REFRACTIVE INDEX OF GLASS

Aim: To determine the refractive index of glass using travelling microscope.

Apparatus: Travelling microscope, a glass slab, chalk dust and paper.

Principle: If a glass slab is placed in air on horizontal surface and its bottom surface is viewed from top, it appears to be elevated due to the refraction. The distance between the apparent bottom and the top surface of the slab gives the apparent thickness of the slab. In case of normal observation, the refractive index of the glass with respect to air is the ratio of real thickness of glass slab to the apparent thickness.

Formula:

1. Total reading TR = MSR + (CVD x LC). cm

2. Refractive index of glass slab $n_g = \frac{R_3 - R_1}{R_3 - R_2}$

Where: MSR – Main scale reading

CVD – Coincide vernier scale division

LC- Least count

R_1 – travelling microscope reading when focused on object (ink mark) through air

R_2 - travelling microscope reading when focused on image when glass slab is kept on object.

R_3 – travelling microscope reading when focused on the particles on the surface of glass slab.

Procedure:

1. The least count of travelling microscope is calculated.
2. A sheet of white paper with ink mark is placed on the base of travelling microscope.
3. The microscope is adjusted to focus on the ink mark on the paper and readings are noted in vertical scale and total reading (R_1) is found using relevant formula.
4. Now glass slab is placed on the paper and the microscope is focused on the ink mark through glass slab and corresponding reading R_2 is found.
5. Some chalk dust is sprinkled on the upper surface of the glass slab the microscope is focused on chalk dust and corresponding reading R_3 is found.
6. Refractive index of glass slab is calculated using the formula $n_g = \frac{R_3 - R_1}{R_3 - R_2}$.
7. The experiment is repeated for one more trail to raise the position of glass slab and hence calculate the refractive index. Then mean refractive index is found.

Diagram:
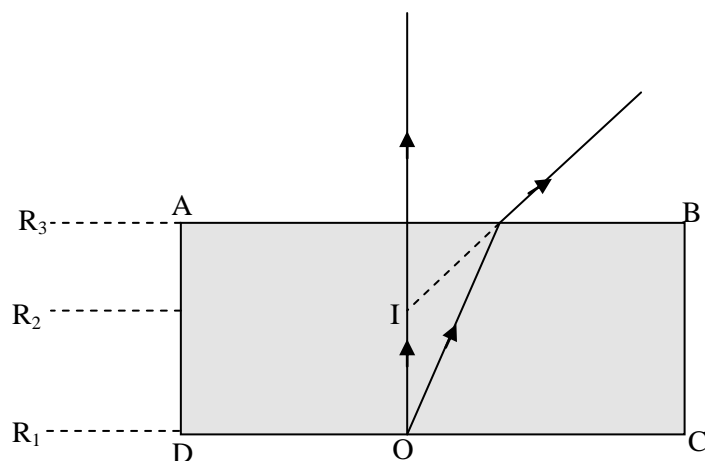
Where:

ABCD – Rectangular glass slab, O – object, I – Image

R_3 - position of the particles on glass slab, R_2 - position of the image (object seen through glass slab),

R_1 - position of the object

Observations:

The value of the 1MSD of travelling Microscope (S) = ………….cm

Total number of VSD (N) = ……………….

Least count (L C) = $\frac{The\ value\ of\ 1MSD}{Total\ no.of\ VSD}$ = _____ = $\cdots$ cm

S.No.	Travelling Microscope Reading for								
	Mark made on paper			Mark made on paper through glass slab			Particles on the top of glass surface		
	MSR in cm	CVD in div	TR in cm (R_1)	MSR in cm	CVD in div	TR in cm (R_2)	MSR in cm	CVD in div	TR in cm (R_3)
1									
2									
3									

Calculation:

Refractive index of the slab (n_g) = $\frac{Real\ thickness\ of\ the\ slab}{Apparent\ thickness\ of\ the\ slab}$

$$n_g = \frac{R_3 - R_1}{R_3 - R_2} = \frac{b}{c}$$

Result: the refractive index of glass is (n_g) = …………….

Precautions:
1. In microscope, the parallax should be properly removed
2. The microscope should be moved in upper direction only to avoid back lash error.

Sources of error:
1. The microscope scale may not be properly calibrated