EXPERIMENT NO.-

OBJECT
To determine the wavelength of sodium light by Newton’s ring.

APPARATUS
A Plane-convex lens of large radius of curvature, traveling microscope, optical arrangement for Newton’s rings, sodium lamp and a spherometer.

DIAGRAM

FORMULA
The mean wavelength of D1 and D2 lines of sodium light is given by the formula:

$$\lambda = \frac{\left[(D_{n+p})^2-(D_n)^2\right]}{4 \, p \, R}$$

Here \(D_{n+p}\) = diameter of the \((n+p)\)th ring

\(D_n\) = diameter of the \(n\)th ring

\(n \& p\) = integer numbers
R=radius of curvature of the curved surface of the lens.

Again,

\[ R = \left( \frac{l^2}{6h} \right) + \frac{h}{2} \]

Where,

l =distance between the two legs of the spherometer.

h =difference of the readings of the spherometer on plane surface and curved surface of the lens.

**PROCEDURE**

1.) The glass plate G in the Newton’s ring apparatus is set such that it makes an angle of 45° with the direction of incident light from the source and reflects the light on the lens.

2.) The plane convex lens is placed below the microscope with its plane surface upwards. This can be judged by gently striking the edge of the plano-convex lens with the finger.

3.) The microscope is moved in the vertical direction by means of rack and pinion arrangements till the the rings are seen distinctly.

4.) The centre of the fringes is brought symmetrically below the cross wires by adjusting the position of the lens and the microscope.

5.) The microscope is moved in horizontal direction to one side of the fringes such that one of the cross wires becomes tangential to the 18th ring. The reading on scale is noted.

6.) The microscope is moved and the cross wire is successively made tangential to the 16th, 14th, and so on till the 18th ring on the other side is reached. The reading on the scale for all these position is noted.

7.) The observations are not taken on the first two or three rings which are wide enough.

8.) The radius of the curvature of the curved surface of the plano-convex lens is determined using spherometer. The observations with the spherometer are first taken on the curved surface and then on the plane surface.

9.) The spherometer is then placed on the notebook and gently pressed to obtain the impression of the three legs of the spherometer. The three points are joined and mean distance between the legs is determined.

**OBSERVATIONS**

(A) Table for determination of the diameter of Newton’s ring:

Least count of the microscope = cm.
### Microscope reading

<table>
<thead>
<tr>
<th>S.No.</th>
<th>No. of the ring</th>
<th>Microscope reading</th>
<th>Diameter</th>
<th>Mean value of $\left( D_{n+p}\right)^2 - D_n^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>One end (a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>M.S.</td>
<td>V.S.</td>
<td>Total</td>
</tr>
<tr>
<td>1</td>
<td>18</td>
<td>M.S.</td>
<td>V.S.</td>
<td>Total</td>
</tr>
<tr>
<td>2</td>
<td>16</td>
<td>M.S.</td>
<td>V.S.</td>
<td>Total</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>M.S.</td>
<td>V.S.</td>
<td>Total</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>M.S.</td>
<td>V.S.</td>
<td>Total</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>M.S.</td>
<td>V.S.</td>
<td>Total</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>M.S.</td>
<td>V.S.</td>
<td>Total</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>M.S.</td>
<td>V.S.</td>
<td>Total</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>M.S.</td>
<td>V.S.</td>
<td>Total</td>
</tr>
</tbody>
</table>

Mean value of $\left( D_{n+p}\right)^2 - D_n^2$ = ……………………. for $p = 8$

(B) Observation table for the determination of $h$

Pitch of the screw = ……………… cm
No of divisions of the spherometer = ……………… cm
Least count of the spherometer = ……………… cm

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Spherometer reading</th>
<th>h=b-a</th>
<th>Mean h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Zero reading on plane surface (a)</td>
<td>Reading on curved surface (b)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M.S.</td>
<td>C.S.</td>
<td>T</td>
</tr>
<tr>
<td>1</td>
<td>M.S.</td>
<td>C.S.</td>
<td>T</td>
</tr>
<tr>
<td>2</td>
<td>M.S.</td>
<td>C.S.</td>
<td>T</td>
</tr>
<tr>
<td>3</td>
<td>M.S.</td>
<td>C.S.</td>
<td>T</td>
</tr>
</tbody>
</table>

Calculations
1. $l = …………. cm$; $h = …………. cm$
   \[ R = …………. cm \]

2. Mean $(D_{n+p})^2 - (D_n)^2 = …………. cm^2$
   \[ R = …………. cm; p = _; \]
**Result**

Mean wavelength of sodium light = \( A^\circ \)

Standard value = 5893 \( A^\circ \)

Percentage error =

**Precautions**

1. The cross wire should be focused tangentially on the bright rings.

2. The microscope must be moved in uni-direction when taking readings.