ASHOKA
Date:
Page No.

Experiment No. - 3

Diffraction Grating

Aim -

1. To determine the number of lines per millimeter of the grating using the green line of the mercury spectrum.

2. To calculate the wavelength of the other prominent lines of mercury by normal incidence method.

Formulas used -

$d \sin\theta_n = n\lambda$ (Grating Equation)

Where
- n = order number
- θ_n = fringe angle.
- λ = wavelength of light.
- d = slit distance

Least Count -

$LC = (1 - MSD/VSD) \times$ value of 1 small division.

- LC = least Count
- MSD = Main Scale Division
- VSD = Virtual Scale Division

Observations & Calculations -

ASHOKA
Date:
Page No.

To standardize grating:

Color	Wave-length (λ)	Order (n)	Vernier 1 Left (L_1)	Vernier 1 Right (R_1)	$\theta = (R_1 - L_1)/2$ (degrees)	Vernier 2 Left (L_2)	Vernier 2 Right (R_2)	$\theta = (R_2 - L_2)/2$ (degrees)	Mean θ $(\theta_1 + \theta_2)/2$	$N = \sin\theta/\lambda$ (lines/nm)
Green	546	1	341.5	19.05	$\frac{37.55}{2} = 18.8°$	160.35	19.9	$\frac{38.65}{2} = 19.32°$	19.06°	5.98×10^{-4}

Table 1 - To find grating constant

Grating Constant $= 5.98 \times 10^{-4}$ lines/nm

To find wavelength

Color	Vernier 1 Left (L_1)	Vernier 1 Right (R_1)	$\theta_1 = (R_1 - L_1)/2$ (degrees)	Vernier 2 Left (L_2)	Vernier 2 Right (R_2)	$\theta_2 = (R_2 - L_2)/2$ (degrees)	Mean $\theta = (\theta_1 + \theta_2)/2$	Wavelength (λ) $= \sin\theta/N$ (nm)
Yellow	339.65	360+20.30	20.42	159.65	200.2	20.27°	20.34	580.96
Green	341.50	360+19.05	18.80	160.35	199	19.32	19.06	546.00
Blue	342.95	360+17.20	17.12	162.80	197.10	17.15	17.18	493.60
Indigo	344.90	360+15.15	15.13	164.75	195.10	15.17	15.16	437.09
Violet	345.90	360+14.10	14.10	165.80	194.10	14.15	14.30	414.91

Table 2 - To find the wavelength of different colors of spectrum for order $n = 1$

To find wavelength:

Color	Vernier 1 Left (L_1)	Vernier 1 Right (R_1)	$\theta = (R_1 - L_1)/2$ (degrees)	Vernier 2 Left (L_2)	Vernier 2 Right (R_2)	$\theta = (R_2 - L_2)/2$ (degrees)	Mean $\theta = (\theta_1 + \theta_2)/2$	Wavelength (λ) $= \sin\theta/N$ (nm)
Yellow	316.10	360+43.95	43.22	136.10	223.85	43.92	43.57	576.00
Green	319.05	360+41.05	41.00	139.55	220.95	40.70	40.85	546.60
Blue	331.90	360+36.20	36.15	143.85	216.10	34.12	35.63	486.83
Indigo	328.00	360+31.05	31.50	148.45	211.40	31.47	32.48	448.65
Violet	326.10	360+29.15	30.02	150.55	209.10	28.27	29.64	413.29

Table 3 - To find the wavelengths of different spectrum for order $n = 2$

ASHOKA
Date:
Page No.

Result-

The wavelength of Yellow = 578.50 nm
The wavelength of Green = 546.30 nm
The wavelength of Blue = 490.20 nm
The wavelength of Indigo = 442.90 nm
The wavelength of Violet = 414.40 nm.