REFLECTION OF LIGHT AT CURVED SURFACES

NAME/partners ___________________ PERIOD ____ PHYSICS (REG)_

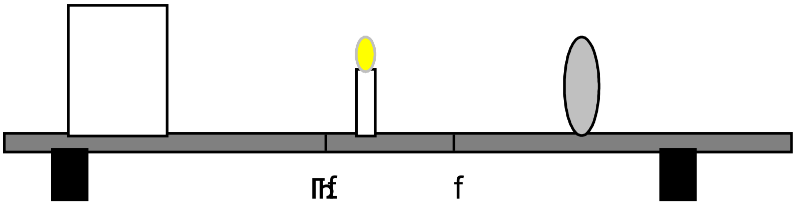
The reflection of light at a curved surface is both an interesting and predictable phenomenon. Whether light is reflected from a concave or convex mirror we can accurately predict both the location and size of the image produced. You will investigate concave mirrors to experimentally determine the focal length and the location of various images.

PROCEDURES

<u>METHOD 1</u> Set up the optical bench as shown with the object (candle) at a very large distance (several meters) from the mirror. At this point all rays of light from the source reaching the mirror can be considered parallel and should reflect off the mirror and be sent to the focal point of the mirror. Move the screen until you obtain the sharply focused image on the screen. The distance of screen (image) to mirror is the focal length.

focal length of the mirror = ______ cm

<u>METHOD 2</u>



Set up the optical bench as shown with the object in between f and 2f. Move the screen until you obtain a clear image on the screen. Use the image distance and the lens equation to determine the focal length of the concave mirror.

$$1/d_o + 1/d_i = 1/f$$

where d_o = distance from object to the mirror
d_i = distance from image to mirror
f = focal length of the mirror

d_o = _____ cm d_i = _____ cm f = _____ cm

<u>METHOD 3</u> Place the concave mirror on the table and turn the spherometer needle down until you *just* make contact with the center of the mirror. Next, bring the device to the tabletop and raise the screw as needed to bring all four points into gentle contact with the surface. Record the # of revolutions of the screw needed to accomplish this.

# of revolutions = ______

Each complete revolution lowers the screw by 0.5 mm so determine by how much the screw was lowered in the process above. Call this "**h**". h = ______mm

Let "**X**" be the distance measured between center post of the spherometer and and the support legs **in millimeters**. X = ______mm

Then the radius of the sphere can be calculated as follows:

$$\mathbf{R = (x^2 + h^2)/2h}$$

Record half of this value as the focal length and convert to centimeters.

SHOW YOUR CALCULATIONS.

f = R/2 = _____mm = _____cm

QUESTIONS

1. How closely do your three experimentally determined values for the focal length compare? Which of the previous methods would you consider most reliable? WHY?

2. List as many examples as you can where concave surfaces are used as reflectors. (More than 5 is worth a bonus!)

3. An object of height 3 cm is placed 8 cm from a concave mirror of focal length 4 cm. What is the image distance and the size of the image?