δ_m° (angle of deviation)
1.	60	20	35
2.	60	30	30
3.	60	35	25
4.	60	40	29
5.	60	45	30 (29.4)

$$\sin(44.5) = 0.70090$$

$$\sin(30) = 0.5$$

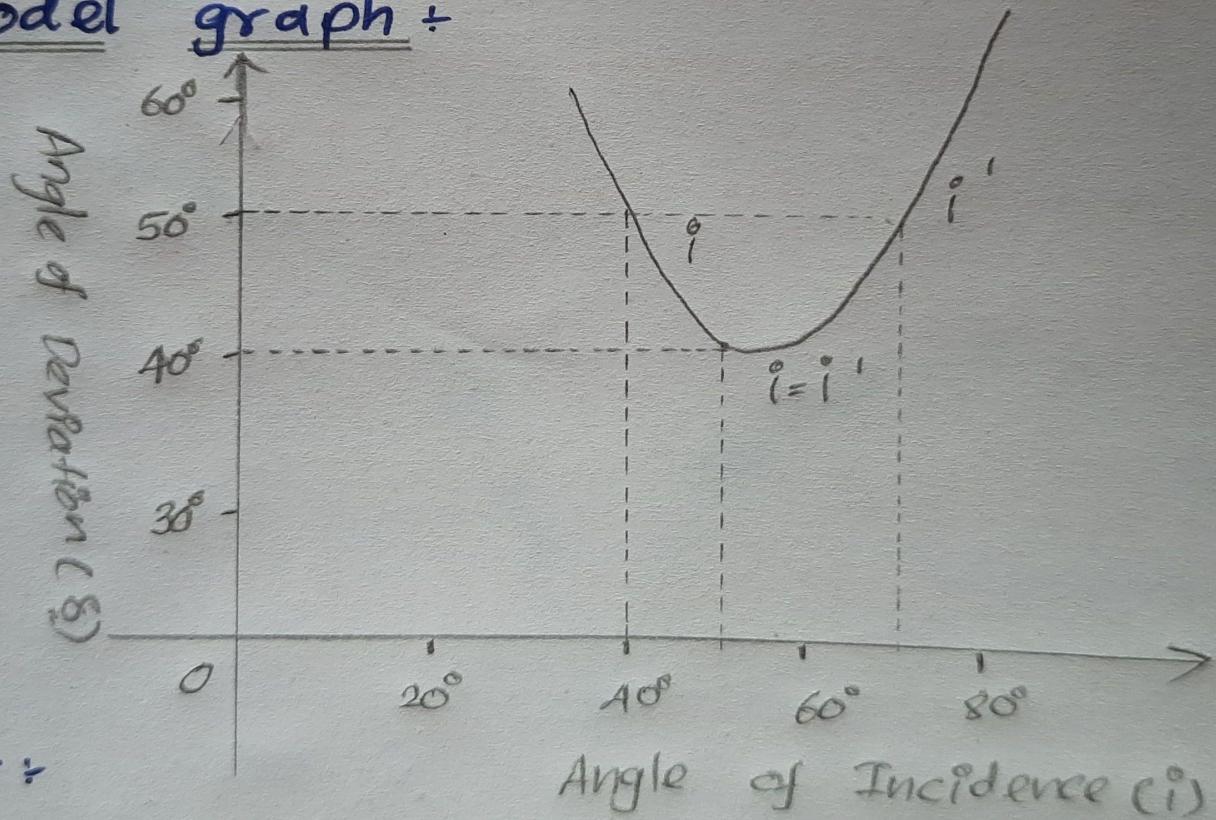
Dil. Sulphuric Acid:

$$\mu = \frac{\sin\left(\frac{60+25}{2}\right)}{\sin\left(\frac{60}{2}\right)} = \frac{\sin\left(\frac{85}{2}\right)}{\sin 30^\circ} = \frac{\sin 44.5^\circ}{\sin 30^\circ}$$

$$\mu = 1.351 \quad (1.40181)$$

GRAPH :

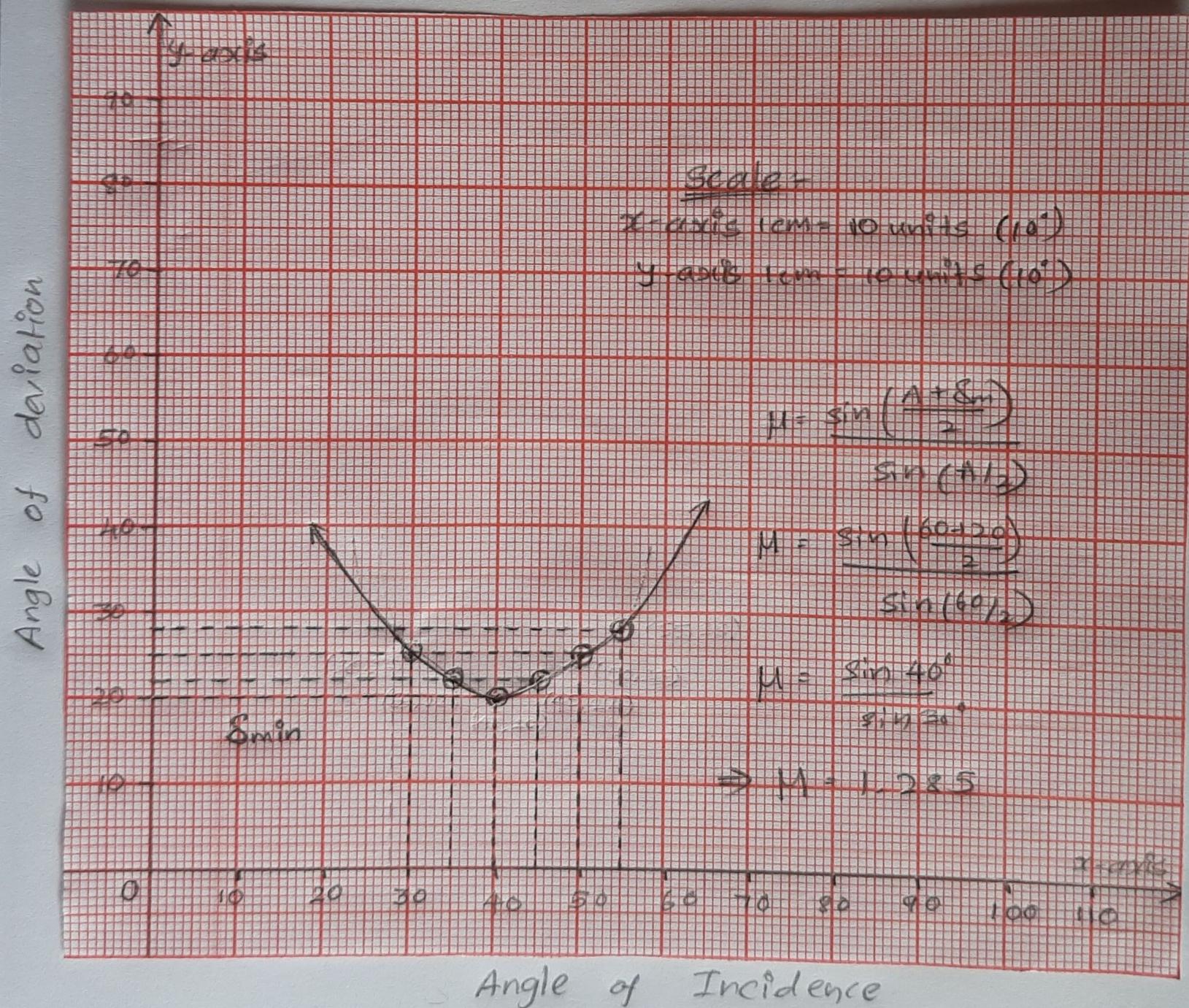
Model graph :



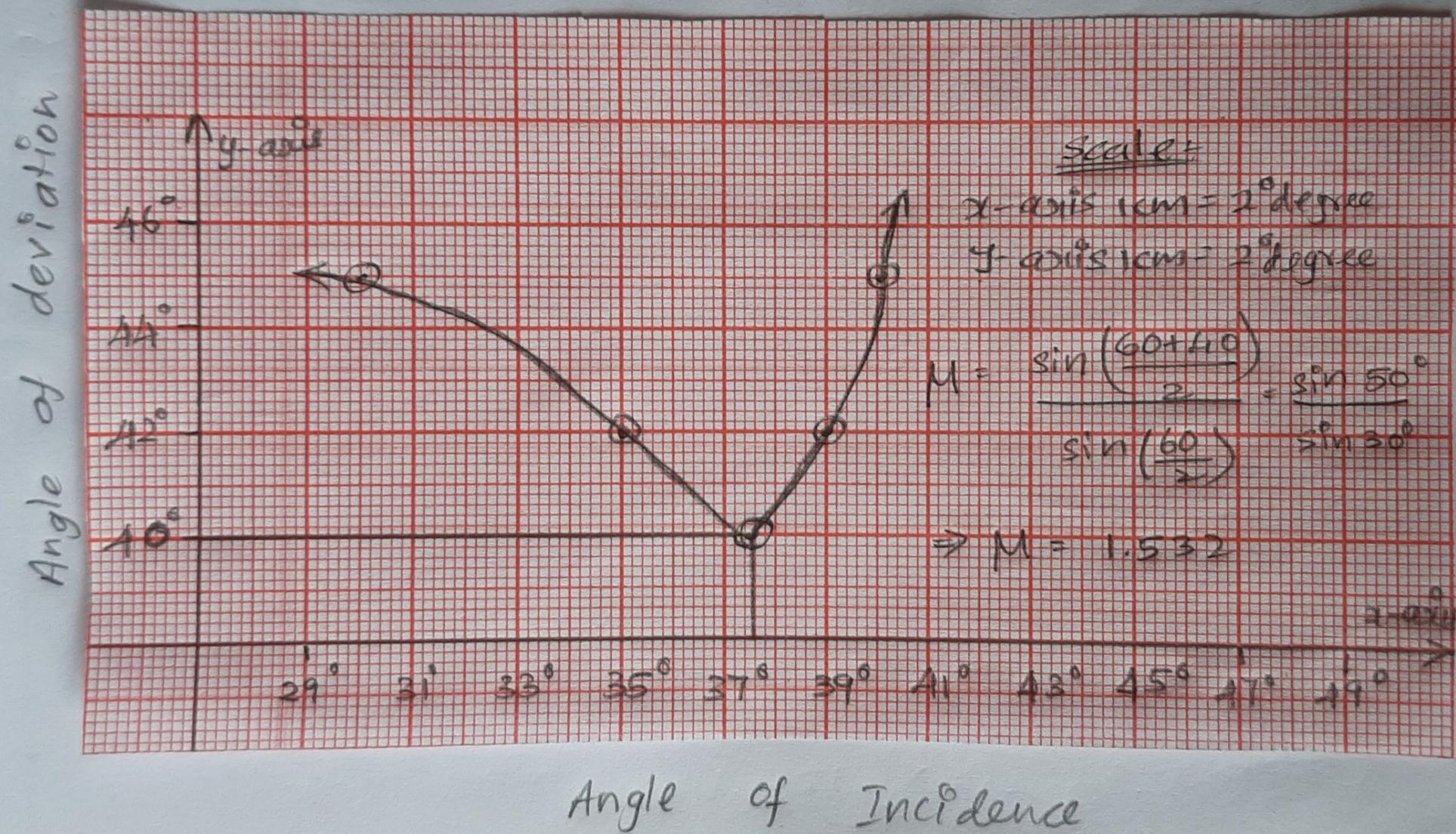
Water :

Water:

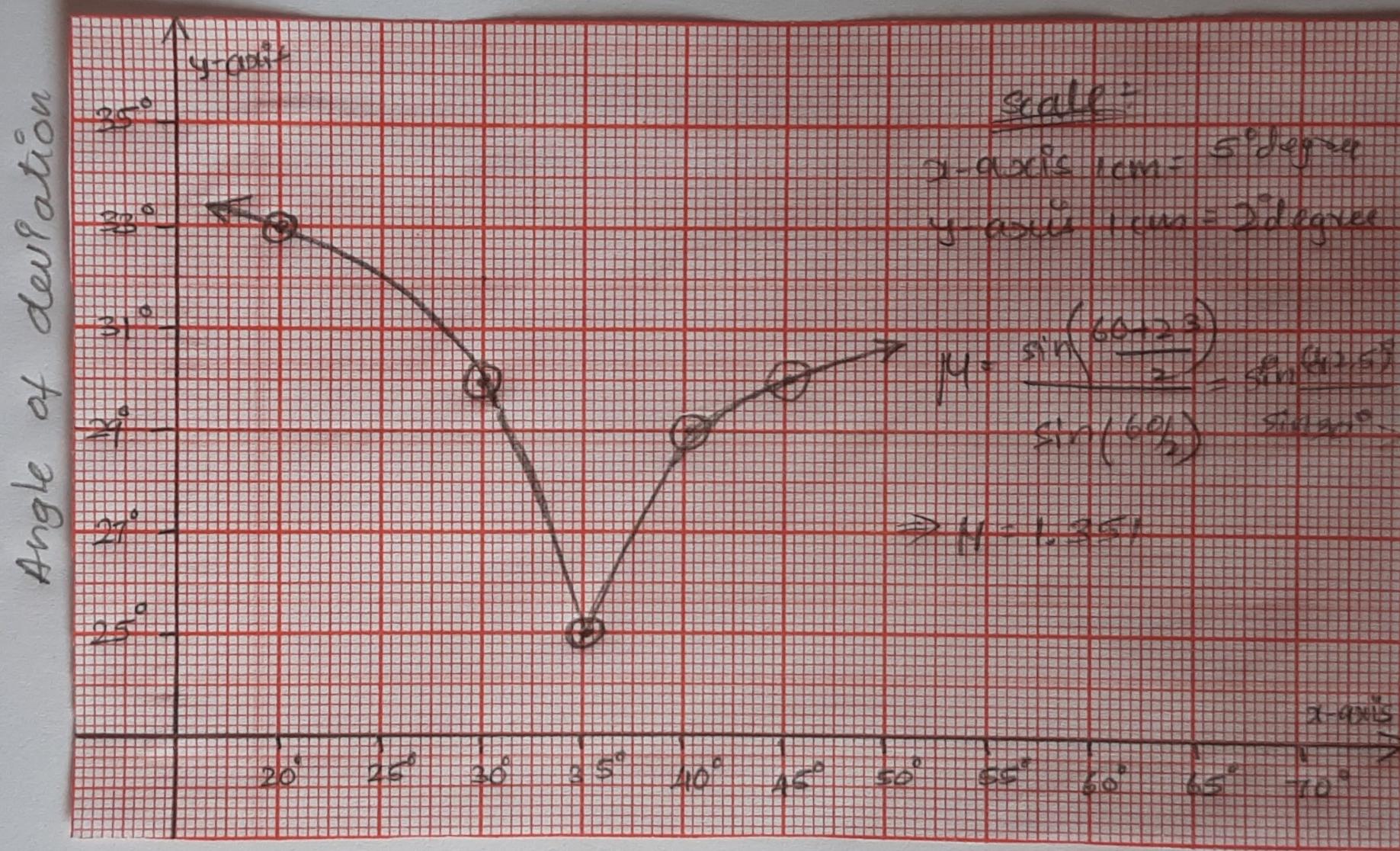
Angle of Incidence (i)



Benzaldehyde :-



Dil. Sulphuric Acid :



Angle of Incidence.

RESULT:

The refractive Index of Water = 1.306 (Graph: 1.285)

The refractive Index of benzaldehyde = 1.504 (Graph: 1.532)

The refractive Index of dil H_2SO_4 = 1.351 (Graph: 1.351)