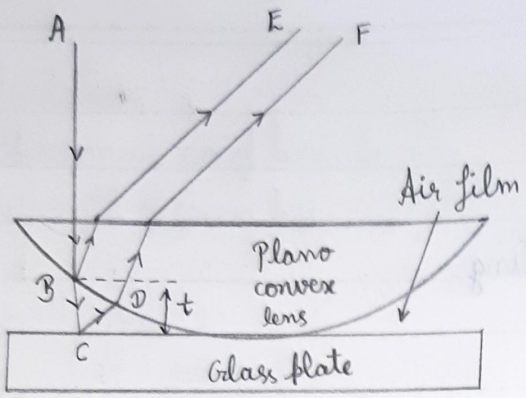


Schematic diagram of light ray in Newton's ring

Observations:

Ring no. (n)	LHS readings			RHS readings			D = b - a (cm)	D^2 (cm^2)
	MSR	VSR	Total (a)	MSR	VSR	Total (b)		
2	2.30	27	2.327	2.55	18	2.568	0.241	0.058
4	2.30	0	2.3	2.60	13	2.613	0.313	0.098
6	2.25	15	2.265	2.60	42	2.642	0.377	0.142
8	2.20	38	2.238	2.65	24	2.674	0.436	0.190
10	2.20	14	2.214	2.70	0	2.70	0.486	0.236
12	2.15	37	2.187	2.70	20	2.72	0.533	0.284
14	2.15	18	2.168	2.70	41	2.741	0.573	0.328
16	2.15	0	2.15	2.75	12	2.762	0.612	0.375
18	2.10	14	2.114	2.75	13	2.763	0.649	0.421
20	2.10	37	2.137	2.80	19	2.819	0.682	0.465

Calculations:

Radius of curvature of lens, R = 100 cm

$D_{20}^2 = 0.465124\ cm^2$,, $D_2^2 = 0.058081\ cm^2$

Experiment 5.

Aim:
To determine the wavelength of sodium light by newton's ring.

Apparatus:
Monochromatic light, mount, plano convex lens, travelling microscope.

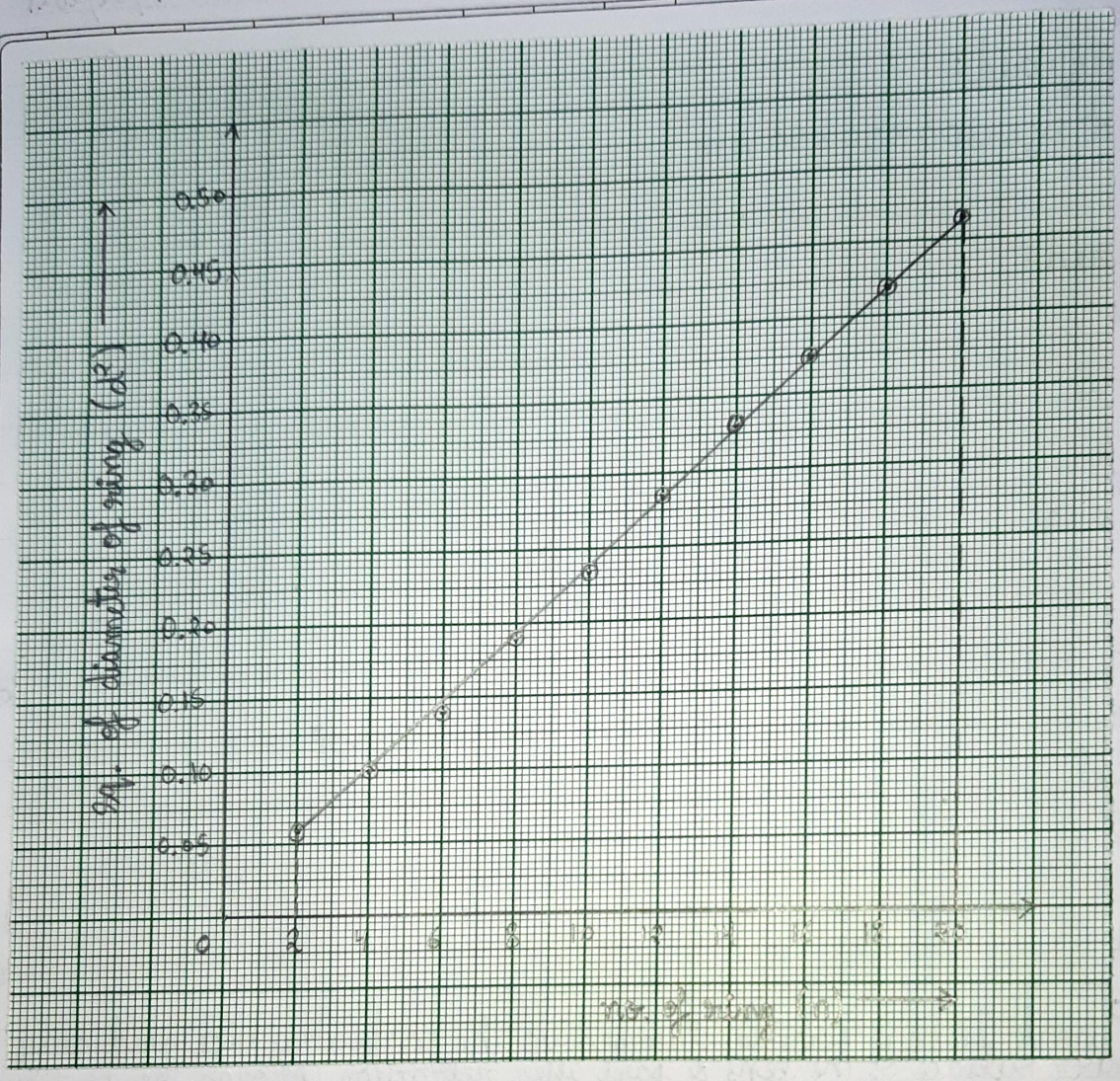
Theory:
The phenomenon of Newton's rings is named after the scientist Sir Issac Newton, is an interference pattern caused by the reflection of light between 2 surfaces,
(i) A spherical surface.
(ii) An adjacent flat surface.

When the beam of monochromatic light is incident normally on a combination of plano convex lens & a glass plate, a part of each incident ray is reflected from the lower surface of the lens & part after refraction through the air film between the lens & the plate is reflected back from the plane surface. These 2 reflected rays are coherent & as the lens is symmetric along its axis as well as the thickness is constant along the circumference of a ring of a given radius, hence will interfere & produce a system of alternate dark and bright circular rings.

Formula used:
Wavelength, $\lambda = \frac{D_m^2 - D_n^2}{m-n} \times \frac{1}{4R}$

where, R is radius of curvature of plano convex lens.

Teacher's Signature : ----------



Slope of graph, $\alpha = \frac{D_{20}^2 - D_2^2}{20-2} = \frac{0.407043}{18}$

Wavelength of sodium light, $\lambda = \frac{\alpha}{4R} = \frac{0.407043}{4 \times 18 \times 100} \simeq 5653.4\ \text{Å}$

Standard value, $\lambda_0 = 5890\ \text{Å}$

Percentage error $= \frac{5890 - 5653.4}{5890} \times 100 \simeq 4.017\ \%$

Least count of microscope:

Main scale has 20 divisions between 1 cm & vernier scale has 50 divisions.

Least Count, LC = $\left[\frac{1}{20}\right]\frac{1}{50} = 10^{-3}$ cm = 0.001 cm

Procedure:

1. Click on the "light on" button.
2. Select the lens of desirable radius (100 cm).
3. Adjust the microscope position to view Newton's rings.
4. Focus the microscope to view rings clearly.
5. Fix the cross wire on 20th ring either from right or left of centre dark ring.
6. Move the cross wire & take reading of 18th, 16th, ..., 2nd ring.
7. Take readings on ring on either side of centre dark ring.
8. Calculate the wavelength of source using the readings.

Results:

Wavelength of light from source = 5653.4 Å (observed value)

Percentage error = 4.017 %

Precautions and Sources of errors:

1. Glass plate and lens should be clean thoroughly.
2. The lens used should be of large radius of curvature.
3. The source of light used should be an extended one.
4. Before measuring the diameter of rings, range of microscope should adjusted.
5. Crosswire should be focused on bright ring tangentially.
6. Radius of curvature should be measured accurately.