

GEOMETRIC OPTICS DAY 10: LAB L13.3: FOCAL LENGTH AND IMAGE SURVEY

CED 13.4 · Skills 3.A/2.D · FRQ: ED · bounded investigation

RETRIEVAL

A real object moves toward a converging lens focal point while staying outside f . Predict what happens to the real image distance: **decreases / stays fixed / increases toward infinity**.

QUESTION AND SAFETY

Question: What focal length is supported by a reciprocal-distance fit, and how does image character change with object position?

Safety: lamps can become hot. Switch off power before moving or storing a lamp, and never use the Sun as the object.

NOTES / REASONING

IMAGE SURVEY

trial	d_o (cm)	d_i (cm)	orientation	relative size
1				
2				
3				
4				
5				

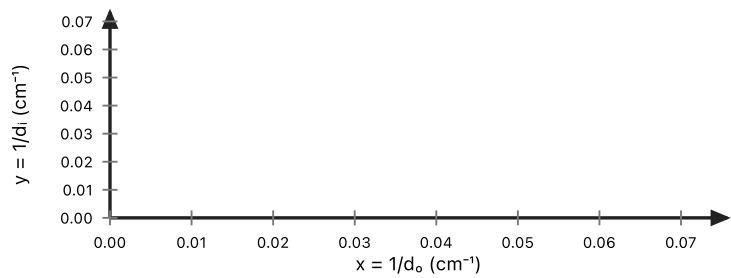
Method: state how your group decides that the screen image is in best focus and how both distances are referenced to the lens center.

Use a range of d_o values rather than clustering trials near one position.

LINEARIZED GRAPH

trial	$x = 1/d_o \text{ (cm}^{-1}\text{)}$	$y = 1/d_i \text{ (cm}^{-1}\text{)}$	residual
1			
2			
3			
4			
5			

PLOT INVERSE IMAGE DISTANCE AGAINST INVERSE OBJECT DISTANCE



Fit: draw one best-fit line and record its slope and vertical intercept.

ANALYSIS AND CONCLUSION

1. Rearrange the lens equation into $y = mx + b$ for the chosen axes.

2. Use the vertical intercept to calculate f with units and uncertainty.

3. Compare the fitted slope with the model value and discuss one systematic source of disagreement.

4. Summarize image orientation and size as d_o moves from beyond $2f$ toward f .