WAVES, SOUND & PHYSICAL OPTICS DAY 13: LAB: MEASURE WAVELENGTH WITH INTERFERENCE

CED 14.8 · Skills 3.A/2.D · FRQ: Experimental Design

RETRIEVAL

Write the bright-order condition $d \sin\theta = m\lambda$. Circle the quantity your group will measure directly on the screen.

QUESTION AND SAFETY

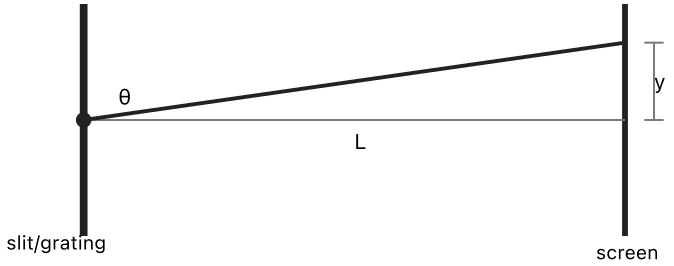
Question: What wavelength follows from the fringe geometry?

Safety: Keep the beam below eye level and on a matte screen. Never look into the laser or aim it at a person.

NOTES / REASONING

GEOMETRY AND DATA

MEASURED RIGHT TRIANGLE



trial/order	m	L (m)	y_m (m)	θ=tan⁻¹(y/L)	λ=d sinθ/m
1					
2					
3					
4					
5					

Measure across several fringe spacings and divide to reduce the fractional ruler uncertainty.

NOTES / REASONING

TWO ANALYSIS ROUTES

Exact

$\theta = \tan^{-1}(y/L)$, then $\lambda = d\sin\theta/m$.

Small angle

For small θ, $\lambda \approx dy/(mL)$.

Use both routes for one trial. Calculate the percent difference between the wavelength estimates.

Calculate a mean wavelength and a range or uncertainty from repeated orders or trials.

EVALUATION

1. State the measured wavelength with units and uncertainty.

2. Identify the dominant measurement uncertainty and justify using fractional uncertainty.

3. Predict how increasing L affects fringe spacing and fractional position uncertainty.

4. If using a hair, explain why its diameter plays the role of single-slit width rather than double-slit separation.