LAB 30, CONVERGING LENSES

Name _____ Period_____

**** Please Bring a Flashlight & Candle for this Lab! ****

Converging lenses can produce both real and virtual images; diverging lenses can produce only virtual images. In this experiment we shall study image formation by a converging lens.
Since the rays of light converge to form the image, it is a real image and can be projected on a screen.

OBJECTIVE: After completing this experiment, you should be able to determine the focal length of any converging lens and understand its image forming characteristics.

PROCEDURE:

1. Focal length

Support a converging lens and a paper screen on a meterstick. Use a flashlight's parallel rays to find the focal point by focusing its image onto the screen and measuring the distance from the **lens to the screen**. Move the screen back and forth until the sharpest image is obtained. Record this focal length in the data table. You are now finished with the flashlight. **Secure it.**

2. Formation of images. The candle flame is the Object.

Case 1. Set or hold the lens in the center of the meterstick. Place the object (the candle flame) beyond the **2f** of the lens. By moving the screen back and forth, find the sharpest image on the screen placed on the opposite side of the lens.
Measure and record in the data table the object distance, $\mathbf{d_o}$, from lens to the object, the image distance, $\mathbf{d_i}$, from the screen to the lens, the height of the object (the flame)**,** $\mathbf{h_o}$, and the height of the image, $\mathbf{h_i}$, on the screen.

Case 2. Place the object (candle) **on** the **2f** from the lens. Move the screen back and forth until the sharpest image is obtained. Record in the data table the object distance, $\mathbf{d_o}$, from lens to the object, the image distance, $\mathbf{d_i}$, from the screen to the lens, the height of the object (the flame)**,** $\mathbf{h_o}$, and the height of the image, $\mathbf{h_i}$, on the screen.

Case 3. Locate the object (candle) between the **2f** and the **f**. Move the screen back and forth until the sharpest image is obtained. Record in the data table the object distance, $\mathbf{d_o}$, from lens to the object, the image distance, $\mathbf{d_i}$, from the screen to the lens, the height of the object (the flame)**,** $\mathbf{h_o}$, and the height of the image, $\mathbf{h_i}$, on the screen.

Case 4. Place the lens so that it is exactly one focal length away from the object. Try to form an image on the screen.

Observation_____.

Look through the lens at the object. Observation_____.

Estimate the size and distance of the ***virtual image*** as seen **through** the lens _____.

Case 5. Place the object between the **f** and the lens. Try to form an image on the screen. Remove the screen and, placing your eye close to the lens, look **through** the lens at the object. Estimate the size and distance of the ***virtual image*** as seen through the lens_____.

Data Table:

..... Focal length for lens (f) _____(cm)

Case	d_o (cm)	d_i (cm)	h_o (cm)	h_i (cm)
1	.	.	.	.
2	.	.	.	.
3	.	.	.	.
4	.	.	.	.
5	.	.	.	.

CALCULATIONS (show them on the back):

1. For each trial recorded in the data table, compute the reciprocals of the object distance $\mathbf{d_o}$, the image distance $\mathbf{d_i}$, and the focal length **f**. Add the reciprocals of $\mathbf{d_o}$ and $\mathbf{d_i}$ and compare their sum with the reciprocal of **f**. Record the results of these computations in the calculations table.

2. For each trial recorded, compute the two ratios $\mathbf{d_o/d_i}$ and $\mathbf{h_o/h_i}$ and compare the results. Record these results in the calculations table..... **Calculations Table:**

Case	$1/d_o$	$1/d_i$	$1/d_o + 1/d_i$	1/f	d_o/d_i	h_o/h_i
1	.	.	.	.	.	.
2	.	.	.	.	.	.
3	.	.	.	.	.	.
4	.	.	.	.	.	.
5	.	.	.	.	.	.

QUESTIONS:

1. Explain the nature of the images in Case 4 and Case 5. DRAW A DIAGRAM of each.

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2. Why would it be better to use the sun to find the focal length than a flashlight?

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CRITIQUE: