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Experiment-5
diffraction grating

Aim: (i) To determine the number of lines per millimeter of the grating using line of the mercury spectrum

(ii) To calculate the wavelength of the other prominent lines of mercury by normal incidence method.

Apparatus Required:

1. A white light source (mercury vapour lamp)
2. Diffraction grating
3. Spectrometer
4. Spirit level.

formula used:

The wavelength λ of any spectral lines can be calculated by the formula

$$(a+b)\sin\theta = n\lambda$$

$$\lambda = \frac{(a+b)\sin\theta}{n}$$

$(a+b)$ = grating element

a = angle of diffraction

Teacher's Signature

Result and conclusion:

for n=1

Wavelength of Yellow: 573nm
Green: 546nm
Blue: 490nm
Indigo: 405nm
Violet: 434nm

for n=2

Wavelength of Yellow: 582nm
Green: 550nm
Blue: 492nm
Indigo: 406 nm
Violet: 444 nm

Table 1 : To find the grating constant

To standardize grating :

Color	Wavelength λ(nm)	Order n	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 $\theta = \frac{\theta_1 + \theta_2}{2}$	$N = \sin\theta/\lambda$ (lines/m)
green	546	1	161	199	19°	341	379	19°	19	5.96×10^{-4}

Table 2 : To find the wavelength of different colors of spectrum of order (n = 1)

Color	Vernier 1 Left (L_1)	Vernier 1 Right (R_1)	$\theta_1 = \frac{R_1 - L_1}{2}$	Vernier 2 Left (L_2)	Vernier 2 Right (R_2)	$\theta_2 = \frac{R_2 - L_2}{2}$	Mean $\theta = \frac{\theta_1 + \theta_2}{2}$	Wavelength = $\sin\theta/N$ (nm)
Yellow	160	200	20°	340	380	20°	20°	573
green	161	199	19°	341	379	19°	19°	546
blue	163	197	17°	343	377	17°	17°	490
Indigo	166	194	14°	359	387	14°	14°	405
Violet	165	195	15°	345	375	15°	15°	434

Table 3 : To find the wavelength of different colors of Spectrum of order (n=2)

Color	Vernier 1		$\theta_1 = \frac{R_1 - L_1}{2}$	Vernier 2		$\theta_2 = \frac{R_2 - L_2}{2}$	Mean $\theta = \frac{\theta_1 + \theta_2}{2}$	Wavelength = $\frac{d \sin\theta}{2N}$ (nm)
	Left (L_1)	Right (R_1)	(degrees)	Left (L_2)	Right (R_2)	(degrees)	(degrees)	
Yellow	136	229	44	316	404	44	44	582
green	139	221	41	319	401	41	41	550
Blue	144	216	36	324	396	36	36	492
Indigo	151	209	29	331	398	29	29	406
Violet	148	212	32	328	392	32	32	444