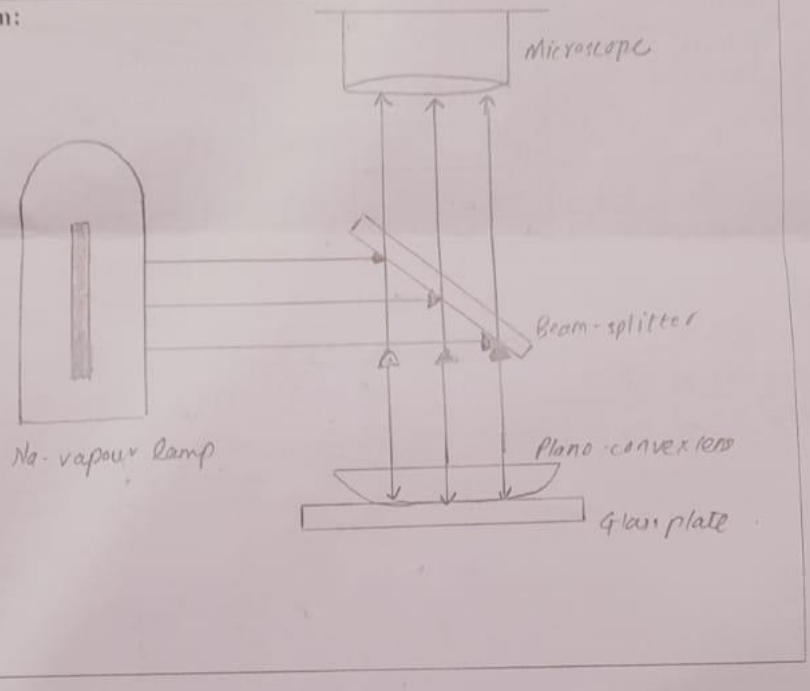
K. J. SOMAIYA COLLEGE OF ENGINEERING
(Autonomous College Affiliated to University of Mumbai)

Meet Gala

Expt. No		Newton's Rings		Date:	10/05/2022
Batch:	A3	Roll No:	16010121051		
CO 4: [illegible]				(Marks & Signature of Faculty in-c)	

Aim:	To determine radius of curvature of plano-convex lens
Apparatus:	Newton's rings set-up (glass plate, plano-convex lens, beam-splitter, black box), monochromatic source (Na-vapour lamp), travelling microscope

Diagram:



Procedure

1) Arrange apparatus as shown in the diagram. Wait until the Na-vapour lamp turns bright yellow. Observe through the microscope and adjust focus to get a clear Newton's rings interference pattern (alternate dark/bright rings).
2) First, adjust crosswire on the centre of the pattern. The central spot is taken as n = 0 and for the innermost dark ring, n = 1. Shift crosswire towards left side of the pattern and count the number of dark rings. Get the crosswire at the 12th dark ring so that the vertical crosswire is tangential to it. Note down the travelling microscope reading at this position.

3) Now shift the crosswire towards centre of the pattern and adjust it at the 10th dark ring. Follow step 2. Continue this procedure for inner dark rings by skipping one dark ring in-between until you complete reading for 2nd dark ring on the left side of central spot.
4) After this, continue shifting the crosswire in same direction (from left to right) so that it moves on the right side of central spot. Adjust the crosswire tangential to 2nd dark ring on right side of pattern and note down the reading. Continue readings in this manner for outer dark rings by skipping one dark ring in-between until you complete reading for 12th dark ring on the right side of central spot.
5) Difference between two readings (i.e. on left and right) for the same ring number will be the diameter (D_n) of that ring. Find diameters of all rings.

Observations:

L. C. of Travelling Microscope: 0.001 cm

Sr. No	n	Micrometer reading (cm)						D_n (cm)	$*D_n^2$ (cm^2) x 10^{-2}
		L (on left)			R (on right)				
		MSR	VR	TR_L	MSR	VR	TR_R	$TR_R - TR_L$	
1	12	6.15	LC×VD 0.019	6.169	5.75	0.001	5.751	0.418	0.174×10^{-2}
2	10	6.1	0.015	6.115	5.80	0.015	5.815	0.3	0.09×10^{-2}
3	8	6.1	0.03	6.13	5.80	0.025	5.825	0.305	0.093×10^{-2}
4	6	6.05	0.01	6.06	5.80	0.008	5.808	0.252	0.064×10^{-2}
5	4	6.05	0.006	6.056	5.85	0.014	5.864	0.192	0.037×10^{-2}
6	2	6	0.027	6.027	5.9	0.037	5.937	0.09	0.081×10^{-2}

*Write values after taking 10^{-2} factor common.
MSR: Main Scale Reading, VSR: Vernier Reading, TR: Total Reading

Formula:

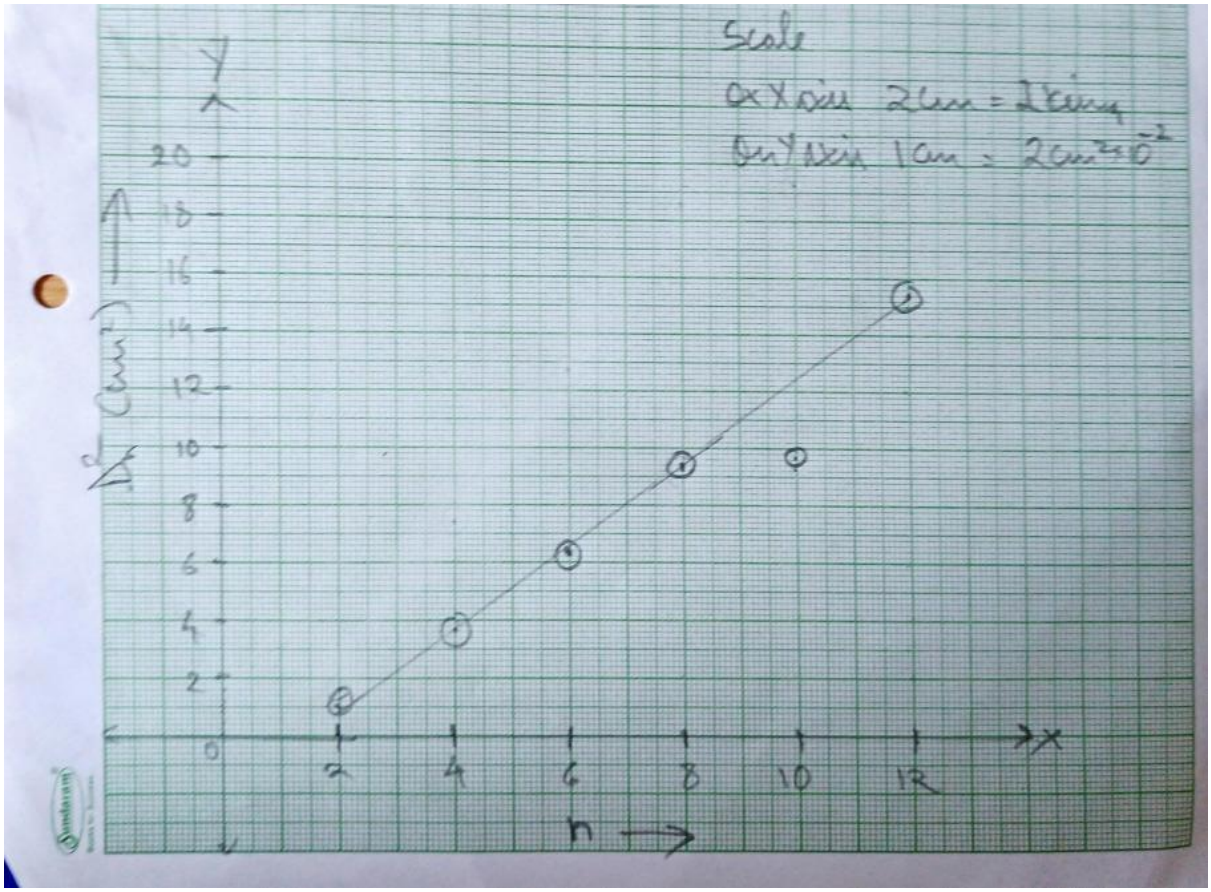
$D_n = TR(L) \sim TR(R)$

(~ means difference i.e greater - smaller)

$R = \frac{\text{slope}}{4\lambda}$

Symbols:

D_n = Diameter of dark ring number n
TR = Total reading on Travelling microscope
L&R => Left and Right side of central spot
R => Radius of curvature of lens
λ => Wavelength of monochromatic light.


Scale
On X axis 2cm = 2 units
On Y axis 1cm = 2cm^{-2}
Y
20
18
16
14
12
10
8
6
4
2
0
d (cm)
Δ
2
4
6
8
10
12
X
n

Data:

Wavelength of light λ	5893 A°

Slope:

Plot of D_n^2 vs n	1.67×10^{-2}

Calculations:

$$\text{slope} = \frac{(17.49 - 0.81) \times 10^{-2}}{10}$$

$$= 1.67 \times 10^{-2} \text{ cm}^2$$

$$R = \frac{1.67 \times 10^{-2}}{4\lambda} = \frac{1.67 \times 10^{-2}}{4 \times 5893 \times 10^{-8}}$$

$$= 70.67 \text{ cm}$$

Results:
Radius of curvature of lens: 0.7 m

Further Work:
Determination of refractive index of liquids using Newton's rings experiment.