Newton's corpuler Theory

→ light is made up of small particles called corpuscles.
→ he give speed of light 3×10^8 m/s.
→ Speed of light in denser medium is more than in vaccume.
→ he explains law of reflection and refraction of light at an interface using concepts of elastic collision and momentum conservation.

Huygen wave theory

→ light travel in the form of wavefront.
→ Speed of light is greater in rarer medium and less in denser medium.

Parameter

Amplitude :- max position of particle from mean position.
Frequency :- no of wave in 1 second
wavelength :- length of 1 wave.
time period :- time required to complete one oscillation.
phase of wave :- position with respect to time.

→ three wavefronts, spherical, cylendrical, & planer.
→ wave travel in ether (for vaccume).
→ different colour have different wavelength.
→

Interference of waves

Input of defination :-

① either minimum two waves
② The frequency of the waves must be the same.

(waves are coherent, they are coming from coherent sources, phase difference

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Interference of waves

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(waves are coherent, they are coming from coherent source, phase difference = 0

Numerical type question (formula, Interfer... calculation...)

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③ Amplitude of the wave should be nearly the same.

④ The direction of the wave must be same.

⑤ plane of vibration of both wave must be same.

Process :- ~~When~~ law of superposition of waves.

Result (Conclusion) :- We have alternating bright and dark fringes of maximum intensity

Definition :- When two wave with same frequency and nearly same amplitude and travelling in same direction with same plane of ~~vibration~~ and follow law of superposition of wave that provide bright and dark fringes this phenomena is known as interference of wave.

Mathematics :- Mathematics is a tool for physics not the subject.

$$y_1 = a_1 \sin(\omega t)$$

$$y_2 = a_2 \sin(\omega t + \phi)$$

$$y = y_1 + y_2$$

$$y = a_1 \sin(\omega t) + a_2 \sin(\omega t + \phi)$$

$$y^2 = a_1^2 + a_2^2 + 2 a_1 a_2 \cos\phi$$

$$y = A \sin(\omega t + \phi)$$

$$I \propto A^2 = a_1^2 + a_2^2 + 2 a_1 a_2 \cos\phi$$

(1) (2) (3)

(formula, Interference & differection) related calculation.

Condition for constructive interference

$$I_{max} = K(a_1 + a_2)^2, \quad \cos\phi = +1$$

$$\boxed{\Delta = \frac{\lambda}{2\pi} \times \phi}$$

$$\boxed{\phi = 2n\pi}$$

$$\boxed{\Delta = n\lambda}$$

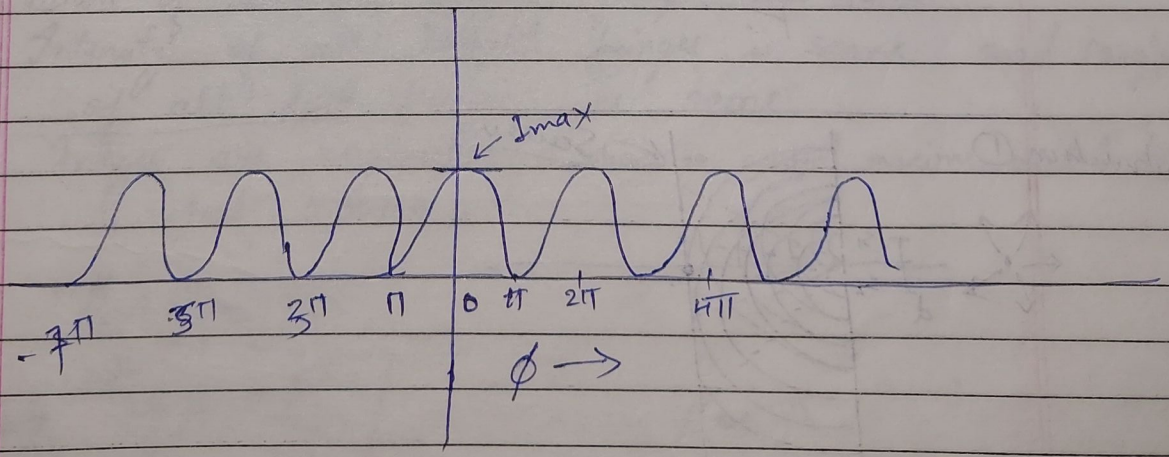
Condition for destructive interference

$$I_{min} = K(a_1 - a_2)^2 \qquad \cos\phi = -1$$

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

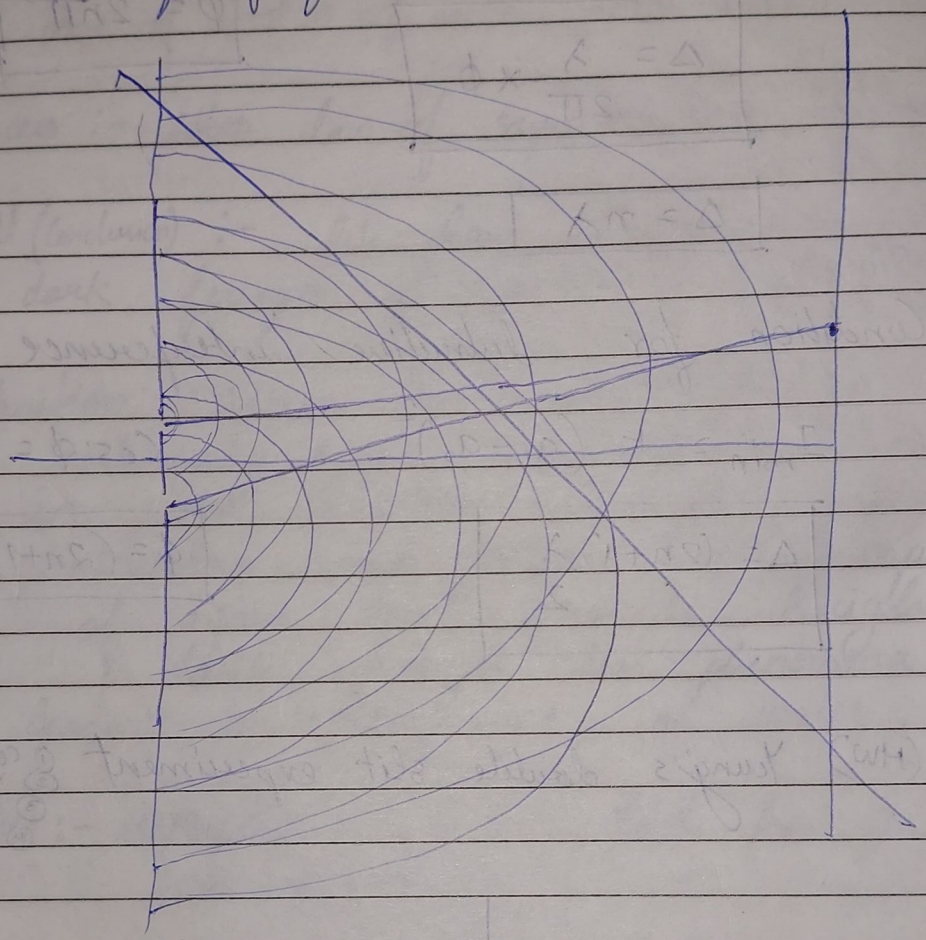
$$\boxed{\phi = (2n+1)\pi}$$

(HW) Young's double slit experiment ① const ② mat req ③ principal result ④ application

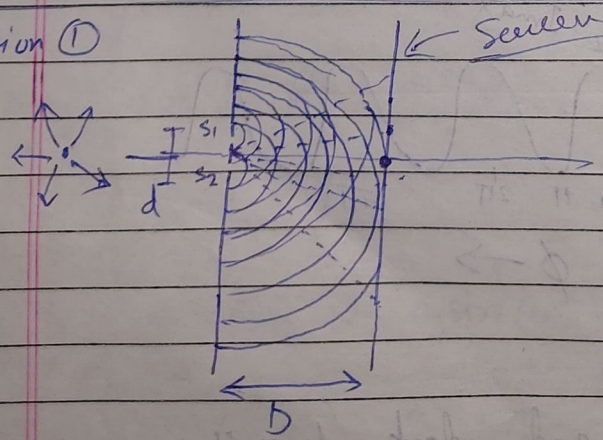


① Alternatingly bright and dark fringes.
② Intensity all bright fringes is same.
③ Intensity of all dark fringes is same.

(4) It is periodic function.
(5) angular difference b/w bright and dark fringe is π
(6) Angular width b/w of dark / bright fringe is 2π.
(7) Central bright fringe is at I_{max}.



Construction (1)



(8) Source, S_1 and (2) source.

Conditions for interference

(0) Source must be coherent.
(1) At least 2 waves. ✓
(2) frequency of wave must be same. ✓
only one coherent have same frequency. and amplitude must be nearly same.
(3) S_1 and S_2 are equal distance from source. ✓
(4) direction of wave in same direction. ✓

how Newton's ring experiment $\lambda = \frac{D_{n+p}^2 - D_n^2}{4PR}$	Construction principal result application

⇒ observation of Young's on screen

(1) We observe central maxima.
(2) Constant distance b/w bright & dark fringe.
(3) width of all bright fringe is same.
(4) width of all dark fringe is same.
(5) width of dark and bright fringe are same.
(6) Intensity of all bright fringes is same. and intensity of all dark fringe is same.
(7) Fringes are symmetric above central maxima and below central maxima.

⇒ Application

(1) fringe width → $\beta = \frac{D\lambda}{2d}$

$\beta \propto \lambda$

$\lambda \uparrow$ then $\beta \uparrow$

$\lambda \downarrow$ then $\beta \downarrow$

red light have more β

violet light have less β

Qun 3 Numerical type ques

$\beta \propto D$

D = distance b/w screen and slits

up to some limits

$\beta \propto \frac{1}{2d}$ d = distance b/w two slits.

width b/w slits should be small.

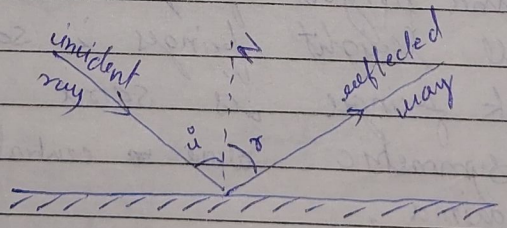
small d have more β.

★ Maths is only tool for physics

$$\lambda = \frac{\beta 2d}{D}$$

We can calculate unknown wavelength of unknown source with a scale only.

★ Phenomena of reflection



★ Phenomena of refraction

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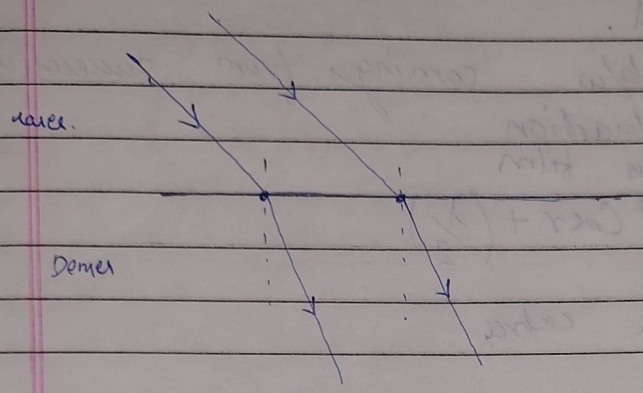
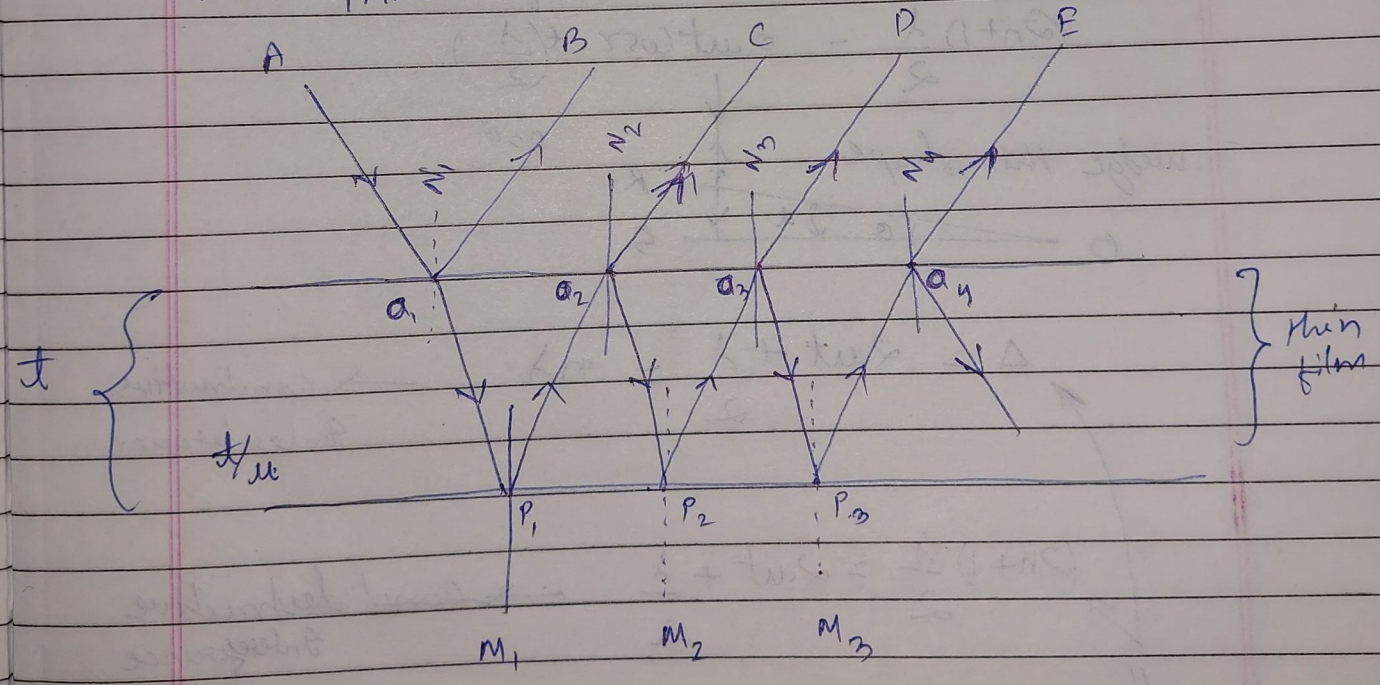
★ phenomena of refraction.



★ phenomena of TIR.
★ phenomena of dispersion.

Thin film



① there should be path difference
② at least two waves.
③ direction of both wave same.

take O_1B and O_2C

④ Thin film we see ~~white~~ ~~dig~~ colour when white light is taken.

Qun 3 Numerical type question

Principle of newtons ring experiment.

wedge - shaped.

Rule ① path difference b/w coming from successive reflection and refraction

path difference in thin film

$$\Delta = 2\mu t \cos r + \left(\frac{\lambda}{2}\right)$$

there will be an extra

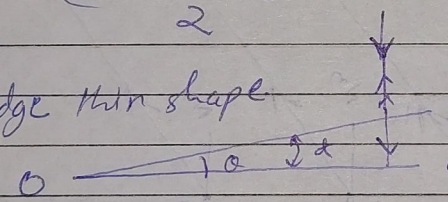
Condition for constructive Interference

$$n\lambda = 2\mu t \cos r + \left(\frac{\lambda}{2}\right)$$

Condition for destructive Interference

$$\frac{(2n+1)\lambda}{2} = 2\mu t \cos r + \left(\frac{\lambda}{2}\right)$$

wedge thin shape



$$\Delta = 2\mu t + \frac{\lambda}{2} = n\lambda \longrightarrow \text{constructive Interference}$$

$$\frac{(2n+1)\lambda}{2} = 2\mu t + \frac{\lambda}{2} \longrightarrow \text{destructive Interference}$$

Effective path difference

t=0 destructive interference