

## Experiment - 03

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Aim:- To determine the refractive index of a glass slab by using a Travelling microscope.

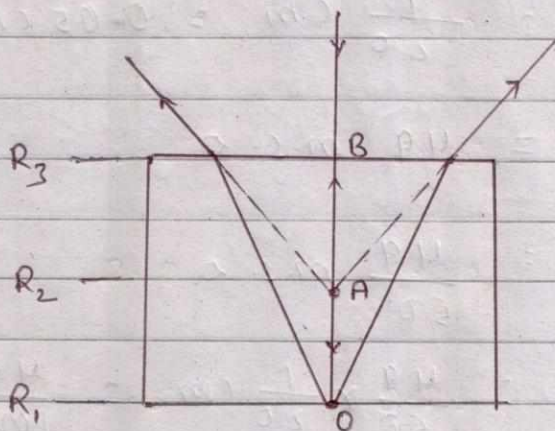
Apparatus required:

- ① Travelling microscope
- ② a glass slab
- ③ chalk powder
- ④ graph paper

Theory:

The change in direction of light when it passes from one medium to another obliquely is called refraction of light.

The ratio of the Real depth and apparent depth is called refractive index.



$$\text{Refractive index} = \mu = \frac{\text{Real depth}}{\text{apparent depth}}$$

$$= \frac{OB}{AB} = \frac{R_3 - R_1}{R_3 - R_2}$$

where,

$R_1$  = focused on graph paper without glass slab

$R_2$  = focused on graph paper with glass slab

$R_3$  = focused on chalk powder + glass slab + graph paper

Least count = The minimum reading taken by the instrument is called least count of the instrument.

Least count (L.C) = 1 main scale division (m.s.d) - 1 Vernier scale division (V.S.D)

$$20 \text{ m.s.d} = 1 \text{ cm}$$

$$\therefore 1 \text{ m.s.d} = \frac{1}{20} \text{ cm} = 0.05 \text{ cm}$$

$$50 \text{ V.S.D} = 49 \text{ m.s.d}$$

$$\therefore 1 \text{ V.S.D} = \frac{49}{50} \text{ m.s.d}$$

$$= \frac{49}{50} \times \frac{1}{20} \text{ cm} = \frac{49}{1000} \text{ cm}$$

So,

$$\text{L.C} = 1 \text{ m.s.d} - 1 \text{ V.S.D}$$

$$= \left( \frac{1}{20} - \frac{49}{1000} \right) \text{ cm}$$

$$= \frac{50 - 49}{1000} = \frac{1}{1000} \text{ cm} = 0.001 \text{ cm}$$

Observation Table :-

S.no.	Object focused on	obs. no.	m.s.d (in div.)	m.s.d (in cm)	V.S.D (in div.)	V.S.D x L.C (in cm)(B)	A+B	mean
1.	focused on graph paper without glass slab ( $R_1$ )	(i)	0	0	0	0	0	0
		(ii)	0	0	0	0	0	0
		(iii)	0	0	0	0	0	0
2.	focused on graph paper with glass slab ( $R_2$ )	(i)	12	$12 \times 0.05 = 0.60$	40	$40 \times 0.001 = 0.040$	0.640	$\frac{1.870}{3} = 0.623$
		(ii)	11	$11 \times 0.05 = 0.55$	45	$45 \times 0.001 = 0.045$	0.595	
		(iii)	12	$12 \times 0.05 = 0.60$	35	$35 \times 0.001 = 0.035$	0.635	
3.	focused on chalk powder + glass slab + graph paper ( $R_3$ )	(i)	36	$36 \times 0.05 = 1.80$	35	$35 \times 0.001 = 0.035$	1.835	$\frac{5.250}{3} = 1.750$
		(ii)	34	$34 \times 0.05 = 1.70$	25	$25 \times 0.001 = 0.025$	1.725	
		(iii)	33	$33 \times 0.05 = 1.65$	40	$40 \times 0.001 = 0.040$	1.690	

Calculation :-

$R_1 = 0, R_2 = 0.623, R_3 = 1.750$

$$\text{Now, } \mu = \frac{R_3 - R_1}{R_3 - R_2}$$

$$= \frac{1.750 - 0}{1.750 - 0.625} = \frac{1.750}{1.125}$$

$$= 1.55 \approx 1.5$$

percentage of Error :-

$$\text{Real value} = 1.50$$

$$\text{Exp. value} = 1.50$$

$$\% \text{ of Error} = \frac{\text{Real value} - \text{Exp. value}}{\text{Exp. value}} \times 100$$

$$= \frac{1.5 - 1.5}{1.5} \times 100$$

$$= 0\%$$