

# PHYSICS PRACTICAL SHEETS

Date Feb 9th, 2023

Class CE

Roll No. 25

Shift Morning

Object of the Experiment (Block Letter)

KU

CAMPUS

Experiment No. 6

Group T

Sub. Physics

Set .....

## MEASUREMENT OF THE WAVELENGTH OF LIGHT USING PLANE DIFFRACTION GRATING

Apparatus required:

i) Spectrometer

iii) Spirit level

ii) Sodium lamp

iv) Diffraction grating.

Theory:

A plane diffraction grating consists of an optically plane glass plate which is ruled a number of equidistant parallel straight lines. The lines divide the glass plate in opacities and transparencies. The number of lines in the plane transmission grating is of the order of 15000 lines/inch.

When a parallel beam of monochromatic light is incident normally on the grating, it suffers diffraction. The transmitted light gives rise to primary maxima in certain directions given by the relation,

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

where, 'a' is the width of the transparency, 'b' that of an opacity,  $\theta_n$  is the angle of diffraction for  $n^{\text{th}}$  order maximum and ' $\lambda$ ' is the wavelength of the light used.

Observations:

Vernier constant (V.C.) =  $1/60$

Number of lines per inch on the grating = 13000

Number of lines per cm on the grating (N) = 5118.11

Grating element  $(a+b) = \frac{1}{N} = 1.953 \times 10^{-4}$

Table for Measuring Angle of Diffraction:

No. of obs	Order of diffraction	Vernier	Telescope reading			Angle of diffraction			$\lambda$
			Left	Direct	Right	Left	Right	Mean.	
1		$V_1$	$9.41^\circ$	$25.25^\circ$	$42.42^\circ$	$15.84^\circ$	$17.17^\circ$	$\theta_1 =$	$5.52 \times 10^{-5}$
	1 <sup>st</sup> order	$V_2$	$188.19^\circ$	$204.41^\circ$	$221.35^\circ$	$16.30^\circ$	$16.94^\circ$	$16.56$	cm
2		$V_1$	$352.58^\circ$	$25.25^\circ$	$58.25^\circ$	$32.67^\circ$	$33.01^\circ$	$\theta_2 =$	$5.43 \times 10^{-5}$
	2 <sup>nd</sup> order	$V_2$	$170.17^\circ$	$204.41^\circ$	$235.73^\circ$	$33.97^\circ$	$31.32^\circ$	$32.74$	cm

### Result:

Mean wavelength ( $\lambda$ ) =  $5.48 \times 10^{-5}$  cm

$$\text{Error \%} = \left| \frac{5.8 \times 10^{-5} - 5.48 \times 10^{-5}}{5.8 \times 10^{-5}} \right| \times 100\% = 5.52\%$$

### Precautions:

- i) The grating should be handled without touching the ruled surface.
- ii) The telescope should be focus on the brightest image of the slit while seeing reflecting image.
- iii) The ruled surface should face towards the telescope.
- iv) The light should fall on the entire grating surface.