Lab 3: Wave & Geometric Optics

Part A: Use rightmost column slits, 2nd and 3rd from top

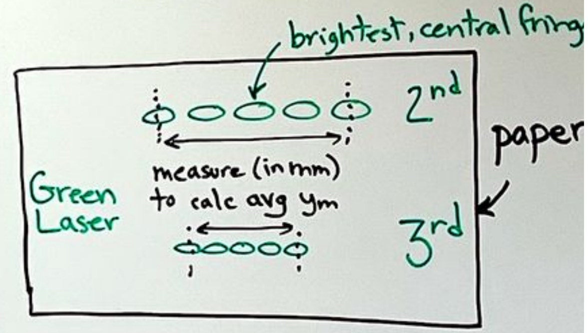
PLO

- green → red laser: $\lambda \uparrow$
- 2nd → 3rd slits: $d \uparrow$

$$y_m = \pm \frac{m \lambda L}{d}$$

y_m ← bright fringe spacing

(eg) Use one paper per laser, label as below:



* repeat for red laser *

Part B: Is $\theta_i \approx \theta_r$? $\Longrightarrow$

2 cases: $\theta_i \approx 25°$

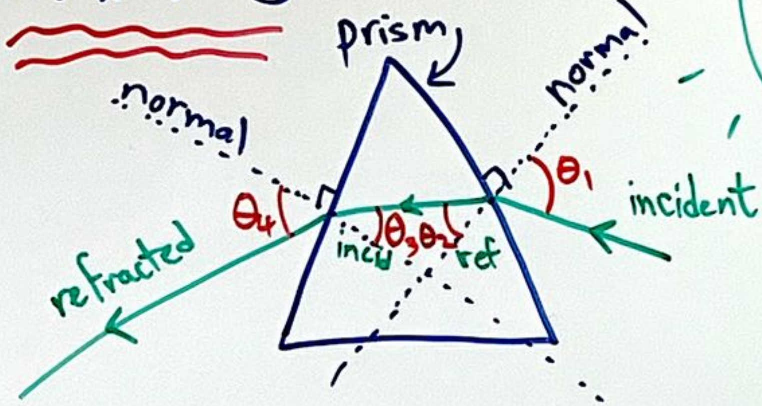
$\theta_i \approx 65°$

$$\%\,diff = \frac{hi - lo}{avg} \times 100$$

$\leq 5\%$?

PLO

PART C:



extend rays/normals so protractor can measure θ's ($\pm 1°$)

Snell's Law:

$$n_i \sin\theta_i = n_r \sin\theta_r$$

- match correct n and θ!
- watch sig figs!
- $n_{air} = 1.000$; $n_{prism} = ?$ (calc)

$$\%\,dev = \frac{exp't - expect}{expect} \times 100$$

$\leq \pm 5\%$?

PART D:

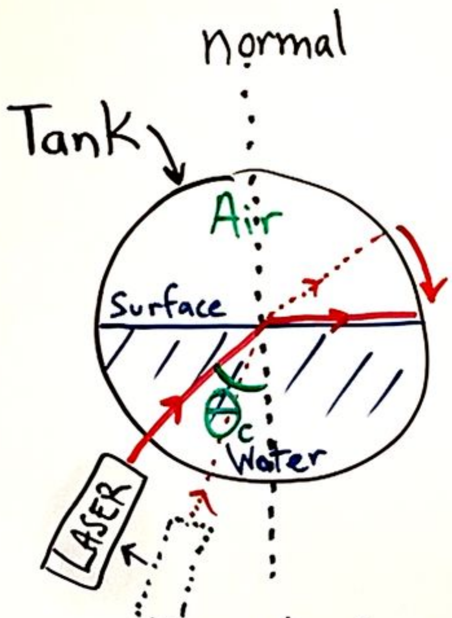
*Snell's Law:

$$n_i \sin\theta_i = n_r \sin\theta_r$$

- match n and θ; watch sig figs
- $n_{air} = 1.00\underline{0}$; $n_{water} = ?$ (calc)

PLO

*Critical angle of refraction:



increase θ_i until refracted ray is parallel to surface of water

$$n_{water} \sin\theta_c = n_{air} \sin 90^\circ$$

$$\therefore \sin\theta_c = \frac{(1.00\underline{0})}{n_{water}} \times \underbrace{\sin 90^\circ}_{=1}$$

solve for θ_c

use average experimental value