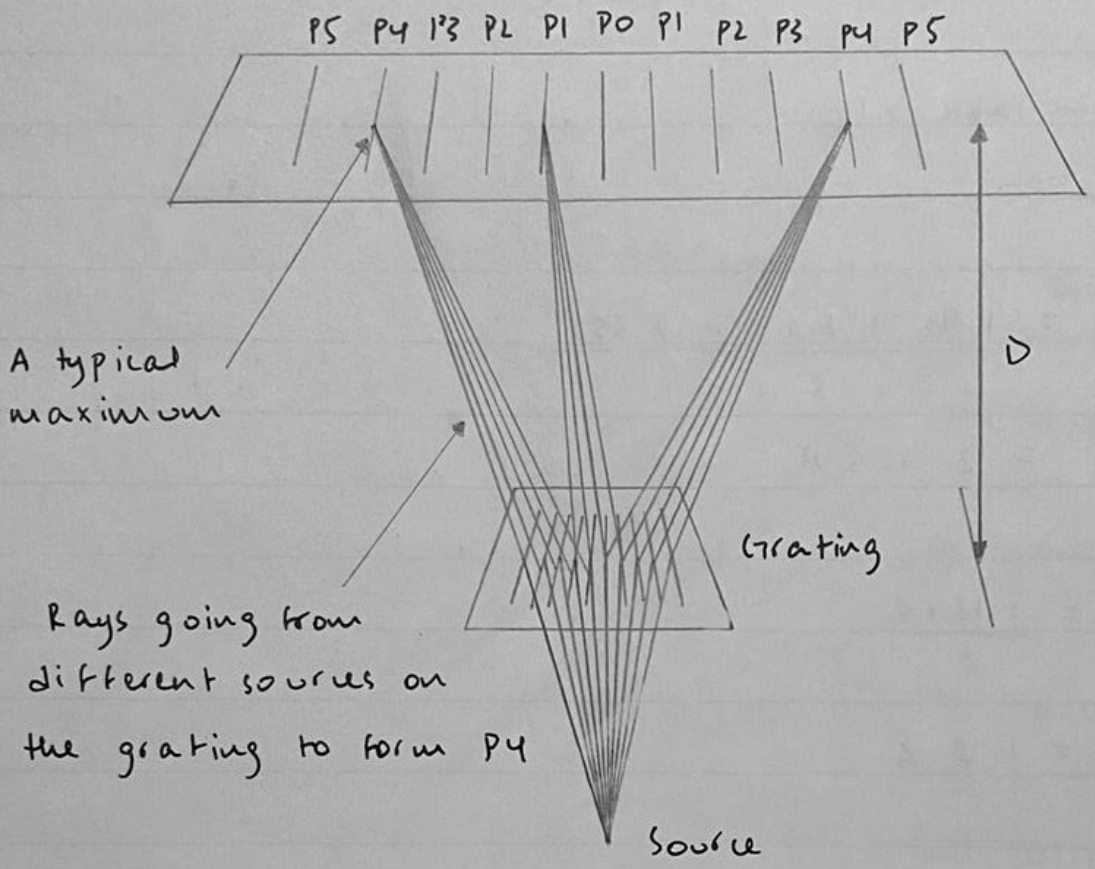
Fig 4.1. wave paths diagram.



D = distance from the grating to the screen

d = spacing between every two lines

If there are N lines per mm of grating, then

$$d = \frac{1}{N}$$

The diffraction grating formula for the principal maxima is: $d \sin\theta = n\lambda$, where n is the order of diffraction ($= 1, 2, 3 \ldots$) and θ, the angle of diffraction

$$\lambda = \frac{\sin\theta}{nN}$$

Monochromator in Sophisticated Instruments

Apparatus Available:

Laser source, grating, scale with measurements

Student Learning objectives:

To determine the wavelength of the given laser source using transmission diffraction grating method.

Observations:

Number of lines per meter on the grating is 98425.2.

Readings recorded in table 4.1.

Calculations:

$$\text{Mean wavelength} = \frac{681 + 665 + 674}{3}$$

$$= 673 \text{ nm}$$

Result:

The wavelength of the laser source is found to be 673 nm.

Teacher's Signature _____

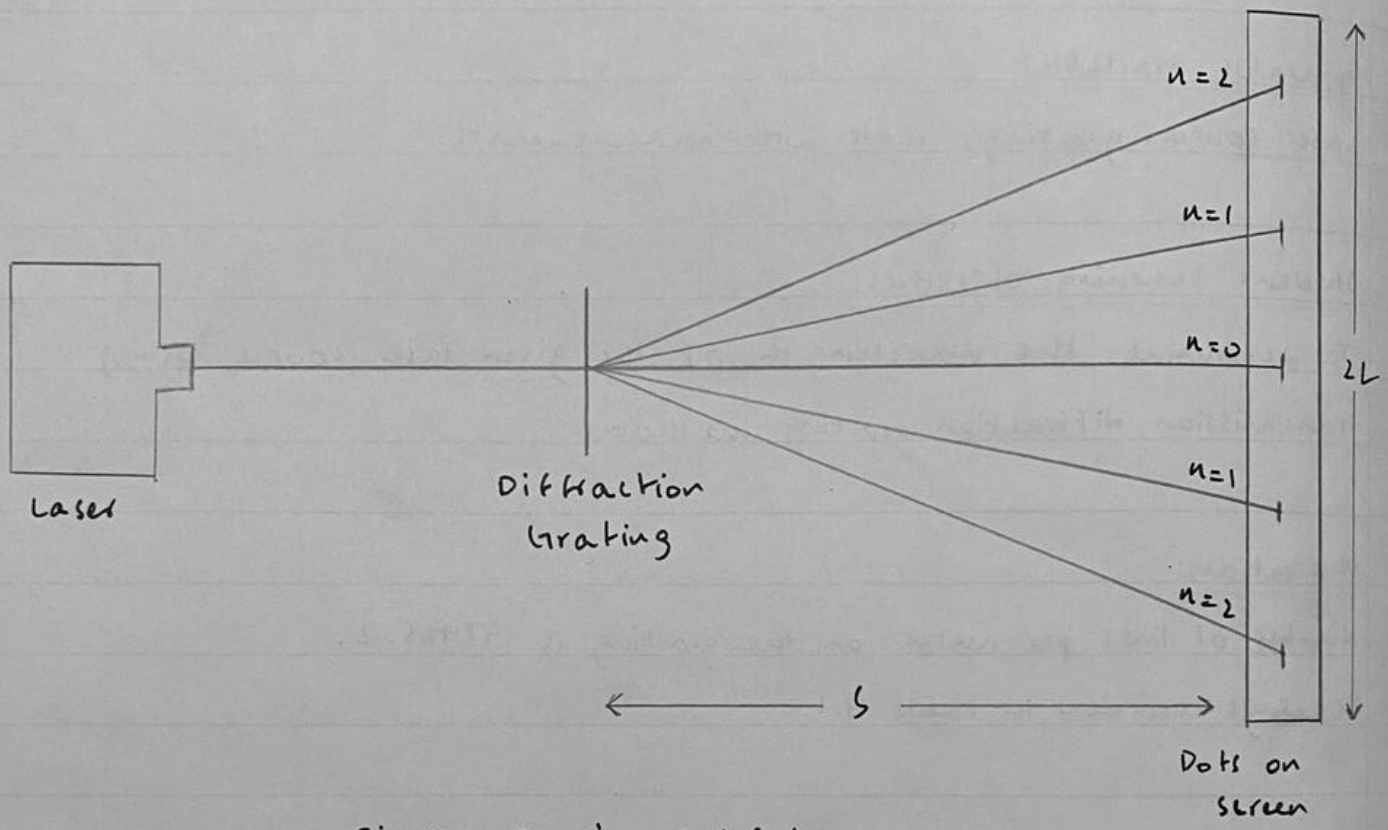


Fig 4.2. Experimental setup

n	S (cm)	2L	L (cm)	tanθ = L/S	θ = tan⁻¹ (L/S)	sinθ	Mean	λ (nm)
1	30	4	2	0.067	3.83	0.067	0.067	681
	40	5.4	2.7	0.068	3.89	0.068		
	50	6.6	3.3	0.066	3.78	0.067		
2	30	7.8	3.9	0.13	7.41	0.129	0.131	665
	40	10.6	5.3	0.133	7.58	0.132		
	50	13.3	6.7	0.134	7.63	0.133		
3	30	11.7	5.9	0.197	11.41	0.199	0.199	674
	40	16.2	8.1	0.203	11.48	0.199		
	50	20.2	10.1	0.202	11.42	0.198		

Table 4.1. observations and calculations