Date: 9-12-25 Classwork

Topic:- Chapter #09
Physical optics

* Light:- Light is an electromagnetic wave & it behave as a particle.

Wave front:- Such a surface on which all the points have same phase of vibrations and are at same distance from the source.

There are two types of wavefront.

a) Spherical wavefront.
b) Plane wavefront.

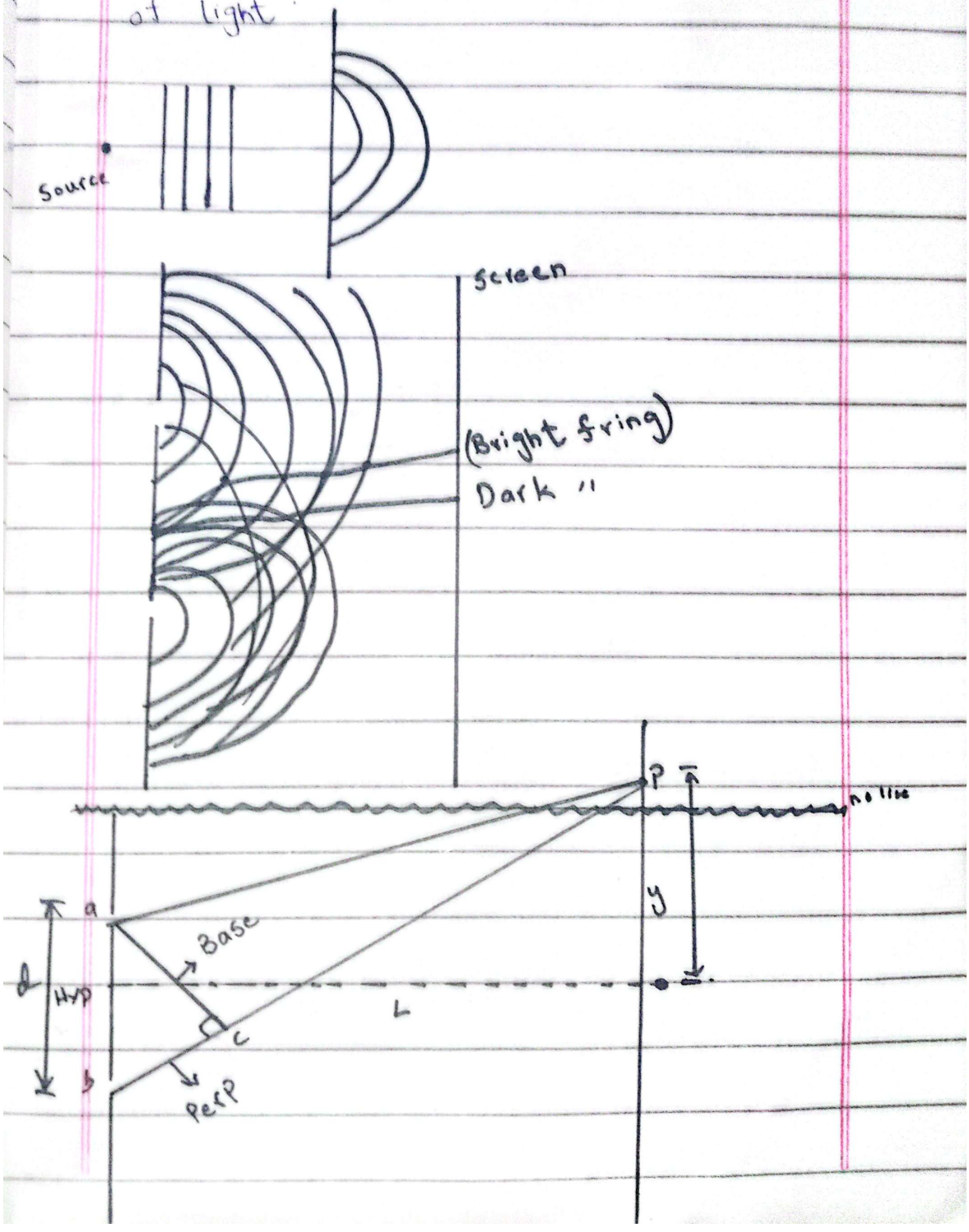
* ~~Hug~~ Huygen's Principle:-

1. Every point of wavefront may be considered as a source of secondary wavelets which spread out in forward direction with speed of light.
2. The new position of the wavefront after a certain time can be found by constructing a surface that touches all the secondary wavelets.

Date: 12-12-25 Classwork Day: Thursday

Topic: Physics.

* **Diffraction of Light**:- Bending of light when it passes through a narrow slit.
* **Young Double Slit experiment**:- Young perform an experiment to verify the wave nature of light.



Date:

If bright fring formed at P.

$\sin\theta = \frac{Per P}{Hyp}$

$\sin\theta = \frac{cb}{ab}$

$cb = ab\sin\theta$

Path diff $= d\sin\theta$ — (i)

for Constructive interference

Path difference $= n\lambda$ — (ii)

Compare (i) and (2)

$d\sin\theta = n\lambda$

$\sin\theta = \frac{n\lambda}{d}$ — (iii)

If dark fring formed at P.

Path difference $= (n+\frac{1}{2})\lambda$ — (iv)

compare equ (i) and (iv)

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

$\sin\theta = \frac{(n+\frac{1}{2})\lambda}{d}$ — (v)

from the fig

$\tan\theta = \frac{Per P}{Base}$

$\tan\theta = \frac{y}{L}$

$y = L\tan\theta$

for small angle

$\tan\theta = \sin\theta$

$y = L\sin\theta$ — (vi)

The position of bright fringe is

$y = L \sin\theta$

$$\boxed{y_n = \frac{nL\lambda}{d}}$$

The position of dark fringe is

$y = L \sin\theta$

$$\boxed{y_n = \frac{(n+1/2)L\lambda}{d}}$$

Distance between Two bright fringes.

$$y_n = \frac{nL\lambda}{d}$$

$$y_{n+1} = (n+1)\frac{L\lambda}{d}$$

$$y_{n+1} - y_n = (n+1)\frac{L\lambda}{d} - \frac{n\lambda L}{d}$$

$$\Delta y_n = \frac{nL\lambda}{d} + \frac{L\lambda}{d} - \frac{nL\lambda}{d}$$

$$\boxed{\Delta y_n = \frac{L\lambda}{d}}$$

Distance between two dark fringes.

$$y_n = \left(n+\frac{1}{2}\right)\frac{L\lambda}{d}$$

$$y_{n+1} = \left(n+1+\frac{1}{2}\right)\frac{L\lambda}{d}$$

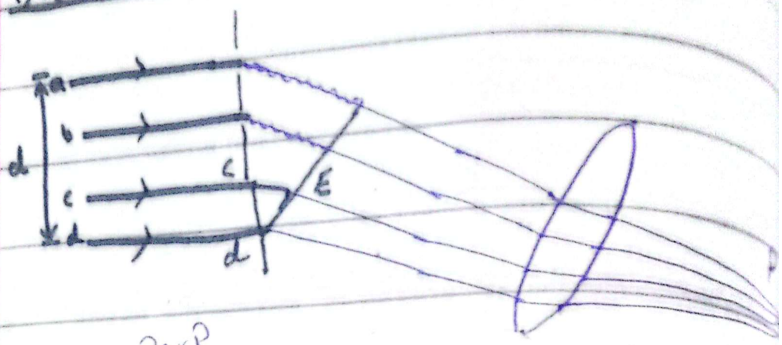
$$y_{n+1} - y_n = \left(n+1+\frac{1}{2}\right)\frac{L\lambda}{d} - \left(n+\frac{1}{2}\right)\frac{L\lambda}{d}$$

Date:

$$\left(n+\frac{1}{2}\right)\frac{\lambda}{d} + \frac{L\lambda}{d} = \left(n+\frac{1}{2}\right)\frac{\lambda}{d}$$

$$\boxed{\Delta y = \frac{L\lambda}{d}}$$

* **Diffraction Due to narrow Slit:-**



$$\sin\theta = \frac{\text{Perp}}{\text{Hyp}}$$

$$\sin\theta = \frac{CE}{Cd}$$

$$CE = Cd \sin\theta$$

$$\text{Path difference} = \frac{d}{2}\sin\theta \quad \text{—— (i)}$$

Now

$$\text{Path difference} = \lambda/2 \quad \text{—— (ii)}$$

Compare (i) and (ii)

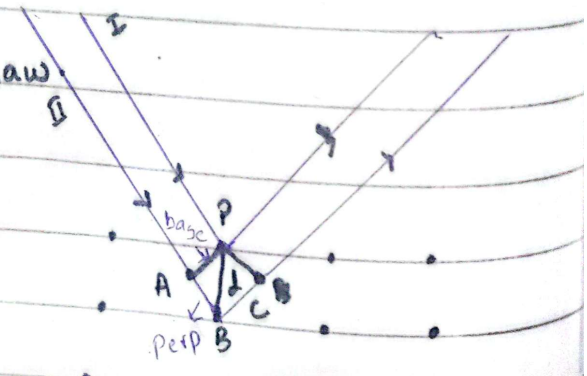
$$\lambda/2 = \frac{d}{2}\sin\theta$$

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

or

$$\boxed{n\lambda = d\sin\theta}$$

* **Bragg's Law:-**



Date: Day:

Path difference = AB + BC ——— (i)

let Δ ABC	let Δ CBD
$\sin\theta = \frac{Per\,P}{hyp}$	$\sin\theta = \frac{Per\,P}{Hyp}$
$\sin\theta = \frac{AB}{d}$	$\sin\theta = \frac{BC}{d}$
$AB = d\sin\theta$	$BC = d\sin\theta$

from equ (i)

Path difference = AB + BC

" = $d\sin\theta + d\sin\theta$

Path difference = $2d\sin\theta$ ——— (ii)

for constructive interference

Path difference = $n\lambda$ ——— (iii)

Compare (ii) and (iii)

$$n\lambda = 2d\sin\theta$$

* **Diffraction Grating:** It consists of glass plate on which very fine equidistance parallel lines are drawn.

A typical differection grating has 500 to 5000 lines per centimeter.

$$d = \frac{1\ cm}{\text{No. of Line Per cm}}$$

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