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ECE – A

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

EXPERIMENT-7

11.06.2021

DETERMINATION OF WAVE LENGTH OF MERCURY SPECTRUM - DIFFRACTION SPECTROMETER

AIM:

To determine the wave length of the mercury spectrum using diffraction grating.

APPARATUS:

A spectrometer, mercury vapour lamp, grating, spirit level, reading lens, etc.

FORMULAE:

Wavelength (λ) = $\sin\theta / mN$ (Å)

λ - wave length of different colours in mercury spectrum (Å)
m - order of the spectrum.
N - No of lines per meter of the given grating.
θ - Mean Angle.

$$LC = \frac{\text{Value of one MSD}}{\text{No of div on VS}}$$

OBSERVATIONS:

Number of lines per meter of grating N = 15000 LPI
$= 6 \times 10^5$ Lines/m.

order of Diffraction m = 1

$$LC = \frac{30'}{30} = 1'.$$

CALCULATIONS:

$$\lambda = \frac{\sin\theta}{mN} \quad ; \quad mN = 1 \times 6 \times 10^5 = 6 \times 10^5.$$

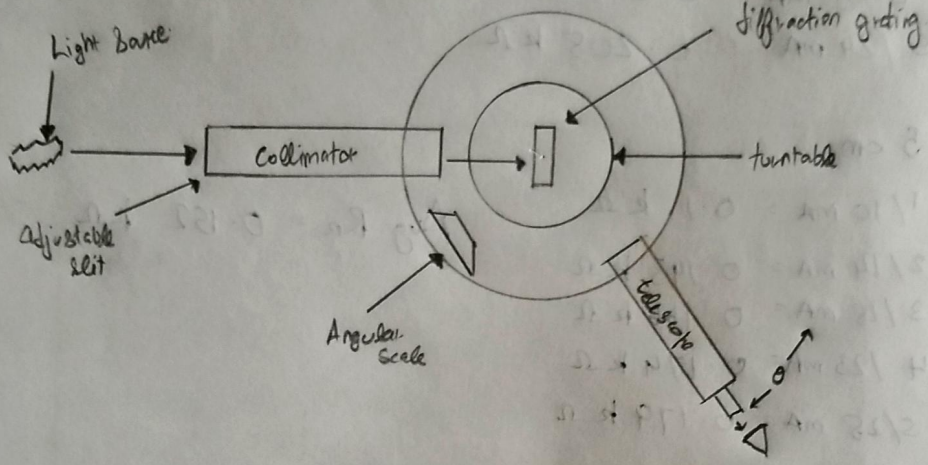
1. $\lambda = \sin 13^\circ / 6 \times 10^5 = 0.225 / 6 \times 10^5 = 3749 \times 10^{-10}$
2. $\lambda = \sin 15^\circ / 6 \times 10^5 = 0.259 / 6 \times 10^5 = 4313$ Å
3. $\lambda = \sin 19^\circ 3' / 6 \times 10^5 = 0.326 / 6 \times 10^5 = 5439$ Å

4. $\lambda = \sin 20° / 6\times10^5 = 0.342 / 6\times10^5 = 5700$ Å
5. $\lambda = \sin 21° / 6\times10^5 = 0.358 / 6\times10^5 = 5972$ Å
6. $\lambda = \sin 23° 2' / 6\times10^5 = 0.391 / 6\times10^5 = 6521$ Å

RESULT:

The wavelengths of colours of mercury spectrum are calculated and the values are tabulated.

DETERMINATION OF WAVE LENGTH OF MERCURY SPECTRUM - DIFFRACTION SPECTROMETER.



Spectrometer Grating Normal Incidence position.

Table to Calculate the Wavelength.

	Spectrometer Reading (Right)		Spectrometer Reading (Left)		2θ		Mean 2θ	θ	$\frac{\lambda}{\sin\theta}$
	V_A	V_B	V_A	V_B	V_A	V_B			
Violet	296° 3'	116° 4'	270° 4'	90° 5'	25° 9'	25° 9'	25° 9'	13°	3749
Blue	298° 8'	118° 7'	268° 14'	88° 7'	30° 6'	30°	30°	15°	4313
Green	301° 29'	121° 5'	263° 17'	84° 10'	38° 12'	37° 4'	38° 6'	19° 3'	5439
Yellow	302° 16'	122° 7'	262° 13'	82° 12'	40°	41°	40° 5'	20°	5700
Orange	303° 5'	123° 7'	261° 9'	81° 7'	41° 6'	42°	41° 8'	21°	5972
Red	305° 5'	125° 5'	259° 10'	79° 10'	46° 4'	46° 4'	46° 4'	23° 2'	6921