Alternate CBL Instructions
Concave Mirror Images

Safety Precautions

- Do not look at the reflection of the Sun in a mirror or use a concave mirror to focus sunlight.
- Use caution when plugging in, using, or unplugging the CBL 2 unit's power supply.

Materials
concave mirror
lamp support and light source
screen support
mirror holder
two metersticks
four meterstick supports
flashlight
CBL 2
link cable
TI graphing calculator
light probe
DataMate program

Procedure

1. Connect the light probe to Channel 1 of the CBL 2 unit. Connect the CBL 2 unit to the graphing calculator using a link cable. Firmly press the ends of the link cable into each unit. Turn on the graphing calculator. Start the DATAMATE program. Press CLEAR to reset the application program. The CBL 2 unit should auto ID the light probe.

2. Determine the focal length of your concave mirror by shining a flashlight into the mirror. The open end of the light probe has a light-sensitive photocell just inside it. Hold the photocell end of the light probe toward the mirror and along the path of the reflected light. While keeping it in the path of the reflected light, move the probe slowly away from the region of the mirror and observe the intensity readings. When the intensity peaks, the image should be focused at the focal point. Measure the distance between the mirror and the light probe photocell. Record this value as the actual focal length of the mirror, *f*.

3. On the lab table, set up two meter sticks on supports in a V orientation. Place the zero measurement ends at the apex of the two meter sticks.

4. Place the mirror in a mirror holder and place it at the apex of the two meter sticks. Using the lamp as the object of the reflection, place it on one meter stick at the opposite end from the apex.

5. Prepare a data table set, like the ones in the textbook, omitting the image and object height columns. Turn the room lights off. Using the lamp as the object of

reflection, place it on one meter stick at the opposite end from the apex. Place the mirror on the other meter stick at the opposite end from the apex. Turn on the lamp on the light support. ***Caution: Do not touch the hot lightbulb.*** Measure the object position, d_o, and record this in Trial 1, d_o column.

6. Hold the photocell end of the light probe toward the mirror and along the path of the reflected light. While keeping it in the path of the reflected light, move the probe slowly away from the region of the mirror and observe the intensity readings. When the intensity peaks, the image should be focused. Then measure the distance between the mirror and the light probe photocell. This distance is d_i. Record this value in your data table.

7. Move the lamp closer to the mirror so that d_o is twice the focal length, *f*. Record this as Trial 2. Again, move the light probe back and forth until the brightest spot is found. As before, record the distance between the probe and the mirror as d_i. Move the lamp closer to the mirror so that d_o is a few centimeters larger than *f*. Record this as Trial 3. Again, move the light probe back and forth until the brightest spot is found. As before, record the distance between the probe and the mirror as d_i.

8. Move the lamp so that d_o is equal to *f*. Record this as Trial 4. Move the light probe back and forth and try to obtain an image location. What do you observe?

9. Move the lamp so that d_o is less than *f* by a few centimeters. Record this as Trial 5. Move the Light probe back and forth and try to obtain an image. What do you observe?

Alternate lab procedure, using a CBL unit

1. Connect the light probe to Channel 1 of the CBL unit. Connect the CBL unit to the graphing calculator using a link cable. Firmly press the ends of the link cable into each unit. Turn on the CBL unit and the graphing calculator. Start the PHYSICS program and go to the MAIN MENU.

2. From the MAIN MENU select SET UP PROBES. Select ONE as the NUMBER OF PROBES. Select LIGHT from the SELECT PROBE menu. Press ENTER.

3. On the MAIN MENU select COLLECT DATA, then select MONITOR INUT from the DATA COLLECTION screen.

4. Determine the focal length of your concave mirror by shining a flashlight into the mirror. The open end of the light probe has a light-sensitive photocell just inside it. Hold the photocell end of the light probe toward the mirror and along the path of the reflected light. While keeping it in the path of the reflected light, move the probe slowly away from the region of the mirror and observe the intensity readings. When the intensity peaks, the image should be focused at the focal point. Measure the distance between the mirror and the light probe photocell. Record this value as the actual focal length of the mirror, *f*.

5. On the lab table, set up two meter sticks on supports in a V orientation. Place the zero measurement ends at the apex of the two meter sticks.

6. Place the mirror in a mirror holder and place it at the apex of the two meter sticks. Using the lamp as the object of the reflection, place it on one meter stick at the opposite end from the apex.
7. Prepare a data table set, like the ones in the textbook, omitting the image and object height columns. Turn the room lights off. Using the lamp as the object of reflection, place it on one meter stick at the opposite end from the apex. Place the mirror on the other meter stick at the opposite end from the apex. Turn on the lamp on the light support. ***Caution: Do not touch the hot lightbulb.*** Measure the object position, d_o, and record this in Trial 1, d_o column.
8. Hold the photocell end of the light probe toward the mirror and along the path of the reflected light. While keeping it in the path of the reflected light, move the probe slowly away from the region of the mirror and observe the intensity readings. When the intensity peaks, the image should be focused. Then measure the distance between the mirror and the light probe photocell. This distance is d_i. Record this value in your data table.
9. Move the lamp closer to the mirror so that d_o is twice the focal length, f. Record this as Trial 2. Again, move the light probe back and forth until the brightest spot is found. As before, record the distance between the probe and the mirror as d_i. Move the lamp closer to the mirror so that d_o is a few centimeters larger than f. Record this as Trial 3. Again, move the light probe back and forth until the brightest spot is found. As before, record the distance between the probe and the mirror as d_i.
10. Move the lamp so that d_o is equal to f. Record this as Trial 4. Move the light probe back and forth and try to obtain an image location. What do you observe?
11. Move the lamp so that d_o is less than f by a few centimeters. Record this as Trial 5. Move the Light probe back and forth and try to obtain an image. What do you observe?
12. When you are done collecting data, press "+" to end. Select RETURN TO MAIN, and then select QUIT from the MAIN MENU to exit the PHYSICS program.