Physics 251 Laboratory
Spherical Lenses

Introduction

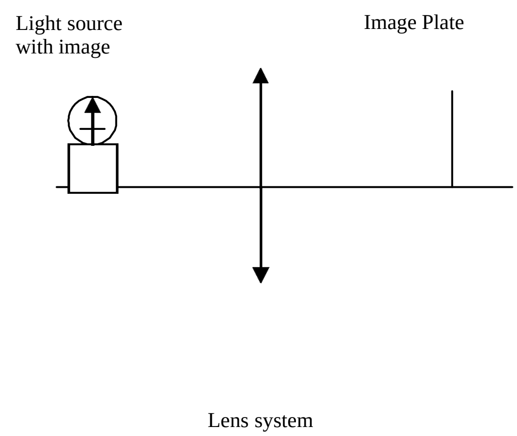
In class recently, we have been studying optical systems and geometric optics. In this lab you will calculate the focal length of a lens system and practice using primary ray diagrams. The lens equation $\frac{1}{s}+\frac{1}{s'}=\frac{1}{f}$ where s is the object distance, s' the image distance and f is the focal length of the lens is used to determine focal lengths for unknown thin lens systems. Remember from lecture that $power=\frac{1}{f}$.

Equipment and Supplies

Computer with Microsoft Excel
Optics track
Light source with object
Converging lens with stand
Image plate
Ruler

Section 1

1. Set up the optics track with the light source on one end followed by the lens system (fixed at the center) and the image plate as shown in the picture to the right.

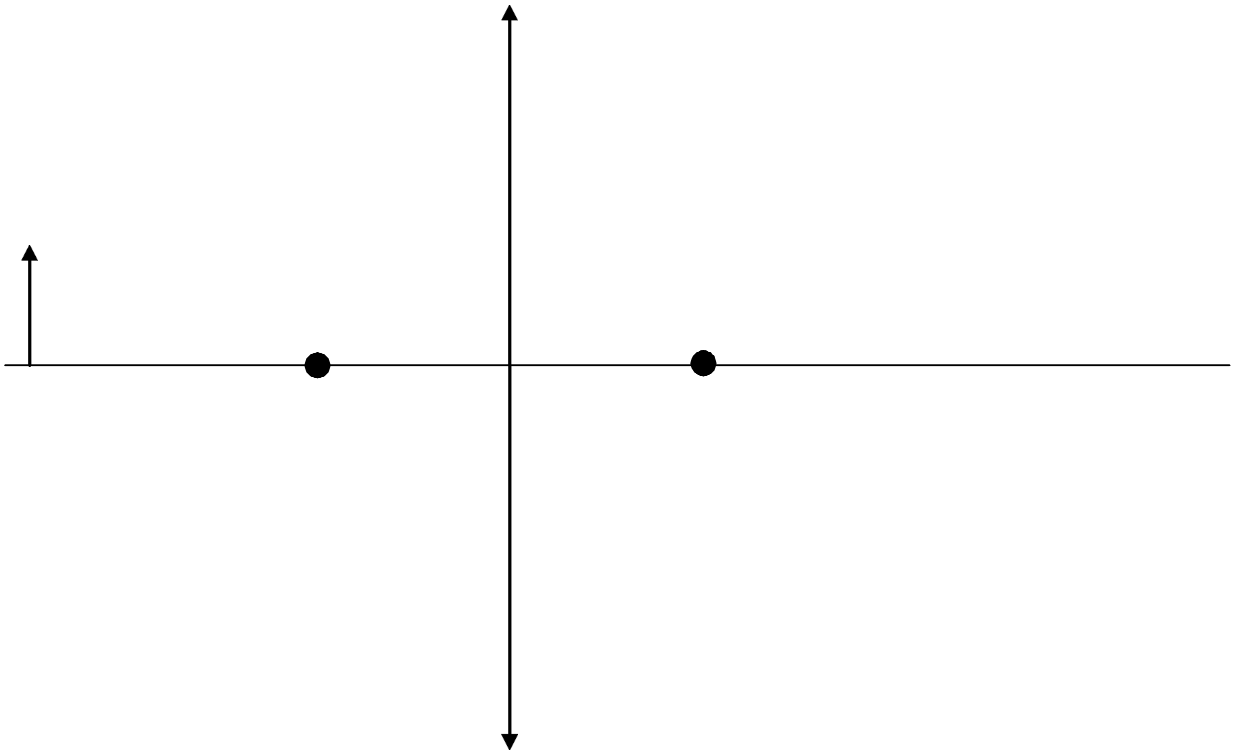


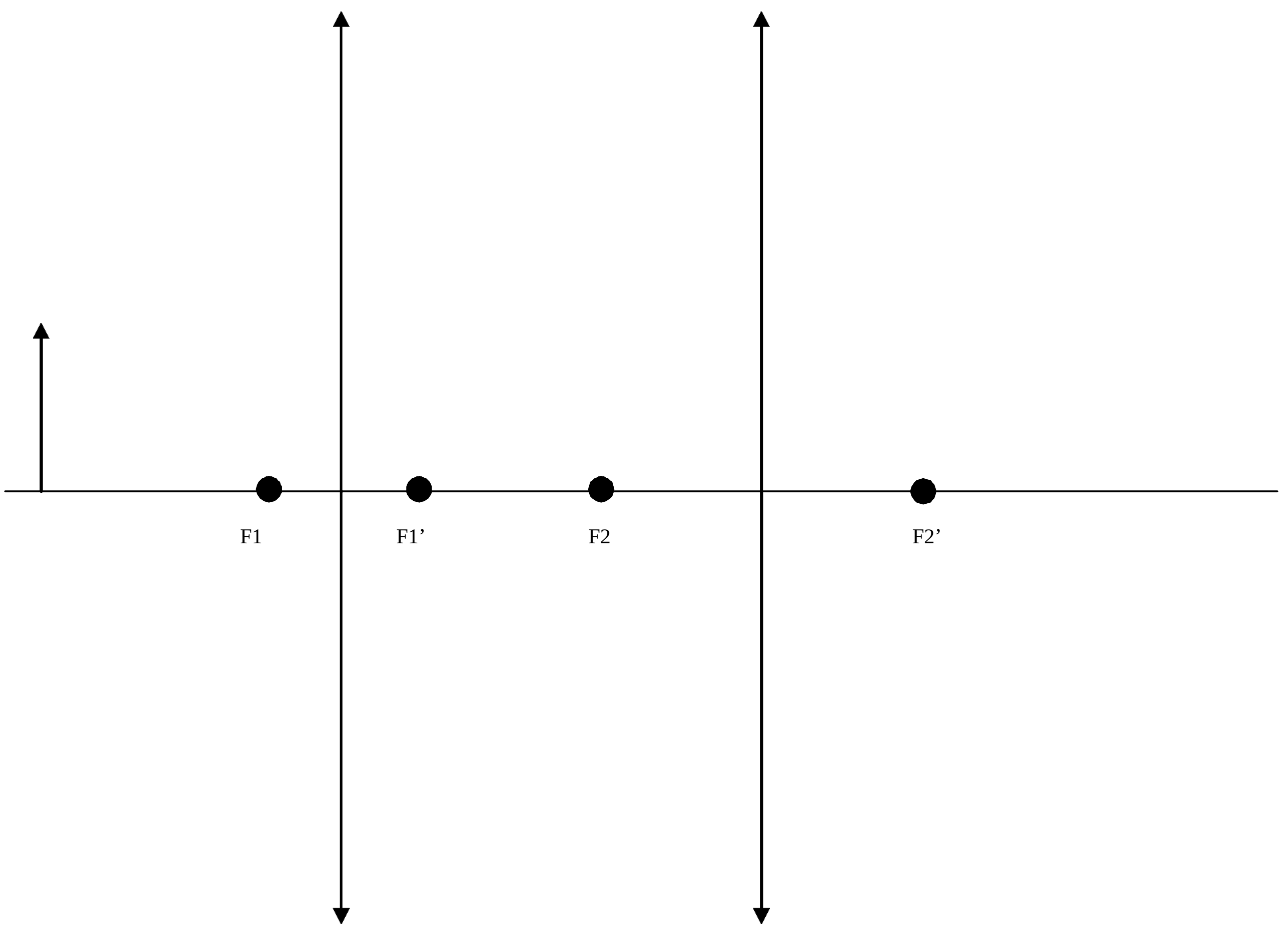
2. Measure and record image distance for at least 10 different object distances (from the lens). Move the image screen until the image is in sharp focus and record the distance of the screen from the lens. These are your s and s' for the system.

3. Graph $\frac{1}{s}$ vs. $\frac{1}{s'}$ as an xy scatter plot. Add a trend line and print the equation on the graph. The y intercept, b, ($y=mx+b$) is the power of the lens.

Section 2

1. Draw the principle rays for the lens systems shown on the next page.
2. Measure distances of object, image and focal points with your ruler.




F1
F1’
F2
F2’

NAME ____ DATE ________________________

LAB PARTNERS ____

Spherical Lenses
Results

Section 1

Object	Image	Object	Image	Object	Image

1. What is the power of your lens system? _______________________________________
2. What is the focal length of your lens system? ___________________________________

Please attach your graph of $\frac{1}{s}$ vs $\frac{1}{s'}$ with the trend line and print the equation on the graph.

Section 2

1. What is the calculated final image distance for the second system?___________________
   F_1 = 1cm, F_2 = 2.2cm, s = 4cm from the first lens, d = 5.5cm (between lenses)

2. Does this agree with measurements from your principle ray diagram?_________________

Overall

Explain to “the boss” why the method used in part 1 to determine the focal length is a good (or bad) way to determine the focal length of an unknown lens. ___________________________

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What was good about this lab and what would you do to improve it?

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