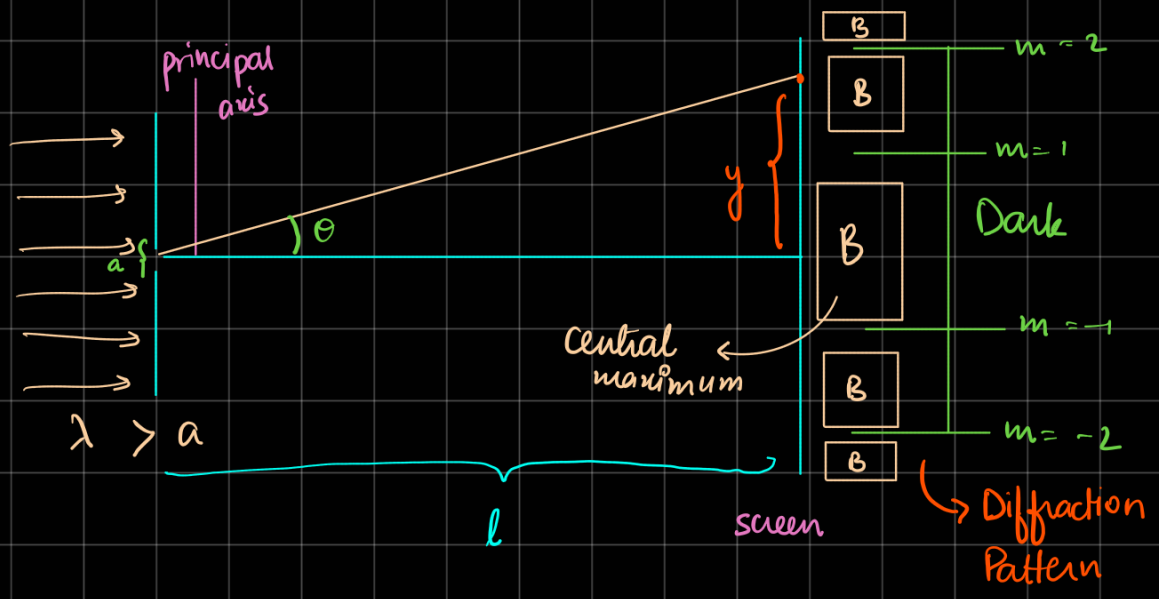
Diffraction



Width of fringe is slightly different

Destructive Interference $a \sin\theta_{dark} = m\lambda$ $\quad m = \pm 1, \pm 2, \pm 3 \ldots$

↳ Each point along the slit is considered a source of light

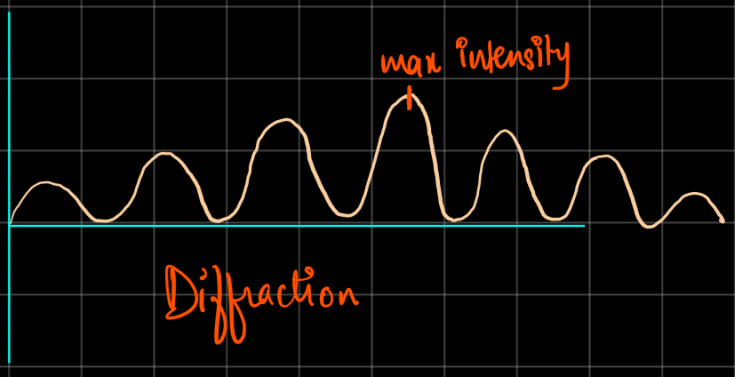
Constructive → Not discussed

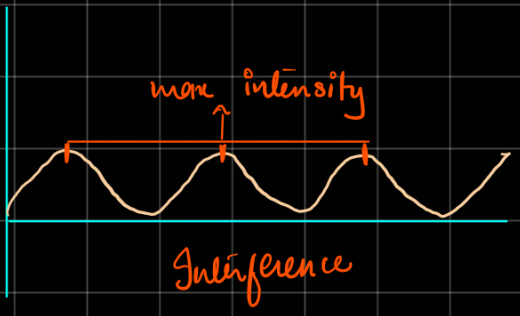
$\tan\theta_d = \frac{y_{dark}}{l} \approx \sin\theta_d \approx \theta_d$

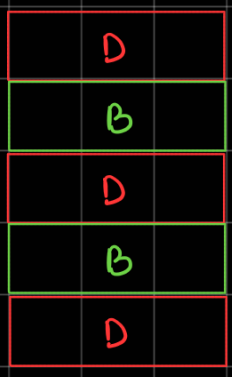
(↳ θ is small (< 10)

Intensity of the light

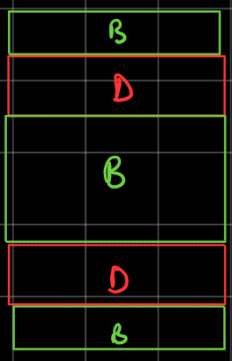
max intensity is at the center







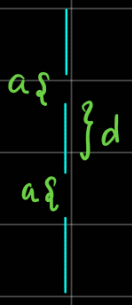
Interference



Diffraction

light → (interference) $\frac{d \sin\theta}{a \sin\theta} = \frac{m\lambda}{(m)\lambda}$

m = 1 → First dark (diffraction)

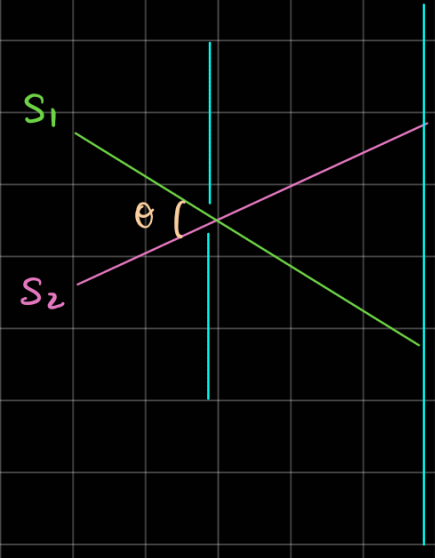


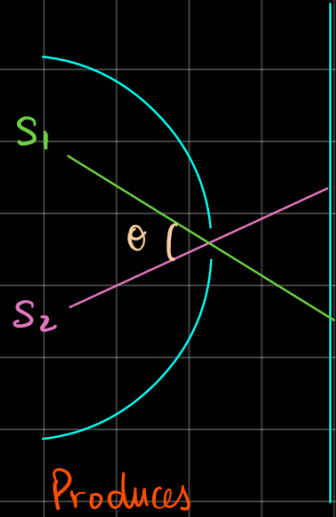
$$\frac{d}{a} = m_{\text{bright}}$$

Resolution

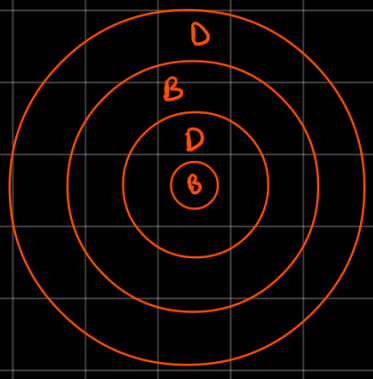
Ability of optical systems to distinguish between closely spaced objects.

$\theta_{min} = \frac{\lambda}{a}$ (rad)





Produces circles on screen



$$\theta_{min} = 1.22 \frac{\lambda}{d}$$

↳ diameter of the circle

Example

$$\theta_{min} = 1.22 \frac{\lambda}{d}$$

$$= \frac{1.22 \times 500 \times 10^{-9}}{58 \times 10^{-2}}$$

$$\theta_{min} = \frac{y}{\ell}$$

$$y = \ell \times \theta_{min}$$

$$y = \frac{270 \times 10^{3} \times 1.22 \times 500 \times 10^{-9}}{58 \times 10^{-2}}$$

Diffraction Grating

Device used to find the wave length of a light source

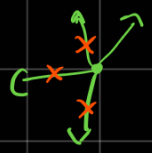
Constructive Interference $d \sin \theta_{bright} = m\lambda$

X Ray Diffraction

$2d \sin \theta = m\lambda \quad m = 1, 2, 3 - - -$

Polarization

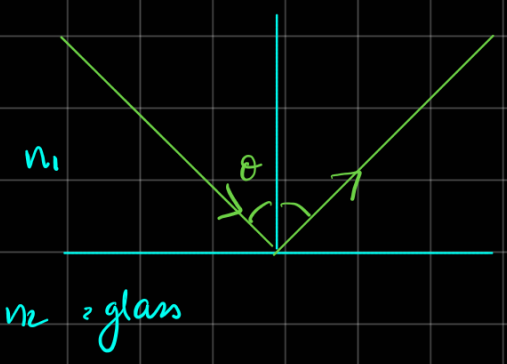
↳ Blocks electric field in some directions



Blocked by polarization

Polarization by reflection

If $\theta = 0$, light is unpolarized
Other angles $\Rightarrow$ Partially polarized
Completely polarized



$$\tan \theta_p = \frac{n_2}{n_1} \Rightarrow \text{Brewster's Law}$$