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ECE – A

Physics: Electromagnetic Theory, Quantum Mechanics, Waves and Optics- 18PYB101J

EXPERIMENT - 9

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DETERMINATION OF WAVELENGTH OF MONOCHROMATIC LIGHT USING NEWTON'S RING.

AIM:

To determine the wavelength of monochromatic light using Newtons ring method.

APPARATUS:

Travelling microscope, glass plate, Convex lens, monochromatic light.

FORMULA:

$$\lambda = \frac{r_{n+m}^2 - r_n^2}{mR} \text{ meter.}$$

OBSERVATIONS:

Radius of Curvature of the given lens - $R = 1m$.
Order of the ring $m = 12$.

CALCULATIONS:

$cm = 10^{-2} m$
$(cm)^2 = 10^{-4} m^2$

1. N ; $r = 0.065$ cm
   $r^2 = 0.00425$ cm^2

2. N+3 ; $r = 0.101$ cm
   $r^2 = 0.0102$ cm^2

3. N+6 ; $r = 0.148$ cm
   $r^2 = 0.0219$ cm^2

4. N+12 ; $r = 0.25$ cm
   $r^2 = 0.0625$ cm^2

5. N+15 ; $r = 0.279$ cm
   $r^2 = 0.0779$ cm^2.

6. N+21 $r = 0.325$ cm
   $r^2 = 0.1056$ cm^2.

Finding $r_{n+12}^2 - r_n^2$.

1. N; $\rightarrow N+12$ $\quad 0.0625 - 0.004225 = 0.0583 \times 10^{-4}\ m^2$

2. N+3; $\rightarrow N+15$ $\quad 0.0779 - 0.0102 = 0.0677 \times 10^{-4}\ m^2$

3. N+6; $\rightarrow N+18$ $\quad 0.1049 - 0.0219 = 0.083 \times 10^{-4}\ m^2$

4. N+9; $\rightarrow N+21$ $\quad 0.1056 - 0.0388 = 0.0668 \times 10^{-4}\ m^2$

$$\text{Mean } (r_{n+12})^2 - r_n^2 = \frac{0.0583 + 0.0677 + 0.083 + 0.0668}{4}$$

$$= 0.06895 \times 10^{-4}\ m^2$$

$$\text{Wave length } (\lambda) = \frac{(r_{n+12})^2 - r_n^2}{mR}$$

$$= \frac{0.06895 \times 10^{-4}}{12}$$

$$= 5.7458 \times 10^{-7}\ m$$

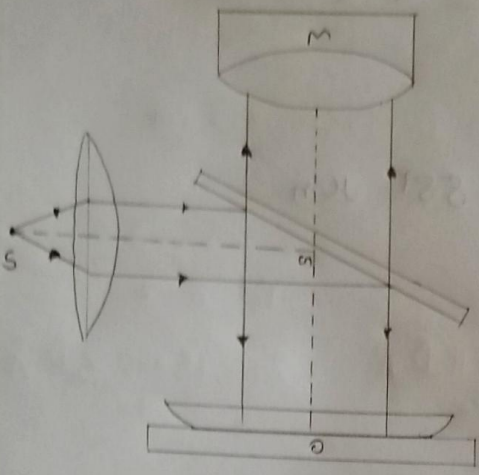
(or)

$$\lambda = 5745\ \text{Å}$$

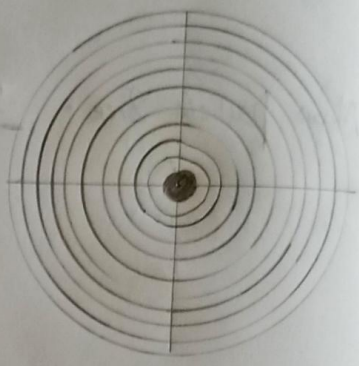
RESULT:

Wave length of the monochromatic light = 5745 Å.

DETERMINATION OF WAVELENGTH OF MONOCHROMATIC LIGHT USING NEWTONS RING



Newtons Ring Set up



Newtons Ring

Table to find wave length

Order of the Ring (N)	Microscopic Reading Left	Right	Diameter of the Ring (cm)	Radius of the Ring cm	$r^2 \times 10^{-4}$ $(cm)^2$	$r_{n+12}^2 - r_n^2$ (cm^2)	
N	5.652	5.755	0.13	0.065	0.004225		
N+3	5.605	5.807	0.202	0.101	0.0102		
N+6	5.554	5.851	0.297	0.148	0.0219		
N+9	5.509	5.903	0.394	0.197	0.0388		
N+12	5.455	5.955	0.5	0.25	0.0625	0.0583	5745 Å
N+15	5.408	5.966	0.558	0.279	0.0779	0.0677	
N+18	5.398	6.045	0.647	0.3234	0.1049	0.083	
N+21	5.353	6.003	0.65	0.325	0.1056	0.0668	
					Mean	0.06895	