

Experiment - 6Aim :

To find the refractive index of given liquid using Newton's ring set up.

Apparatus :

monochromatic source of light, plano-convex lens, convex lens, travelling microscope.

Theory :

When light is incident on such a film, a small portion gets reflected from the upper surface and a major portion is transmitted into the film. The reflected beams reunite to produce interference.

for air,

$$D_{m+p}^2 - D_m^2 = 4p\lambda R$$

for liquids,

$$D_{m+p}^2 - D_m^2 = \frac{4p\lambda R}{\mu}$$

Refractive index of the given liquid can be given by,

$$\mu = \frac{D_{m+p}^2 - D_m^2}{D_{m+p}^2 - D_m^2}$$

Observation Table :

(I) Air

Order of Ring	Readings.		Diameter ² D ²	D _{ntp} ² - D _m ²
	Left	Right		
2	2.352	2.556	0.0416	-
4	2.310	2.602	0.0852	0.0436
6	2.278	2.632	0.1253	0.0837
8	2.252	2.660	0.1664	0.1248
10	2.228	2.684	0.2079	0.1663
12	2.205	2.712	0.2570	0.2154
14	2.190	2.734	0.2959	0.2543

(II) Water

Order of Ring	Readings		Diameter ² D ²	D _{ntp} ² - D _m ²
	Left	Right		
1	2.35	2.47	0.044	-
4	2.30	2.53	0.0529	0.0385
8	2.21	2.58	0.1369	0.1225
12	2.19	2.62	0.1849	0.1705
16	2.15	2.65	0.2500	0.2356
20	2.10	2.69	0.3481	0.3337

Procedure :

1. Click on light button and select lens of desirable radius.
2. Adjust the microscope position to view Newton's Rings.
3. Focus microscope to view rings clearly.
4. Fix the crosswire on the ring either from left or right of the centre dark rings and take the readings.
5. Move the crosswire and take reading for other rings.
6. Take the reading from either side of the centre dark ring.

Observations:

LC

One main scale division = $\frac{1}{20}$

Number of divisions on vernier = 50

Least Count = $\frac{1}{20} \times \frac{1}{50} = \frac{1}{1000} = 0.001$

Result :

refractive index of given liquid is 1.301.

Calculations :

D _{air}	D _{water}	$\eta = \frac{D_{air}}{D_{water}}$
0.0675	0.0385	1.7532
0.1375	0.1225	1.1224
0.2275	0.1705	1.3343
0.3024	0.2356	1.2855
0.3375	0.3937	1.0114

$$\eta_{mean} = 1.301$$