INVERSE-SQUARE LAW FOR LIGHT

INTRODUCTION:

A light source will appear brighter (more intense) to a nearby observer into a more distant observer. If the intensity (brightness) can be measured at a known distance, then we can compute the intensity at any other distance. For example, since we can measure the intensity of sunlight on the Earth, we can compute the intensity of sunlight on each of the other planets. Of course, we also need to know the distance of each planet from the sun.

PROCEDURE:

1. A photocell and a computer will be used to measure the intensity of light at various distances from a small bulb. Your instructor will do this. Record the data in the table below.

Distance	Measured intensity	Computed intensity

Question 1. Describe how the light intensity varied with the distance of the photocell from light bulb.

2.a. When the photocell was 50 cm from lightbulb, the light intensity was _____lux. Substitute these values for the intensity and distance into the equation below and solve it for the constant:

Intensity = Constant x [1/Distance^2]

Constant = _____

b. Use your value of the constant compute the values of the intensity for each of the measured distances used in the table above. Add your computed intensity values to the table. Include a sample calculation below:

c. Plot a graph of intensity (vertical axis) vs. distance (horizontal axis) using your computed intensity values. Plot each of these points using this symbol: ∇. Connect the points with a smooth curve. Remember to fill as much of the graph paper as possible with your graphs.

d. Plot on the same graph the measured intensities, using this symbol ⊕ for each point.

Question 2. How closely do the measured points fit your computed curve? Are they closer in one region than in another? Why might this occur?

Question 3. Neptune is 30 times farther from the sun than the Earth. Compare the intensity of sunlight at Neptune with the intensity on Earth. (Hint: Let the intensity of sunlight on the earth equal 1.0).

Question 4. Compare the intensity of sunlight at the orbit of Venus with the intensity on earth.

Question 5. What would happen if a semi transparent material were placed between light bulb and the photocell? Test your prediction using the set up at the front of the room and record your result.

Question 6. A star that actually emits a great amount of light may appear to us to be rather dim. List two reasons why this could occur.