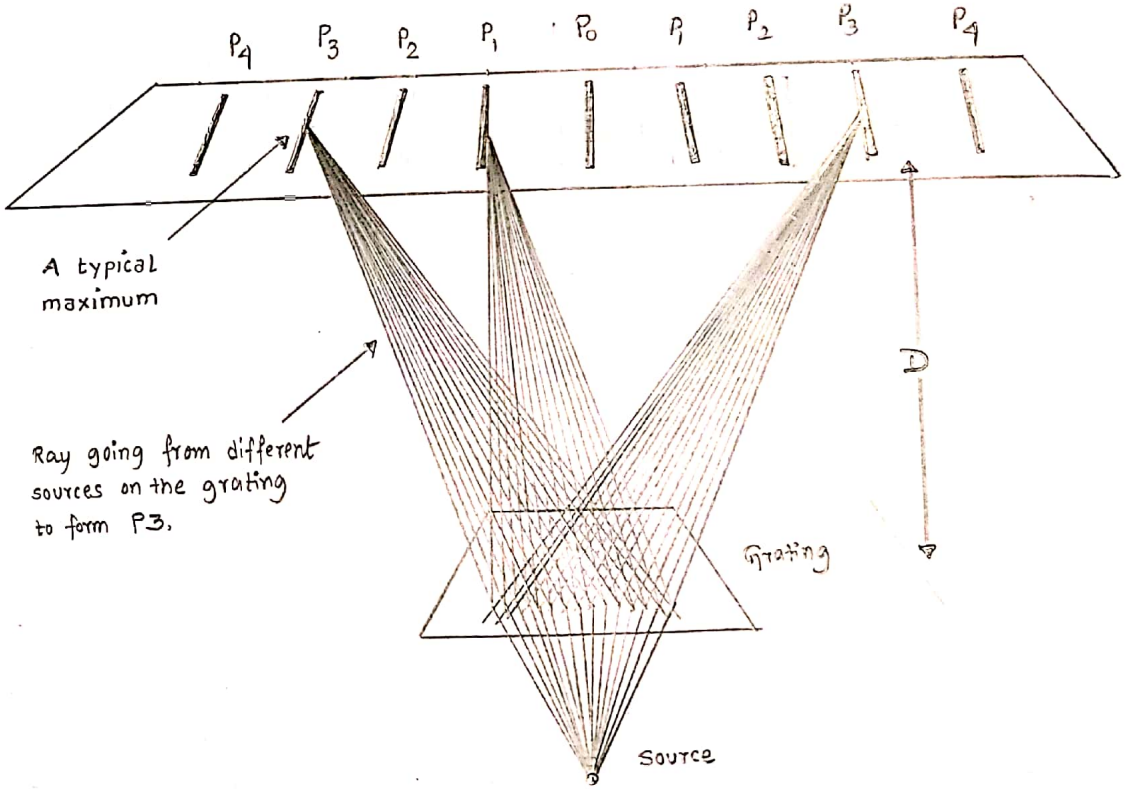

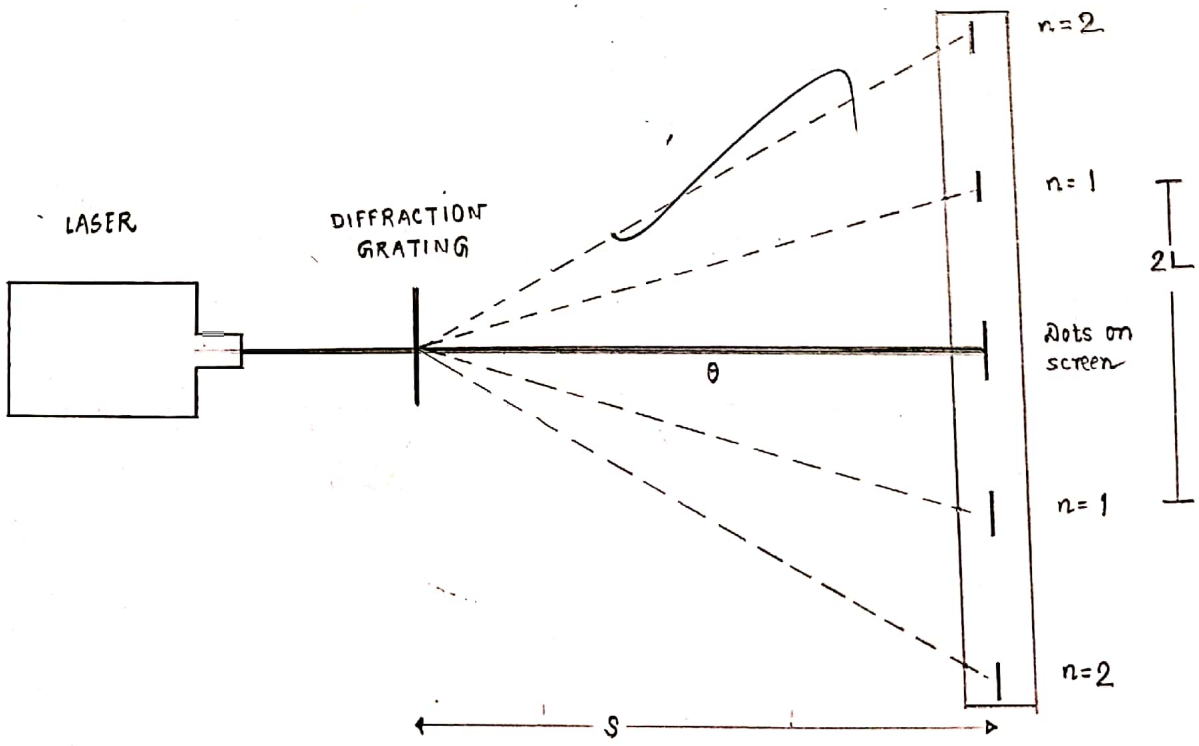

Date 25.7.2019

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TOPIC : Monochromators in sophisticated instrument [Laser grating]

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

FORMULA USED :

- The diffraction grating formula for the principal maxima is:

$$d \sin\theta = n\lambda$$

where n = order of diffraction
θ = angle of diffraction

- Also, $d = 1/N$, where d = space between every 2 adjacent lines;
N = no. of lines per mm of grating

- Hence, $$\lambda = \frac{\sin\theta}{N \cdot n} \text{ (meter)}$$

OBSERVATION: Number of lines per meter on the grating is 10^5

Tabular form:

n	S cm	2L cm	L cm	$\tan\theta = L/S$	$\theta = \tan^{-1}(L/S)$	$\sin\theta$	Mean	λ nm
1	25	3.6	1.8	0.072	0.071	0.070	0.069	690
	30	4.2	2.1	0.070	0.069	0.068		
	35	5.0	2.5	0.071	0.070	0.069		

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n	S cm	2L cm	L cm	$\tan\theta = L/S$	$\theta = \tan^{-1}(L/S)$	$\sin\theta$	Mean	λ (nm)
2	25	7.2	3.6	0.144	0.143	0.142	0.141	705
	30	8.6	4.3	0.143	0.142	0.141		
	35	9.8	5.0	0.142	0.141	0.140		
3	25	10.8	5.4	0.216	0.212	0.210	0.207	690
	30	12.8	6.4	0.213	0.209	0.207		
	35	14.8	7.4	0.211	0.207	0.205		

CALCULATION:

For $n = 1$,

Mean value of sine $= (0.070 + 0.068 + 0.069)/3 = 0.069$

$$\lambda = \frac{0.069}{10^5 \times 1} = 6.9 \times 10^{-7}\ m$$

For $n = 2$,

Mean value of sine $= (0.142 + 0.141 + 0.140)/3 = 0.141$

$$\lambda = \frac{0.141}{10^5 \times 2} = 7.05 \times 10^{-7}\ m$$

For $n = 3$

Mean value of sine $= (0.210 + 0.207 + 0.205)/3 = 0.207$

$$\lambda = \frac{0.207}{10^5 \times 3} = 6.9 \times 10^{-7}\ m$$

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RESULT:

∴ The wavelength (mean value) of the laser source is found to be 695 nm (High)

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