OBJECTIVE - To determine the wavelength of sodium light by Newton's rings apparatus

APPARATUS - One plano-convex lens of large radius of curvature, plane glass plate, optical arrangement for Newton's rings, sodium lamp and travelling microscope, spherometer.

WORKING FORMULA - In Newton's ring experiment, when a plano-convex lens is placed in contact with a plane surface a thin air film is formed at the interface, fringes of equal thickness are formed.

Wavelength is given by:
\[
\lambda = \frac{D_{mn}^2 - D_m^2}{4nR}
\]

where \(D_{mn}\) = Diameter of \((m+n)\)th ring
\(D_m\) = Diameter of \(m\)th ring
\(n\) = Difference in order bw \((m+n)\)th and \(m\)th rings
\(R\) = Radius of curvature of lens

Radius of curvature of lens with spherometer is given by:
\[
R = \frac{a^2 + h}{6h}
\]

CALCULATIONS - Radius of curvature of lens
\[
R = \frac{a^2 + h}{6h} = \frac{7.5^2 + 0.038}{6 \times 0.038} = 57.115
\]

The wavelength of sodium light
\[
\lambda = \frac{D_{mn}^2 - D_m^2}{4nR} = \frac{668 \text{ A}^0}{4 \times 5 \times 1.115} = 0.19 \text{ A}^0 = 668 \text{ A}^0
\]
No. of divisions on the circular scale \( N \) = 100

Pitch of the screw \( p \) =

Least count of spherometer = 0.01 mm = 0.001 cm

Distance between the two legs of spherometer \( l \) = 3 cm

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Spherometer Reading</th>
<th>( l = b-a ) (mm)</th>
<th>Mean (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reading on plane surface</td>
<td>Reading on lens</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.1</td>
<td>0.101</td>
<td>0.16</td>
</tr>
</tbody>
</table>

RESULTS - The mean wavelength \( \lambda \) of sodium light = 589.6 \( \AA \)  
Standard mean wavelength of sodium light =  

PRECAUTIONS - 1. Glass plate and lens should be cleaned 
2. The lens used should be of large radius of curvature. 
3. An extended source of light should be used. 
4. Radius of curvature should be measured accurately.
**Observations:** Volume of water required for 20% solution = 80 cc

- Length of polarization tube = 2 dm = 20 cm
- Least count of the vernier scale = 0.1°

**For distilled water**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Position 1</th>
<th>Angular Reading</th>
<th>Position 2 (after rot. of 180°)</th>
<th>Total V₂</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C.S.R</td>
<td>V.S.R</td>
<td>Total V₁</td>
<td>C.S.R</td>
</tr>
<tr>
<td>1. Y/Y</td>
<td>298</td>
<td>9</td>
<td>298.9</td>
<td>122</td>
</tr>
<tr>
<td>2. B/P</td>
<td>198</td>
<td>2</td>
<td>198.2</td>
<td>19</td>
</tr>
</tbody>
</table>

**For 20% solution**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Position 1</th>
<th>Angular Reading</th>
<th>Position 2 (after rot. 180°)</th>
<th>Total V₂</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C.S.R</td>
<td>V.S.R</td>
<td>Total V₁</td>
<td>C.S.R</td>
</tr>
<tr>
<td>1. Y/Y</td>
<td>223</td>
<td>8</td>
<td>223.8</td>
<td>145</td>
</tr>
<tr>
<td>2. B/P</td>
<td>224</td>
<td>1</td>
<td>224.1</td>
<td>146</td>
</tr>
</tbody>
</table>

Calculations: Concentration of 20% solution in gm/cc = \( \frac{20}{100} = 0.2 \text{gm/cc} \)