PHYSICS PRACTICAL SHEETS

Date 09-03-2023 ..... KU ..... CAMPUS
Class CE
Roll No. 25
Shift Morning
Object of the Experiment (Block Letter) 09-03-2023

Experiment No. 2
Group I
Sub. Physics
Set

DETERMINATION OF THE WAVELENGTH OF SODIUM LIGHT USING NEWTON'S RING APPARATUS

Apparatus Required:

i) A travelling microscope
ii) Sodium lamp
iii) Newton's rings apparatus
iv) A spherometer
v) A convex lens of small focal length.

Theory:

Circular interference fringes produced by enclosing a thin air film of varying thickness between the surface of convex lens of large radius of curvature and a plane glass plate are known as Newton's rings. The wavelength of monochromatic light which produces these rings by

$$\lambda = \frac{D_n^2 - D_m^2}{4R(n-m)}.$$

where, R = radius of curvature of surface of plane convex lens in contact with the glass plate.

D_n and D_m are diameters of n^{th} and m^{th} dark/bright rings.

Observations:

Least count of main scale = 0.1 cm

No. of vernier scale division = 100

Vernier constant (V.C) = $\frac{0.1}{100}$ = 0.001 cm

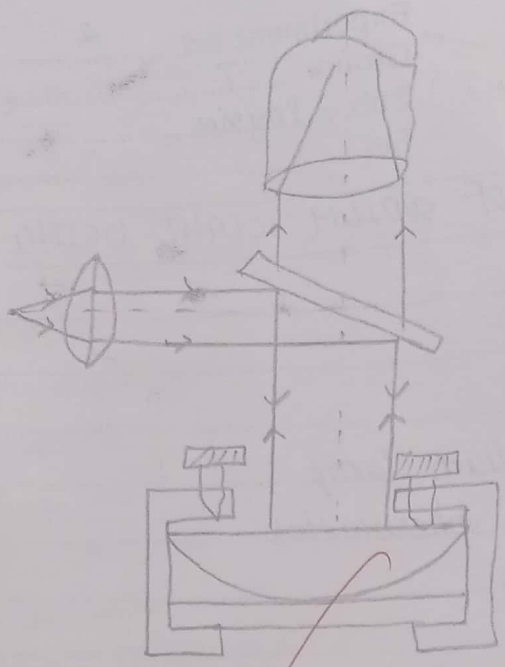

Fig: Schematic diagram of Newton's ring apparatus

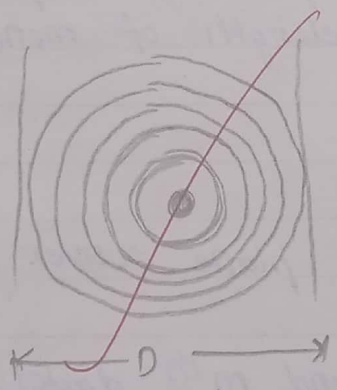

fig: Newton's rings.

Table for diameter of the Newton's ring

No. of obs	Ring No	Microscope reading Left	Microscope reading Right	Diameter	Microscope Read. Left	Microscope Read. Right	Diameter	Mean
1	20	4.330	3.330	1	3.335	4.328	0.993	0.99
2	16	4.279	3.040	0874	3.385	4.280	0.895	0.887
3	12	4.222	3.45	0.712	3.442	4.222	0.780	0.776
4	8	4.154	3.52	0.634	3.511	4.155	0.644	0.639
5	4	4.069	3.61	0.459	3.591	4.070	0.479	0.469

Result:

The radius of curvature R of plano-convex lens $(R) = \frac{a^2}{6h} + \frac{h}{2}$

$= 260$ cm

The wavelength λ obtained from $D_{20}, D_{12} = 4.709 \times 10^{-5}$ cm

The wavelength λ obtained from $D_{16}, D_8 = 4.643 \times 10^{-5}$ cm

The wavelength λ obtained from $D_{12}, D_4 = 4.649 \times 10^{-5}$ cm

The wavelength of sodium light is found to be

$= 4.649 \times 10^{-5}$ cm

$$\% \text{ error} = \left| \frac{5.8 \times 10^{-5} - 4.649 \times 10^{-5}}{5.8 \times 10^{-5}} \right| \times 100\%$$

$= 19.84\%$.

Precautions:

(i) The glass plate and lens must be cleaned properly.

ii) The lens must have larger radius of curvature.

iii) The amount of light from the source should be adjusted for maximum visibility.