Group # Names: _____

Date: _____

_____

Lenses

I. Focal Length

Take a *convergent* lens ans examine it. Is it thicker or thinner in the center? What do objects look like through it? Could it be used as a magnifying glass? Try the lens both close to objects and far from them. Record your observations in the space below.

If a lens is used to form an image of something infinitely far away, the distance from the lens to the image is defined to be the focal length. For now, infinitely far away will have to mean, say, across the street. Use the lens to form an image of something far away... something outside the building, preferably. To see the effect, you may want to try this first by holding a piece of paper behind the lens and varying the distance between them until you obtain the image of an object outside, e.g., a tree.

To do this more quantitatively, place now the lens in a lens holder on the optical bench and move the screen on the bench until a sharp image is formed on it. Then read off the focal length using the scale on the optical bench.

Focal length =

Is the image right side up?	Is the image magnified?

II. Image–Object Relationships

In this part you will use the light box as the object, while the lens will form images of this box on the screen, using the optical bench. Place the object and the screen at opposite ends of the bench such that the distance between them is $L = 110\,\text{cm}$. Now move the lens between them until a sharp image is formed on the screen. Record the distance from the lens to the object (p) and the distance from the lens to the image (q). Measure also the height of the image (h'). Note that there are <u>two</u> positions for the lens at which you obtain sharp images on the screen. Move the object in by 10 cm and repeat your measurements. Use the table below to record the data (columns 2–4).

L (cm)	p (cm)	q (cm)	h' (cm)	f (cm)	h'/h	q/p
110						
110						
100						
100						
90						
90						
80						
80						
70						
70						

Use the lens equation to calculate the focal length and fill in column 5 in the table above. Do you get consistent values for the focal length?

Do these results agree with the focal length you found in the first part of the experiment?

Which of the measurements of the focal length f is the most accurate and which is one is the least reliable? Explain your answer below.

Finally, calculate and fill in the last two columns of the table. Do you find the two ratios are equal?

Explain why for a fixed distance between the object and the image you get sometimes two positions at which the lens gives you a sharp image, while for others only one or even none at all.

Time: 1 h 00 min.