Thin Lens Lab

Procedure

Make a chart with Quantity Measured/Symbol for Measurement/Instrument Used. Briefly, but completely, describe the procedure for this lab – and include labeled sketches.

Data

Part 1

p	*q*	*pq*	*p+q*

Part 2

	Distance
Light to Lens 1	
Lens 1 to Lens 2	
Lens 2 to Screen	
Object Height	
Image Height	

Graph

Using appropriate scales and labels graph the product of ***p*** and ***q, (pq),*** on the *y*-axis, and the sum of ***p*** and ***q, (p+q),*** on the *x*-axis. Find the best fits line of this linear graph.

Questions

1) Show how the thin lens equation can be rearranged to an equation in the form of $y = mx$, with *y* as ***pq***, *x* as ***p+q*** and slope as the focal length of the lens.

2) Use your graph to find the focal length of the lens. Show your work. Indicate which lens (A or B) you were using.

3) Use your focal length from #2, along with the object distance you measured for Part 2 to find the first image distance. Use that value, along with the distance from lens 1 to lens 2 to find the a second "object" distance for lens 2. (The image from lens 1 becomes the object for lens 2, and the object distance is <u>not</u> the distance from lens 1 to lens 2!) Use your second object distance and the second image distance (from lens 2 to screen) to calculate the focal length of the second lens. Indicate which lens has which focal length.

4) As accurately as possible, sketch a lens diagram for the complex lens case. Use the distances measured between the light source, lens 1, lens 2 and screen, along with the focal lengths of the lens – one you found from in question #2, the other from question #3. Make your drawing to scale and include the scale you used.

5) Measure the height of your object and final image from your lens diagram. Use these values to find the magnification of the complex lens combination. Then use the actual heights of the light source object and image measured during the lab to find the magnification of the complex lens combination.

6) Using your answer for magnification found from actual measurements as the accepted value, and your lens diagram magnification as the experimental value, find the % error.

Error Analysis

Thoroughly explain what the main sources of error are for this lab, and how you would correct them. Use a t-chart to organize your analysis.