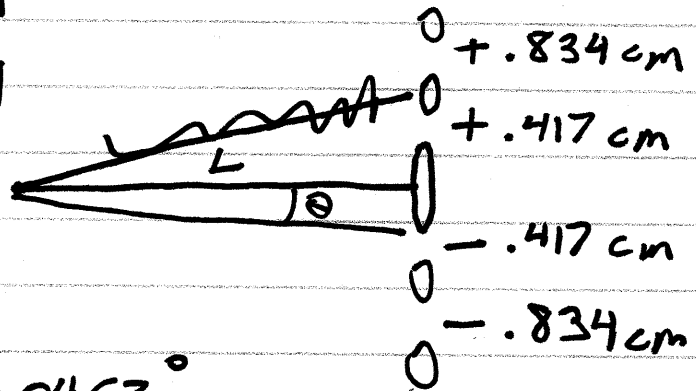


① Phys 1402 2014-11-18

650 nm Laser
5.16 m from screen
0.417 cm dot spacing



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

$$\theta = \tan^{-1} \frac{y}{L} = 0.0463^\circ$$

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

$$d = \frac{m\lambda}{\sin \theta} = \frac{(1)(650 \text{ nm})}{\sin \theta} = 804 \mu\text{m}$$

Measured width w/ calipers = 0.81 mm

HW5 Questions

#14 Mosquito 36 dB } 28 dB difference
Vacuum 64 dB }

$$28 \text{ dB} \Rightarrow 10^{\beta/10} = 10^{2.8} = 631$$

#15 Speed of Light $c = 3 \times 10^8 \text{ m/s}$

$$v = \frac{d}{t}$$

$$\text{Ex: } d = 5.8 \times 10^{18} \text{ m}$$

$$t = d$$

$$t = \frac{d}{v}$$

$$t = 1.93 \times 10^{10} \text{ s}$$

(2)

#16
$$\text{Intensity} = \frac{P}{\text{Area}}$$

P of star \rightarrow spreads over sphere
 $A = 4\pi r^2$
 $r = \text{dist from star}$

Intensity \rightarrow Hits cross-section of Earth
 $A = \pi r^2$
 $r = \text{radius of Earth}$

③

Optics - Controlling Waves

Normally, waves travel in "rays".

- Rays are straight.
- They start at a source.
- They stop when they hit something.

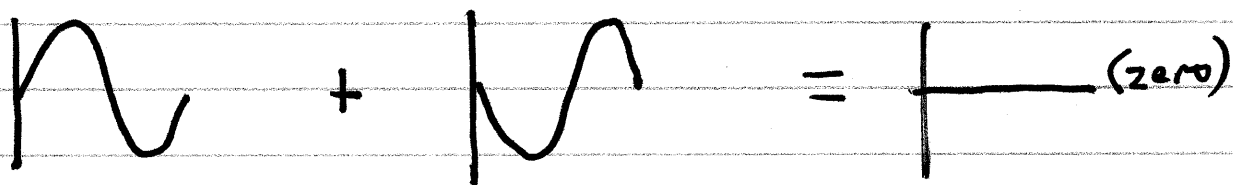
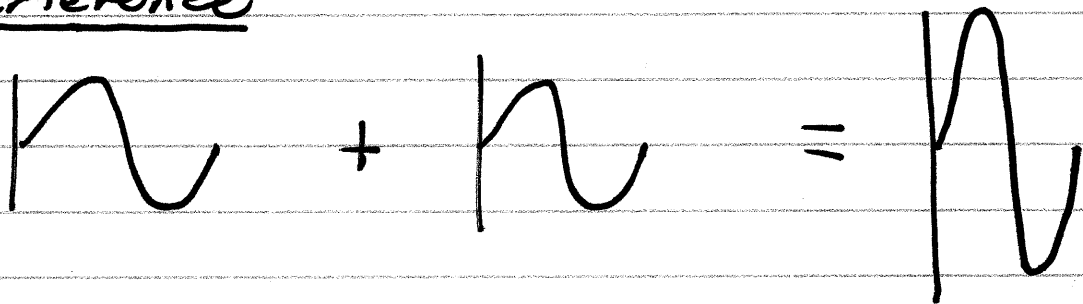
How can we change this?

- Use the wavelength - block part of the beam and interference causes preferred directions.

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

- Use the speed - reflection and refraction are the bending of light as it changes speed.

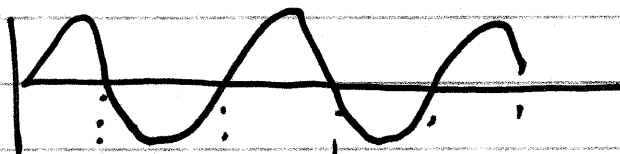
Interference



④

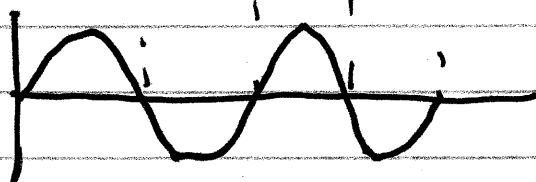
Wave

①



Wave

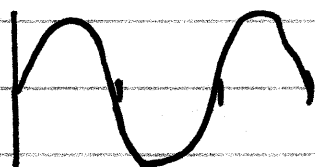
②



Shifted sideways
by $\frac{1}{2}\lambda$

Wave

③



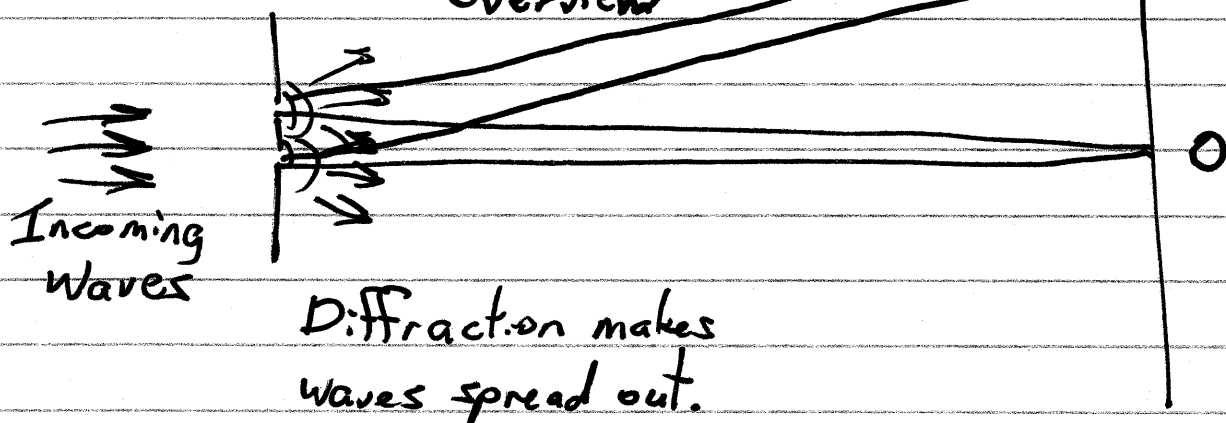
Shifted by λ

Waves 1 and 2 cancel: Destructive Interference.

Waves 1 and 3 add: Constructive int.

Two-Slit Experiment

Overview



• Point 1 is closer to the upper slit.

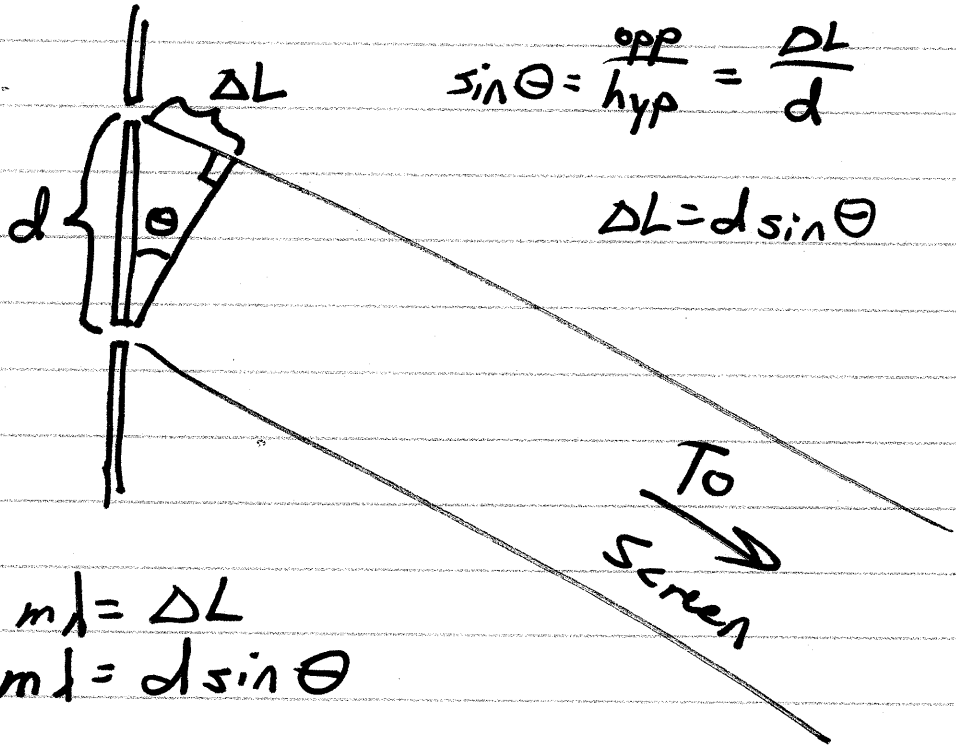
IF $\Delta L = \frac{1}{2}\lambda$, destructive interference.

IF $\Delta L = \lambda$, constructive.

Generally, $\Delta L = m\lambda$ $m = \text{integer}$, constructive.

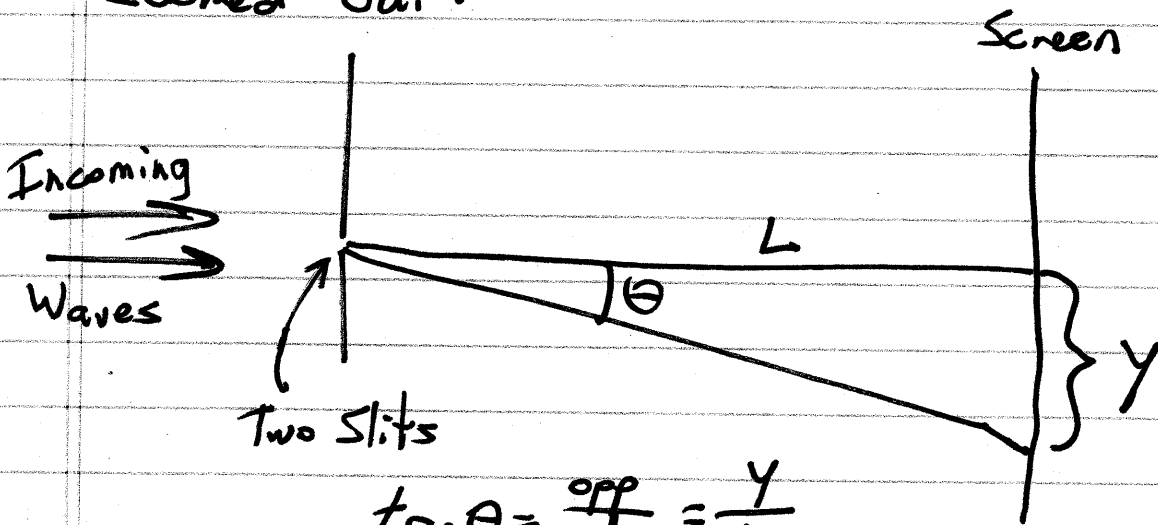
⑤ (M)

Zoomed in:



Whenever θ fits the equation and m is an integer, we can see a bright spot.

Zoomed out:



$$\tan \theta = \frac{\text{opp}}{\text{adj}} = \frac{y}{L}$$

Note: Larger λ \rightarrow Larger θ .
Smaller d \rightarrow