PHYSICS

LAB - *CONVEX LENSES* NAME ______________________

OBJECTIVE: To determine the focal length of a convex lens and to observe real and virtual images formed by convex lenses.

MATERIALS:

Meter stick	Lens support	2 meter stick supports
Candle	Convex lens	Screen
Matches	Screen support	

PROCEDURE

1. **Finding the focal length of a convex lens.**
   Put the lens at the center of the meter stick. Place the screen and screen support at the 75 cm mark on the meter stick. Take the meter stick out of the supports and bring it to the window. Aim the meter stick at a distant object that can be seen through the window (fig 1). Move the screen slowly towards the lens until you see and image of the object on the screen. Adjust the screen until the object is in sharp focus.
   The parallel rays from the distant object converge to the focal point of the lens, thus, the focal point is where the screen is located. The distance from the lens to the focal point is the focal length of the lens. Record the focal length in table 1.
   Take 2 more trials by having different lab partners try find the focal length. Record the results in table 1. Take an average for these values and record as your final result. Report this to your teacher before you go on.

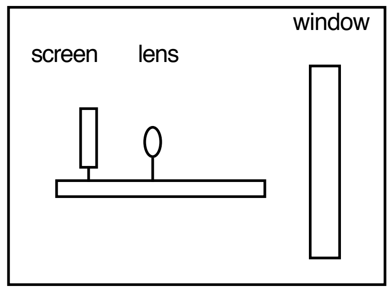

figure 1

2. **Finding the image of an object.**
   Place the meter stick back in the supports. Place the candle at the 10 cm mark for the rest of the experiment - this will be your object. Place the lens at a distance of more that 2 times the focal length from the object (Example - If your focal length was 20 cm than 2f = 2x20 = 40, so you would want to put your lens over 40 cm away from the candle - perhaps the 60 cm mark on your meter stick). Put the screen on the other side of the lens (fig 2) and adjust until a clear image appears on the screen. Record d_o, d_i, h_o, h_i, size of image compared to object, whether the image is real or virtual, and whether the image is inverted or upright in table 2.

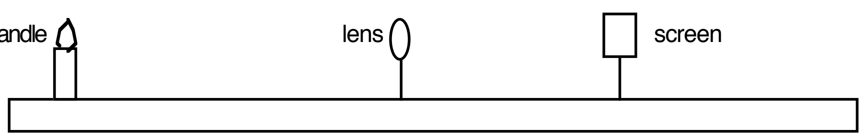

figure 2

3. Repeat step #2 with the lens set so the distance between the object and the lens is between F & 2F.

4. Repeat step #2 with the lens set so the distance between the object and the lens is exactly 2F.

5. Place the lens so the distance between the object and the lens is less than F. Attempt to find an image on the screen. Can you find one? Take the screen off the meter stick and look straight through the lens at the candle. What do you see? Record the comparison of image size, the type of image, and the direction of the image in table 2.

TABLE 1

NAME ______________________

TRIAL 1	
TRIAL 2	
TRIAL 3	
AVERAGE	

TABLE 2

Position of object	d_o	d_i	h_o	h_i	Image size (larger or smaller)	Type of image (Real or virtual)	Direction of image (Inverted or upright)	Focal length
Beyond 2F								
Between F and 2F								
At 2F								
Less than F	X	X	X	X				X

ANALYSIS

1. Calculate the focal length for each case above.

2. Compare to your final result from part 1 those you just calculated. Make a table and discuss the results in your discussion.

3. For each trial in table 2 compute the magnification by d_o/d_i and h_o/h_i and compare the results.

4. Use your results to answer the following in your discussion: Where must the object be for a convex lens to act as a magnifying glass?

5. Answer in your discussion: Why is it better to use the sun as the distant object than it is to use a house or tree when finding the focal length of the lens?

6. (extra credit) Set up your apparatus to determine the focal length of the lens by the method of parallax (this method gives a much better estimate). See your teacher for details.