WAVES, SOUND & PHYSICAL OPTICS DAY 7: LAB: STANDING WAVES ON A STRING

CED 14.6 · Skills 3.A/2.D · FRQ: Experimental Design

RETRIEVAL

Write $f_n = nv/(2L)$. For fixed L and v, predict the shape of a graph of f_n versus n.

QUESTION AND SAFETY

Question: Do measured harmonics and tension dependence support $f_n = nv/(2L)$ and $v = \sqrt{T/\mu}$?

Safety: Wear eye protection, keep faces away from the vibrating string, secure the pulley, and keep feet and hands out from under hanging masses.

NOTES / REASONING

PART A: HARMONIC LADDER

Keep string length and tension fixed. Locate at least four resonances.

n	resonant f (Hz)	λ=2L/n (m)	v=fλ (m/s)
1			
2			
3			
4			

Graph f_n vertically versus n horizontally. Interpret the slope in terms of v and L.

PART B: TENSION

Hold L, μ, and harmonic number fixed. Change one tension at a time.

mass (kg)	T=mg (N)	f (Hz)	λ (m)	v (m/s)	√T
1					
2					
3					
4					

Plot v versus $\sqrt{T}$. Include units and a best-fit line.

ANALYSIS AND CLAIM

1. Use the Part A slope to calculate wave speed.

2. Use the Part B slope to estimate μ.

3. State whether each model is supported, citing a graph feature and numerical evidence.

4. Identify one measurement limitation and explain its likely effect.