SAP ID- 60004200132
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DATE:

Exp - 3 : Diffraction Grating.

1) Explain any one application based on this experiment (Related to your core branch)

Ans Diffraction gratings are often used in monochromators, spectrometers, lasers, wavelength division multiplexing devices, optical pulse compressing devices, and many other optical instruments.

(a) Lasers.
Diffraction gratings are often used in lasers for wavelength tuning. That is, calibrating the laser to emit a specific wavelength of electromagnetic radiation.

(b) Optical communication
Holographic diffraction gratings have widespread use in optical communications and industrial measurement across near infrared spectral regions in which high performance and environment resistance are necessary.

(c) Monochromators
In some way, monochromators are kind of reverse of spectrometers while spectrometers seperate white light into all its constituents colours, monochromates are devices used to filter out all but a narrow band of electromagnetic energy. This particular application of diffraction gratings for spectrometry tools is very useful when tunable monochromatic light is needed.

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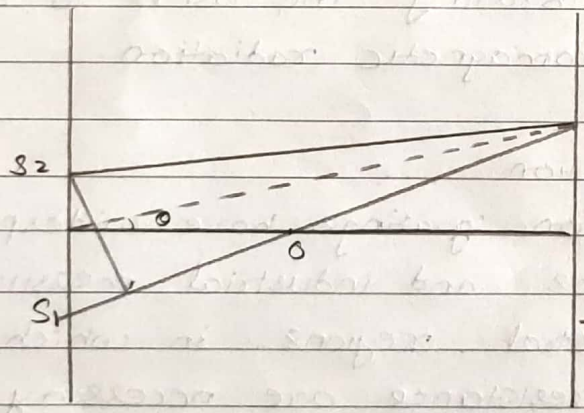
2) Explain any other technique or experiment other than the one performed which will achieve the result and fulfil the aim of experiment.

Ans Young's double slit experiment would satisfy the aim of experiment.

Young's double slit experiment uses two coherent sources of light at a seperation 'a' placed at a distance 'D' from screen and photodetector.

Let the wavelength of light be 'd' and distance of n^{th} fringe from centre be y_n.



$$\tan\theta = \frac{y_n}{D} \quad -(1)$$

$$\sin\theta = \frac{\Delta x}{d} \quad -(2)$$

where Δx = Path difference
$= n\lambda$

for 'θ' to be small, $\tan\theta \approx \sin\theta \approx \theta$

So from eq(i) and (ii)

$$\frac{y_n}{D} = \frac{\Delta x}{d}$$

$$\therefore \frac{y_n d}{D n} = \lambda \quad \text{, where } n \text{ is fringe number.}$$

$$\therefore \lambda = \frac{y_n d}{nD}$$

So, our aim to find wavelength is fulfilled.