(1) Ans Bright frings (or) Dark frings. is known as fringe width (β)

Consider a Monochromatic source of light (s) and two narrow slits (S_1 & S_2) equi distinct from 'S' and S_1 and S_2 are separated by a distance 'd'. The screen is placed at distance 'D' from S_1 and S_2. Due to the super imposition of waves from S_1 and S_2 the interference Pattern is produced on the screen. The point 'C' is equi distinct from S_1 and S_2. Therefore, the path difference.

Between the waves S_1 & S_2 at point 'C' is 0. Hence Point 'C' is a bright fringe.

- Consider a point P at distance 'x' from point 'C' the Path difference between the waves from S_1 and S_2 to reach point P

$$\delta = S_2P - S_1P$$

from Δ^{le} S_2PR.

$$(S_2P)^2 = (S_2R)^2 + (PR)^2$$
$$= D^2 + (PC + CR)^2$$
$$= D^2 + (x + d/2)^2$$
$$\therefore (S_2P)^2 = D^2 + (x + d/2)^2.$$

from Δ^{le} S_1PQ.

$$(S_1P)^2 = (S_1Q)^2 - (PQ)^2$$
$$= D^2 + (PC - CQ)^2$$
$$= D^2 + (x - d/2)^2.$$
$$\therefore (S_1P)^2 = D^2 + (x - d/2)^2$$

$$(S_2P)^2 + (S_1P)^2 = D^2 + (x + d/2)^2 - D^2 (-x + d/2)^2$$
$$= D^2 + (x + d/2)^2 - D^2 - (x - d/2)^2$$
$$= (x + d/2)^2 - (x - d/2)^2$$
$$= x^2 + d^2/4 + 2x\,d/2 - x^2 - d^2/4 + 2x\,d/2$$
$$= 2xd$$

$$(S_2P)^2 - (S_1P)^2 = 2xd$$

$$(S_2P + S_1P) - (S_2P - S_1P) = 2xd$$

$$(D+D) - (S_2P - S_1P) = 2xd$$

$$S_2P - S_1P = 2xd/2D$$

$$S_2P - S_1P = xd/D \Rightarrow \delta = xd/D$$

Condition for bright fringe.

when the path difference is equal to integral multiples of λ a bright fringe is formed.

$$\delta = xd/D = n\lambda$$

$$x_n = n\lambda D/d.$$

for n^{th} fringe

$$x_{n-1} = \frac{(n-1)\lambda D}{d}.$$

for $(n-1)$ fringe

$$x_n - x_{n-1} = \frac{n\lambda D}{d} - \frac{n\lambda D}{d} + \frac{\lambda D}{d}$$

$$x_n - x_{n-1} = \lambda D/d$$

$$\boxed{\beta = \lambda D/d.}$$

Condition for Dark fringe.

when the path difference is equal to odd multiples of half the wavelength then the dark fringe is formed.

$$\delta = xd/D = (2n-1)\lambda/2 \quad (\text{where } n = 1, 2, 3 \ldots)$$

for n^{th} fringe

$$x_n = \frac{(2n-1)\lambda D}{2d}.$$

for $(n-1)$ fringe

$$x_{n-1} = \frac{(2(n-1)-1)\lambda D}{2d}.$$

$$x_n - x_{n-1} = \frac{(2n-1)\lambda D}{2d} - \frac{(2(n-1)-1)\lambda D}{2d}$$

$$= \frac{1}{2d}\left[(2n\lambda D - \lambda D) - (2n\lambda D - 3\lambda D)\right]$$

$$= \frac{1}{2d}\left[2n\lambda D - \lambda D - \cancel{2n}\lambda D + 3\lambda D\right]$$

$$\Rightarrow \frac{2\lambda D}{2d}$$

$$\boxed{\beta = \lambda D/d}$$

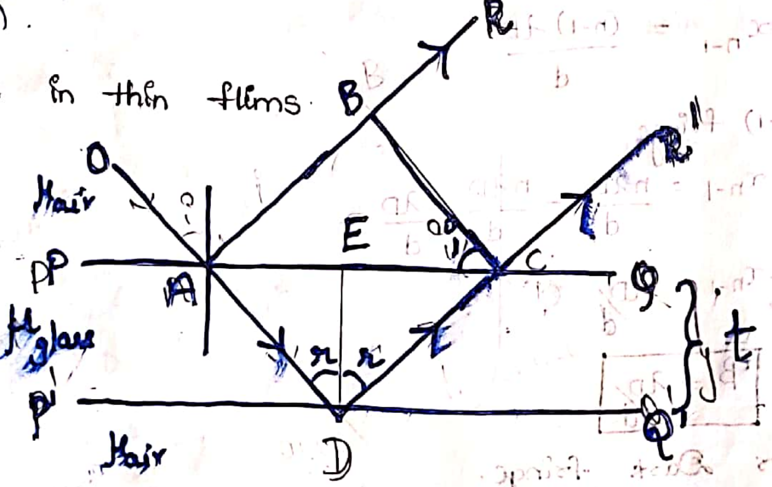
∴ The distance between two Consecutive Dark fringes (or) Bright fringes are equal.

Hence.

The fringe width is proportional to the wavelength and the distance between the sources and screen (D) and it is inversely proportional to the distance between the two sources (d).

(2) Interference in thin films.

Ans



→ Consider two plains surfaces P, Q and P', Q' separated by a distance 't' the refractive index between the surfaces is assumed as 'μ'

→ let a ray OA be incident on the surface PQ at point 'A' medium as ray 'AR' the remaining part is transmitted into the medium and it reflected at the lower surface P', Q' at point 'c', meets the upper ray and emerges as ray 'DR''

→ In order to find the path difference between the reflected ray the perpendicular 'OB' and 'CB' are drawn

Interference due to thin films - δ

Path difference $= (AC+CD)\mu - AB$

from Δ^{le} AEC

$\cos r = EC/AC = t/AC$

$AC = t/\cos r$

$AC = CD \Rightarrow CD = t/\cos r$

$\delta = \left(t/\cos r + t/\cos r\right)\mu - AB.$

$= 2t\mu/\cos r - AB$

Acc to Snell's law

$\mu = \sin i/\sin r$

$\sin i = \mu \sin r$

from Δ^{le} ABD

$\sin i = AB/AD = AB/(AE+ED)$

To find i

To find the value of AC. Consider Δ^{le} AEC

$\tan r = AE/EC$

$AE = \tan r\, EC$

$AE = ED$

$ED = t \tan r$

$\sin i = \frac{AB}{t\tan r + t\tan r}$

$AB = 2t \tan r . \sin i$

$= 2t \sin r/\cos r \; \mu \sin r$

$= 2t\mu \frac{\sin^2 r}{\cos r}$

$= 2t\mu/\cos r - \frac{2t\mu\sin^2 r}{\cos r}$

$= 2t\mu/\cos r \,(1-\sin^2 r)$

$= \frac{2t\mu}{\cos r}(\cos^2 r) = 2t\mu\cos r.$

When the light is reflected from an interface beyond the medium of lower refractive index then the refracted wave will not undergo any change when the medium beyond the interface has higher refractive index then their is the face change of 'ϕ' (180°) and the ~~and~~ corresponding path difference $\lambda/2$ is introduced

Hence path difference between 'AR' and 'DR' is.

$$\delta = 2\mu t\cos r - \lambda/2.$$

Condition for Maxima for the air film to appear bright $2\mu t\cos r - \lambda/2 = n\lambda$ [n = 0, 1, 2, 3 . . .]

$2\mu t \cos r - \lambda/2 = n\lambda.$

$2\mu t \cos r = n\lambda + \lambda/2$

$\Rightarrow (2n+1)\lambda/2.$

Condition for Minima for the air film to appear ~~bright~~ ~~$2\mu t\cos r - \lambda/2 = n\lambda$ [n=0.~~ dark $\delta = 2\mu t \cos r - \lambda/2.$

$\delta = 2\mu t\cos r - \lambda/2$

$2\mu t \cos r = n\lambda$

$\Rightarrow \cancel{(2n+1)\lambda/2}.$

Ans (3) Newton Rings

Experimental Arrangements :-

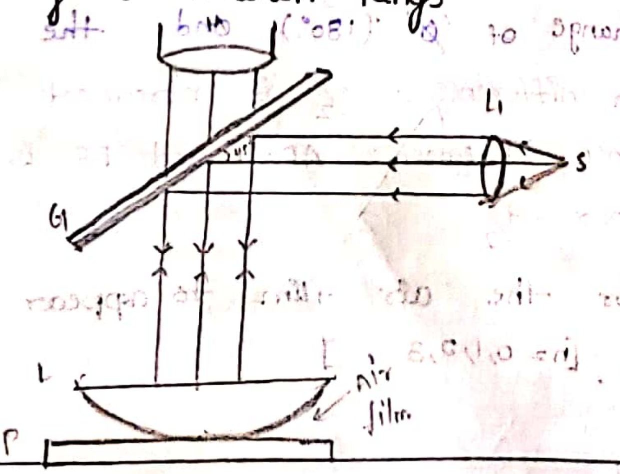
→ Newton Rings experimental arrangements consists of plain of convex lens 'L' of radius of curvature placed on the glass plate 'P'.

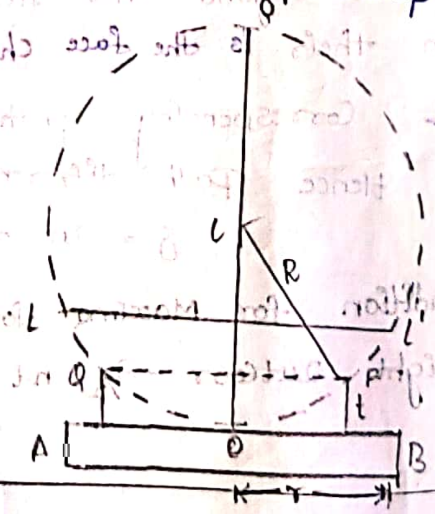
→ The light from monochromatic source is incident on the glass plate 'G' at 45°.

→ A part of light is reflected by the curved surface of lens 'L' and the remaining is transmitted which is reflected back from the plain surface of glass plate 'P'

→ The two reflected rays interfer and produce interference pattern to form bright and dark rings. the pattern is observed with the help of Microscope.

Theory of Newton Rings:-





→ let LOL' be the lens placed on the glass plate AB. let 'R' be the radius of curvature and 'r' be the radius of Newton rings corresponding to the constant thickness of the film 't'

→ As the rings are observed in reflected light and Additional path difference of $\lambda/2$ Hence path difference
$\delta = 2\mu t \cos r + \lambda/2$

→ for air film $\mu = 1$ and for Normal incidence 'r' = 0
therefore $\delta = 2t + \lambda/2$.
Therefore at the point of contact 't' = 0

$$\delta = \lambda/2$$

$$\delta = 2\mu t \cos r$$

$$\mu = 1, r = 0^\circ$$

$$\delta = 2(1) + \cos 0^\circ .$$

$$2t, \lambda/2$$

It is the condition for minimum intensity.

The condition for bright ring is

$$\Delta = 2t + \frac{\lambda}{2} = n\lambda$$

(or)

$$2t = (2n-1)\frac{\lambda}{2}$$

→ The condition for dark ring is

$$2t + \frac{\lambda}{2} = (2n+1)\frac{\lambda}{2}$$

$$2t = n\lambda$$

from figure

$$NP \times NQ = NO \times NO'$$

$$r \times r = t \times (2R - t)$$

$$r^2 = 2Rt - t^2$$

Since t is small

$$r^2 = 2Rt$$

$$t = \frac{r^2}{2R}$$

from that $t = \frac{r^2}{2R}$

condition for bright fringes:-

$$2t + \frac{\lambda}{2} = n\lambda$$

$$2t = n\lambda - \frac{\lambda}{2}$$

$$\cancel{2}\left(\frac{r^2}{\cancel{2}R}\right) = \frac{\lambda}{2}(2n-1)$$

$$\frac{r^2}{R} = \frac{\lambda}{2}(2n-1)$$

$$r^2 = \frac{(2n-1)\lambda R}{2}$$

$$r' = D/2 \Rightarrow \frac{D^2}{4}$$

$$\frac{D^2}{\cancel{4}} = \frac{(2n-1)\lambda R}{\cancel{2}}$$

$$D^2 = (2n-1)2\lambda R$$

$$D = \sqrt{(2n-1)2\lambda R}$$

$$\therefore D = 4\sqrt{(2n-1)\lambda R}$$

condition for dark fringes:-

$$\cancel{2}\left(\frac{r^2}{\cancel{2}R}\right) = n\lambda$$

$$\frac{r^2}{R} = n\lambda$$

$$r^2 = Rn\lambda$$

$$\frac{D^2}{4} = Rn\lambda$$

$$D^2 = 4Rn\lambda$$

$$D = \sqrt{4Rn\lambda}$$

$$D = 2\sqrt{n\lambda R}$$

~~$D_n \propto \sqrt{n}$~~

Determination of wave length

$$D_n = \sqrt{4Rn\lambda} = 2\sqrt{Rn\lambda}$$

$$D_{n+P} = 2\sqrt{Rn\lambda}$$

$$D_n^2 = 4Rn\lambda$$

$$D_{n+p}^2 = 4Rn\lambda + 4P\lambda R$$

$$D^2_{n+P} - D^2$$

$$= \cancel{4Rn\lambda} + 4P\lambda R - \cancel{4Rn\lambda}$$

$$\therefore \lambda = \frac{\cancel{D^2_{n+P} - D_n^2}}{\cancel{4PR\lambda}}$$

$$\lambda = \frac{D_{n+p}^2 - D_n^2}{4PR}$$

Fraunhofer diffraction : due to single slit :-

Consider as a slit 'AB' of width 'd' and the monochromatic light 'S' emitting the waves incident on the convex lens 'L_1'

Sources is placed at a focal point of convex lens so that it becomes parallel beam and it incident on slit 'AB'. the light rays focausd by convex lens on screen capital 'xy' are placed at the focal point of the lens L_2.

The diffraction pattern consisting of wide central bright band surrounded by few narrow bands on either side which are alternating bright and dark.

theory :-

According hygen's wave theory each point on 'AB' sends out secondary wavelets in all directions and the rays which are moving in the same direction as that of incident ray are focused at 'P_0'

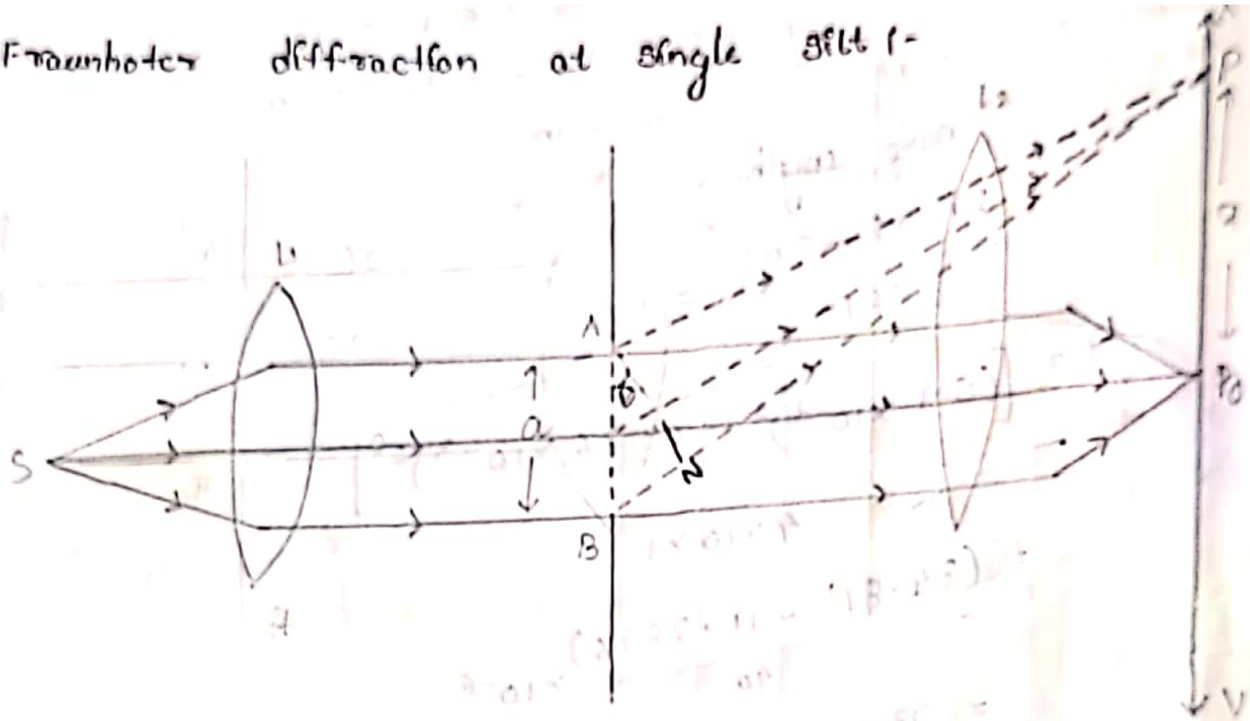
② The diffracted rays which are at angle θ are focused at point P.

③ The intensity at point P is maximum (or) minimum depending upon the path difference between the rays coming from AB

④ P_0 is optically equidistinct from the corresponding points on the slit AB.

⑤ To calculate the intensity at point P let us assume the width of the slit is devided into "n" equal parts and the amplitude of each wave is 'a'

Fraunhofer diffraction at single slit :-



1, Path difference
2, Phase difference
3, Resultant Amplitude.
4, Resultant Intensity
5, Condition for minima.
6, Condition for central maxima
7, Condition for secondary max.
8, width of central max.

i, Path difference :-

Path difference of secondary wavelength in reaching (from A & B)

Q from Δ^{le} ABN $\sin\theta = BN/AB$

$$\delta \rightarrow BN = AB \sin\theta.$$

$$\delta = d \sin\theta$$

Scanned with OKEN Scanner

ii, Phase difference :-

$$\phi = \frac{2\pi}{\lambda} \times \text{Path diff } (\Delta)$$

$$= \frac{2\pi}{\lambda} \times d \sin\theta$$

let the slit AB is divided into 'n' equal parts (where 'n' is very large) :

$$\phi = \frac{1}{n}\left(\frac{2\pi}{\lambda} \times d \sin\theta\right)$$

3, Resultant Amplitude.

using the theory of 'n' harmonic vibration of same amplitude "a" and having common phase difference of ϕ resultant Amplitude.

$$R = \frac{a \sin\left(\frac{n\phi}{2}\right)}{\sin\left(\frac{\phi}{2}\right)}$$

$$R = \frac{a \sin\left(\frac{n}{2} \cdot \frac{1}{n} \cdot \frac{2\pi}{\lambda} d\sin\theta\right)}{\sin\left(\frac{1}{2} \cdot \frac{1}{n} \cdot \frac{2\pi}{\lambda} d\sin\theta\right)} = \frac{a \sin\left(\frac{\pi d \sin\theta}{\lambda}\right)}{\sin\left(\frac{\pi}{n\lambda} d\sin\theta\right)}$$

let $\alpha = \frac{\pi d \sin\theta}{\lambda}$

then $R = \frac{a \sin\alpha}{\sin(\alpha/n)}$

If n is very large α/n is very small

$\sin \alpha/n = \alpha/n$

$$= a \frac{\sin\alpha}{\alpha/n}$$

$$= na \sin\alpha/\alpha$$

let $na = A$

then

$$\boxed{R = \frac{A \sin\alpha}{\alpha}}$$

4, Resultant intensity :-

$$I = \frac{A^2 \sin^2\alpha}{\alpha^2}.$$

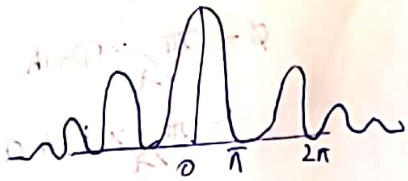
5. Condition for minimum :-

$I = 0$ so $(\alpha \neq 0$

$\sin\alpha = 0$ $(\alpha = 0$ corresponds to central max)

$$\alpha = \pi,\ 2\pi,\ 3\pi$$

$$\alpha = \pm m\pi \qquad m = 1, 2, 3$$



$$\frac{\pi d \sin\theta}{\lambda} = \pm m\pi$$

$$\boxed{d\sin\theta = \pm m\lambda}$$

6, Condition for Centre max :-

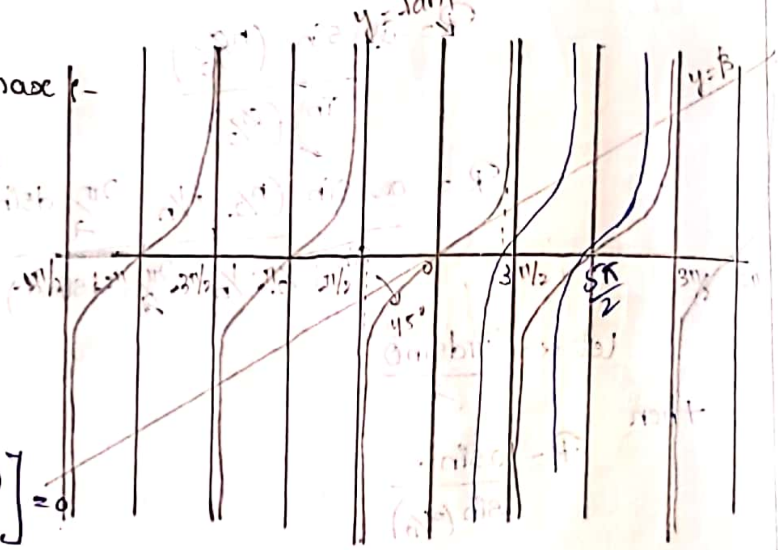
$$I = \frac{A^2 \sin^2\alpha}{\alpha^2} = \max \qquad \left(\because \lim_{\theta\to 0} \frac{\sin\theta}{\theta} = 1\right)$$

$\alpha = 0$

$$\frac{\pi d \sin\theta}{\lambda} = 0 \qquad \Rightarrow I = A^2 \lim_{\alpha\to 0} \frac{\sin^2\alpha}{\alpha^2} = A^2 = I_0$$

$$\sin\theta = 0 \quad \Rightarrow \underline{\theta = 0^\circ}$$

7, Condition for Secondary max :-



$$I = \frac{A^2 \sin^2\alpha}{\alpha^2}, \quad \alpha = \frac{\pi d \sin\theta}{\lambda}$$

$$\frac{dI}{d\alpha} = 0$$

$$\frac{d}{d\alpha}\left(\frac{A^2 \sin^2\alpha}{\alpha^2}\right) = 0$$

$$A^2\left[\frac{\alpha^2 (2\sin\alpha\cos\alpha) - \sin^2\alpha\,(2\alpha)}{\alpha^4}\right] = 0$$

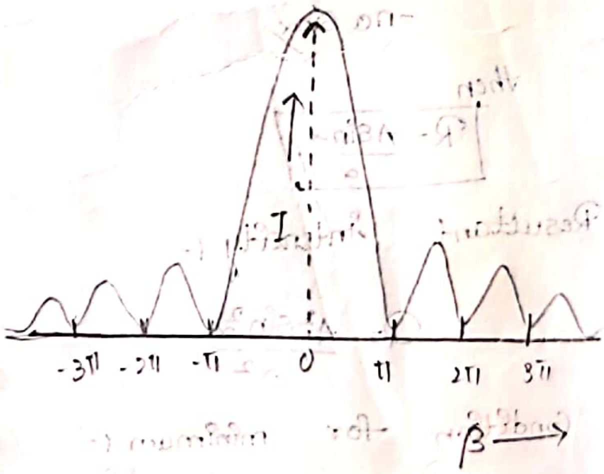
$$A^2 \frac{2\alpha \sin\alpha}{\alpha^4}\left[\alpha\cos\alpha - \sin\alpha\right] = 0$$

$$\alpha\cos\alpha - \sin\alpha = 0$$

$$\alpha = \tan\alpha.$$

$$\alpha = 0,\ 3\pi/2,\ 5\pi/2,\ 7\pi/2 \text{ e.t.c}$$

Central max.



$$\alpha = (2m+1)\pi/2, \quad m = 1, 2 \ldots$$

$$\alpha = (2m+1)\pi/2$$

$$\frac{\pi d \sin\theta}{\lambda} = (2m+1)\pi/2$$

$$d\sin\theta = (2m+1)\lambda/2$$

width of Central max :-

Cond for min intensity $d\sin\theta = m\lambda \quad m=1$

$d\sin\theta = \lambda$

$\sin\theta = \lambda/d$

θ is very small.

$\sin\theta = \theta$

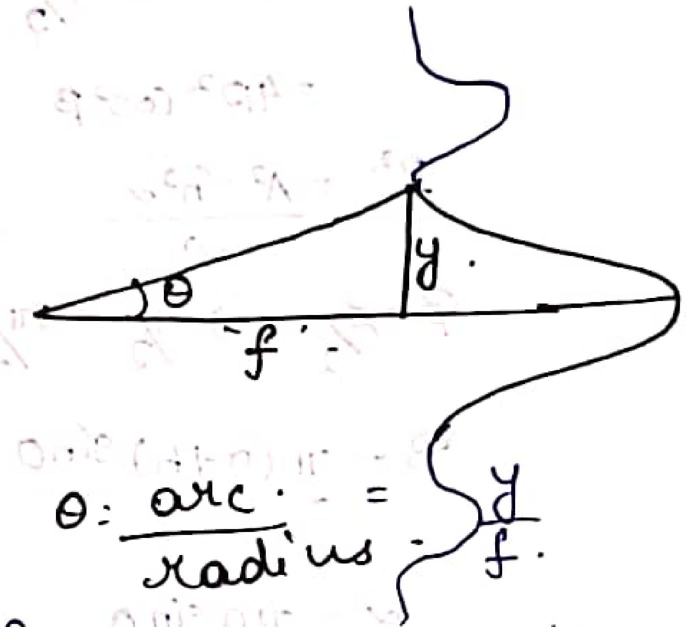
$\theta = \lambda/d = y/f$

$\boxed{y = f\lambda/d}$

$\boxed{y \propto \lambda}$

$\boxed{y \propto 1/d}$

Linear width $2y = \dfrac{2f\lambda}{d}$.



$\theta = \dfrac{arc}{radius} = \dfrac{y}{f}$.

f - focal length of the lens.

Diffraction due to double slit :-

Consider AB and CD two parallel slits of equal width a separated by distance 'b' the distance between corresponding points of the two slits is ~~ab~~ a+b

2. let a parallel of monochromatic light of wavelength 'λ' be incident on the two slits and the light diffracted from these slits are focused on the screen 'xy' by a lens L_2

3. The diffraction at the two slits is a combination of interference and diffraction.

4. the pattern on the screen is diffraction pattern due to single slit on which a system of interference fringes are superposed

5. If we consider the secondary waves travelling in a direction inclined at an angle θ with the intial direction then from the theory of diffraction - - - - - due to all the wavelets diffracted from each slit is

$$\boxed{'R' = \frac{A \sin\alpha}{\alpha}}$$

6. Let 'S_1' and 'S_2' be the midpoints of the slits and each source send a wavelet of amplitude $\frac{a \sin\alpha}{\alpha}$ in the direction θ. then the resultant amplitude ~~term~~ is

$$\boxed{R = \frac{A^2 \sin^2\alpha}{\alpha^2}}$$

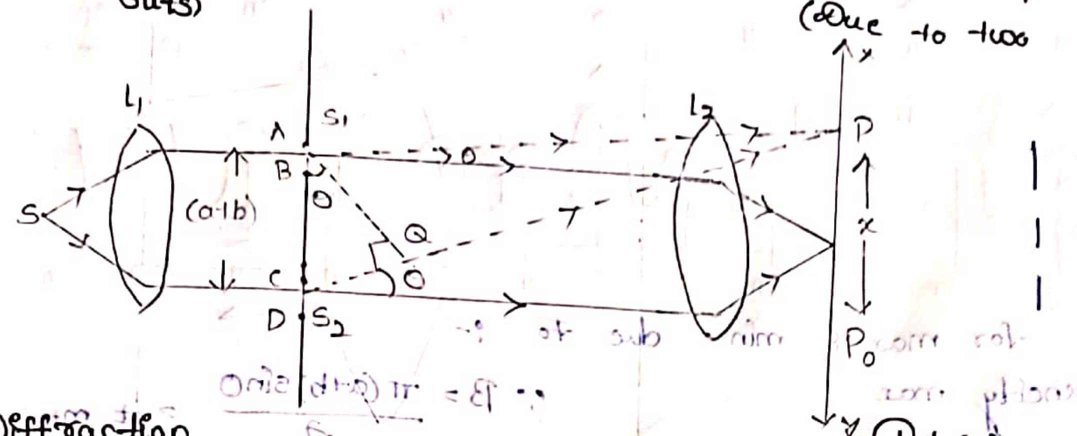
$y \propto 1/d$

lens.

Fraunhofer diffraction due to double slit.

i) Diffraction pattern (Due to each individual slits)

ii) Interference pattern (Due to two slit)



Diffraction

Path diff $\Delta = a\sin\theta$

Max : $a\sin\theta = (2m+1)\lambda/2$

Min : $a\sin\theta = m\lambda$

Interference:

$\Delta = (a+b)\sin\theta$

Cond. for max

$\Delta = m\lambda$ - max

$\Delta = (2m+1)\lambda/2$ - min

→ Max $(a+b)\sin\theta = m\lambda$

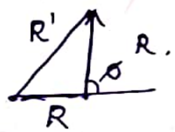
Min $(a+b)\sin\theta = (2m+1)\lambda/2$.

The resultant intensity

$$I = \frac{4A^2\sin^2\alpha}{\cos\alpha}\cos^2\beta$$

$R'^2 = R^2 + R^2 + 2RR\cos\phi$

$R'^2 = 2R^2(1+\cos\phi) = 2R^2(2\cos^2\phi/2)$



$(\because R^2 = P^2+Q^2+2PQ\cos\theta)$

law

[parallelogram of vector]

$(\because \beta = \phi/2)$

$= 2R^2 (1+\cos\phi) = 2R^2 (2\cos^2\phi/2)$

$= 4R^2 \cos^2\phi/2$

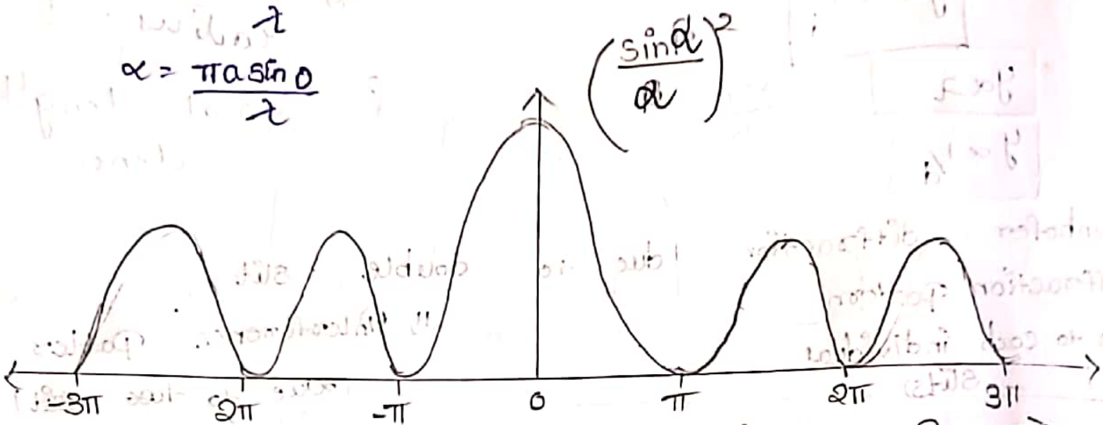
$= 4R^2 \cos^2\beta$

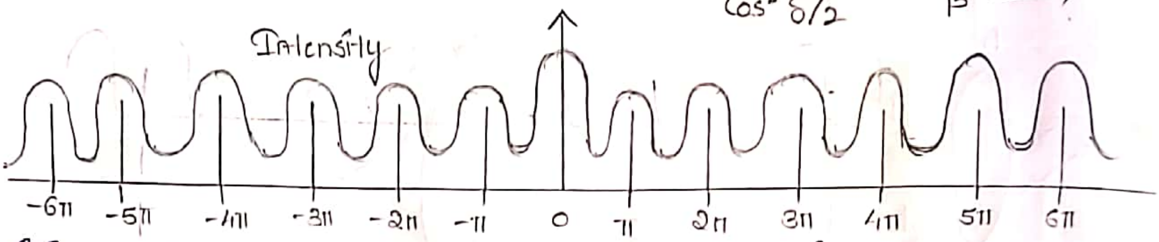
$R^2 = \frac{A^2 \sin^2\alpha}{\alpha^2}$

$\beta = \phi/2 \Rightarrow \frac{1}{2} \cdot \frac{2\pi}{\lambda} (a+b)\sin\theta$

$\beta = \frac{\pi (a+b)\sin\theta}{\lambda}$

$\alpha = \frac{\pi a \sin\theta}{\lambda}$





Condition for max & min due to :-

Intencity max

$I_{max} \Rightarrow \cos^2\beta = 1$

$\beta = 0, \pm\pi, \pm 2\pi$

$\beta = \pm m\pi$; $m = 0, 1, 2, \ldots$

$\because \beta = \frac{\pi (a+b)\sin\theta}{\lambda} = \pm m\pi$

$\Rightarrow ((a+b)\sin\theta) = \pm m\lambda$

if $m = 0 \Rightarrow \theta = 0° \Rightarrow$ Centrema

Intencity minimum :-

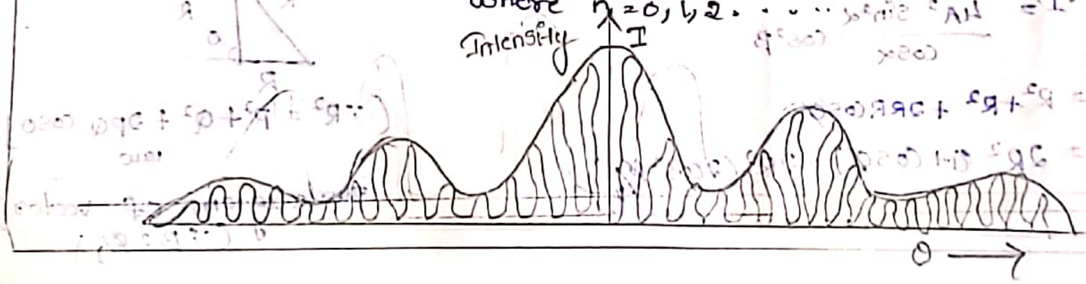
$I = min \quad \cos^2\beta = 0$

$\beta = \pm (2m+1)\pi/2$

$\frac{\pi (a+b)\sin\theta}{\lambda} = \pm (2m+1)\pi/2$

$(a+b)\sin\theta = \pm (2m+1)\lambda/2$

where $n = 0, 1, 2, \ldots$



Fraunhofer due to n-slits :-

Consider ABCDEFGHIJ representing the section of grating normal to the plane of paper having slit width 'a' and the slits AB, CD, EF, GH, IJ and slits are seperated by a distance 'd'. the sum of two widths (a+d) is called grating element (or) Grating Constant.

→ let plane waves of monochromatic light λ be incident normally on the grating then by hygen's principle each of the infinite points in the slits sends secondary wavelets in all directions.

→ The secondary wavelets travelling of the incident light will focus at point P_0 on the screen i.e Central maxima.

→ the secondary waves travelling in a direction inclinded at an angle θ with the incident light reaches P_1 through the convex lens is different phases.

→ As a result dark and bright bands occur on both the sides of central maxima.

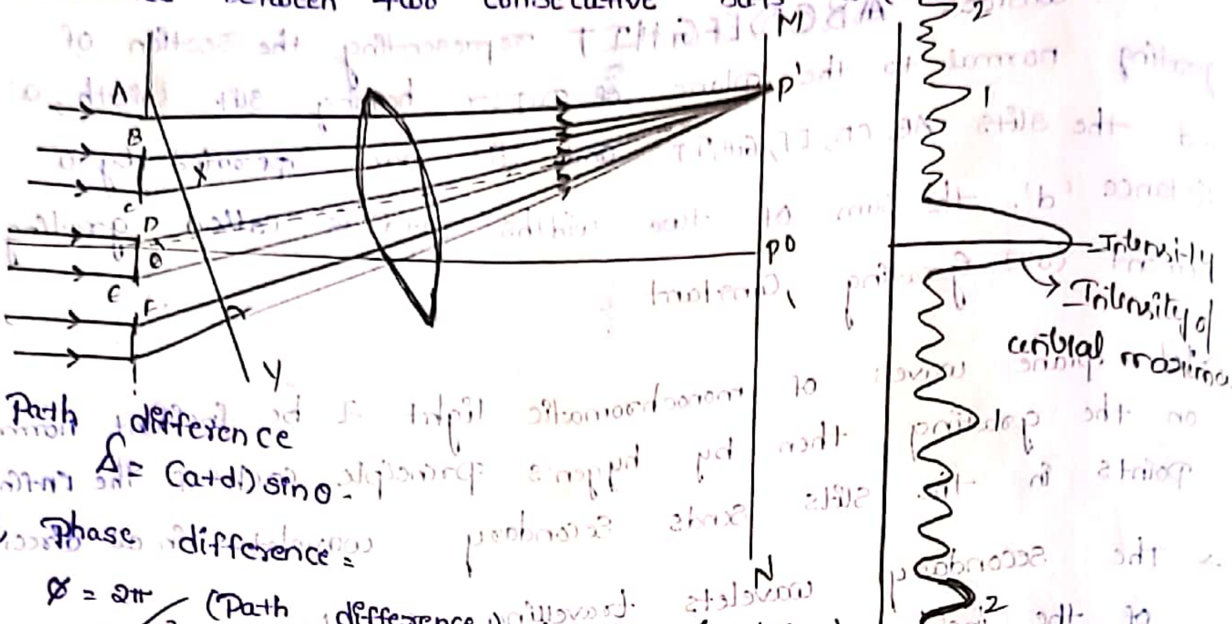
theory :-

PTO

→ the wavelength proceeding from all points in slit along the direction θ are equavalent to a single wave of amplitude $\left[\frac{A\sin\beta}{\beta}\right]$

where $\beta = \pi A \sin\theta / \lambda$

→ when there are n- slits we have n- different diffractive waves one each from the middle point of the slits then the path difference between two consecutive slits is $(a+d)\sin\theta$.



1, Path difference

$\Delta = (a+d)\sin\theta$.

2, Phase difference =

$\phi = \frac{2\pi}{\lambda}$ (Path difference) $\Rightarrow \phi = \frac{2\pi}{\lambda}(a+d\sin\theta)$

$\therefore \frac{2\pi}{\lambda}(a+b)\sin\theta = 2\gamma$

3, the resultant intensity is considered with the help of vector addition.

$$R = \frac{A\sin\beta}{\beta}\left(\frac{\sin N\gamma}{\sin\gamma}\right)$$

$$I = A^2$$

$$I = \left(\frac{A^2\sin^2\beta}{\beta^2}\right)\left[\left(\frac{\sin^2 N\gamma}{\sin^2\gamma}\right)\right]N^2.$$

4, Condition for central max;

if $\gamma \to 0$ $\quad \sin N\gamma = 0$

$\frac{0}{0}$ $\Rightarrow \gamma = \pm m\pi$

we have 'L'-hospital rule

$$\lim_{\gamma\to\pm m\pi}\frac{\sin N\gamma}{\sin\gamma} = \lim_{\gamma\to\pm m\pi}$$

$$\left[\frac{A\sin\beta}{\beta}\right] \text{ amplitude}$$

$$\frac{\frac{d}{d\gamma}(\sin N\gamma)}{\frac{d}{d\gamma}(\sin\gamma)} = N\left[\frac{\cos\gamma}{\cos\gamma}\right] = \pm N \quad = \beta \text{ where}$$

$$I = \frac{A^2 \sin^2\beta}{\beta^2} N^2$$

$$\frac{\pi}{\lambda}(a+b)\sin\theta = \pm m\pi$$

$\Rightarrow (a+b)\sin\theta = \pm m\lambda$

Grating equation.

5, Condition for minima.

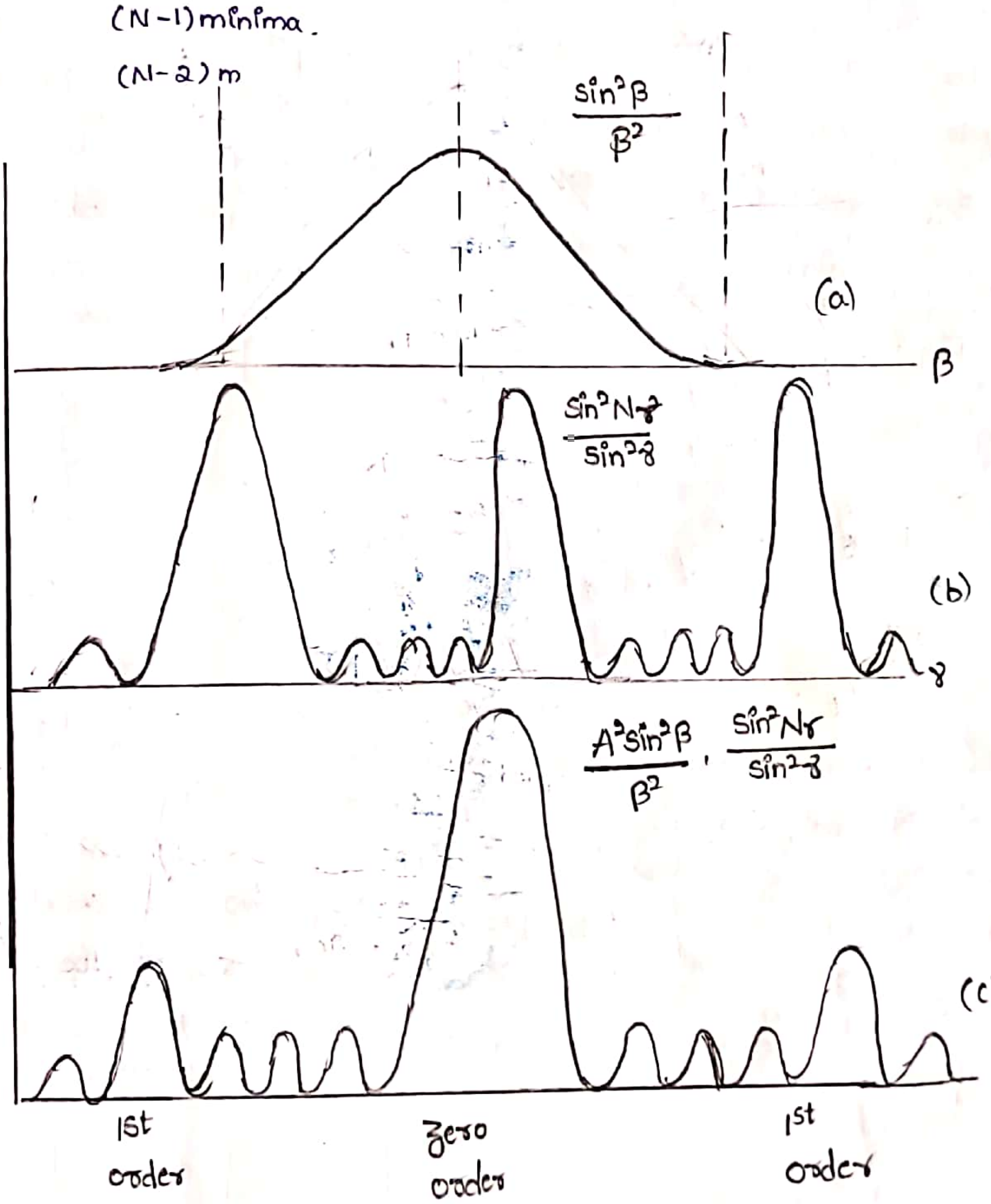
$\frac{\pi}{\lambda}(a+b)\sin\theta = m\pi$

$\sin N\gamma = 0 \quad \pi = 0$

$\gamma = \pm m\pi \quad m = 1, 2, 3, (N-1)$

$(N-1)$ minima.

$(N-2)$ m



Nicol prism :- Polarization due to Double Refraction :

Nicol prism is an optical device used for Producing and analyzing plane polarized light. It was invented by William Nicol in 1828 and the principle involved is double refraction.

Construction :-

1, Nicol Prism is made up of calcite crystal whose length is 3 times as that of its width.

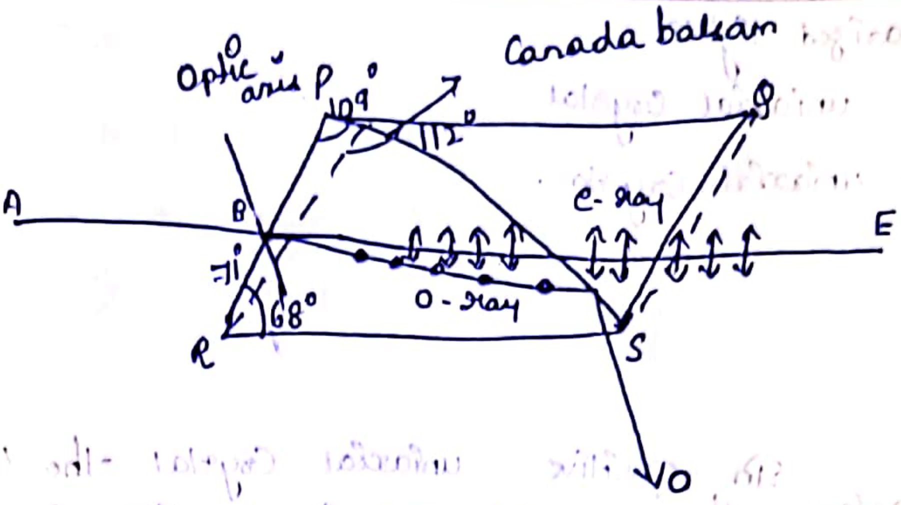
2, The end faces of this crystal are grounded in such a way that the angle of principle section becomes 68° and 112° instead of 71° and 109°.

3, Calcite crystal is cut into two pieces by a plane perpendicular to principle section as well as end faces PR and QS

4, The cut faces are grounded and polished optically flat then they are cemented together by Canada Balsm

5, Canada Balsm is a transparent substance which is optically dense for extraordinary ray and less dense for ordinary ray (for sodium light $\mu_o = 1.658$ and $\mu_{\text{Canada Balsm}} = 1.55$ and $\mu_e = 1.486$)

working.



1, when a beam of light AB enters the face PR of the nicol prism. it is doubly refracted into ordinary Polarized beam 'BO' and extra ordinary Polarized beam 'BE'

2, Canda Balsm acts as denser medium for extraordinary ray and acts as rarer medium for ordinary ray.

3, The angle of incidence of ordinary ray at the Calcite-Balsm Surface becomes greater than the critical angle 69°, under Such Condition 'O' ray is completed reflected at Calcite - Balsm Surface as internal reflection.

4, extraordinary is not totally reflected because it is travelling from rarer to denser medium and thus it is transmitted with no much loss of intensity.

5, since extraordinary is plane polarized having vibration Parallel to Principle plane the light emerging from Nicol's prism is plane polarized.

Long Answer Questions : Engineering Physics Unit-1

(1) What are the necessary conditions to get clear & distinct interference fringes.

2, Obtain the conditions for maxima & minima due to interference of reflected light in thin transparent film of uniform thickness.

3, With the help of neat schematic diagram explain Newton's rings. experimental set up. Determine the wavelength & refractive index.

4, Explain with theory Fraunhofer diffraction due to single slit.

5, Explain Fraunhofer diffraction due to N-slits.

6, Explain polarization due to double refraction with the help of Nicol's prism.

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