

## Lab 7 – Focal Length of a Thin Lens

Name \_\_\_\_\_

### I. Introduction/Theory

The purpose of this experiment is to determine the focal length of a thin lens. For a thin lens:

$$\frac{1}{f} = \frac{1}{o} + \frac{1}{i}$$

Where  $f$  is the focal length,  $o$  is the object to lens distance, and  $i$  is the image to lens distance. See Figure 1.

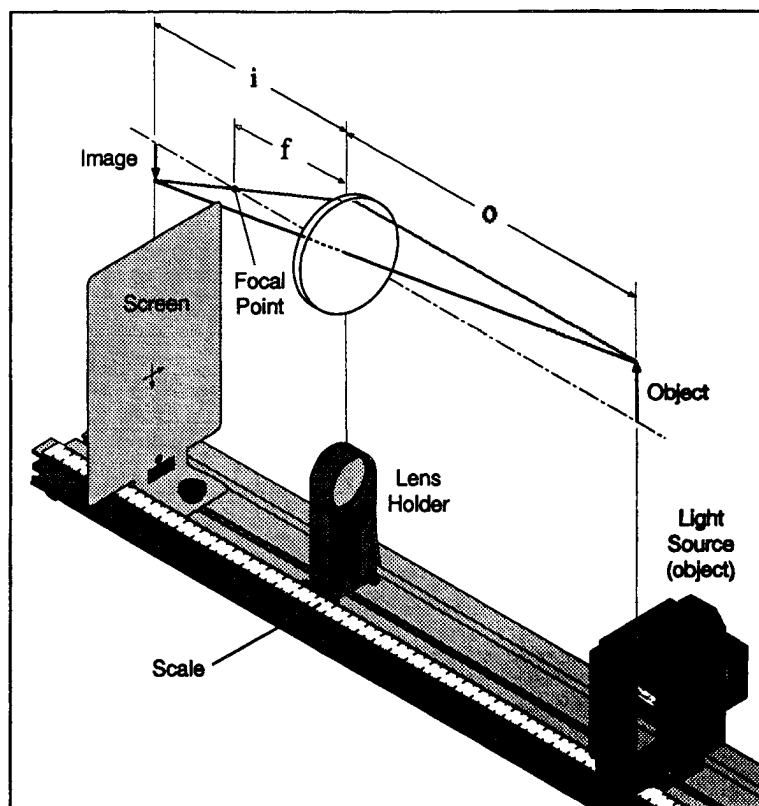


Figure 1

## II. Equipment

Optical Bench

Convex Lens ( $f = 10\text{ cm}$ )

Light Source

Screen

Ruler

## III. Procedure/Data

1. On the optical bench, position the  $\sim 10\text{ cm}$  focal length lens between the light source (the object) and the screen. Be sure the object and the screen are at least one meter apart.
2. Move the lens to a position where an image of the object is formed (and focused) on the screen. Measure the image distance and the object distance. Record all measurements in table 1.
3. Measure and record the object size and image size for this position. Also, observe and record the image orientation in table 1.
4. Move the lens to a second location between the object and screen where the image is in focus on the screen. NOTE: do not move the screen or light source from the previous step. Measure the image distance and the object distance. Record all measurements in table 1.
5. Measure and record the object size and image size for this position. Also, observe and record the image orientation in table 1.
6. Move the screen toward the object until you can no longer find two positions of the lens where the image will focus. Then move the screen a few centimeters further away from the object.
  - a. Move the lens to a position where an image of the object is formed on the screen. Measure the image distance and the object distance. Record all measurements in table 1.
  - b. Move the lens to a second location between the object and screen where the image is in focus on the screen. NOTE: do not move the screen or light source from the previous step. Measure the image distance and the object distance. Record all measurements in table 1.

| Trial | Object Distance | Object Size | Image Distance | Image Size/Orientation | Focal Length |
|-------|-----------------|-------------|----------------|------------------------|--------------|
| 1     |                 |             |                |                        |              |
| 2     |                 |             |                |                        |              |
| 3     |                 | XXX         |                | XXX                    |              |
| 4     |                 | XXX         |                | XXX                    |              |
|       | XXX             | XXX         | XXX            | Average                |              |
|       | XXX             | XXX         | XXX            | Std. Dev.              |              |
|       | XXX             | XXX         | XXX            | Standard Error         |              |

Table 1



