

Name: \_\_\_\_\_ Lab Group: \_\_\_\_\_

Date: \_\_\_\_\_ Period: \_\_\_\_\_

## My World Is Upside Down

### **KEY QUESTION/STATEMENT OF PROBLEM:**

Does the amount of light affect the image quality of a pinhole viewer?

### **BACKGROUND:**

Light emitted by a luminous object travels in a straight line outward in all directions from the source. When an obstruction with a small hole is placed in the path of the light, the light will travel in a straight line through the hole. Light travels from the top of the object in a straight line through the hole, and strikes the bottom of the screen. Likewise, the light from the bottom of the object travels in a straight line through the hole and strikes the top of the screen. This produces a real but, inverted image. When the hole is enlarged, the image will become blurry. Since more rays will be able to pass through the bigger hole, the image will appear sharp.

### **HYPOTHESIS:**

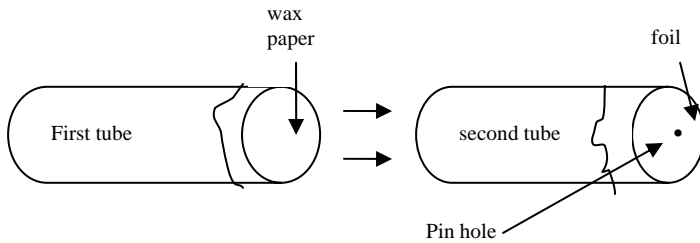
If the amount of light reflected on an object changes, then the image quality of a pinhole viewer will \_\_\_\_\_.

### **MATERIALS:**

- 2 pieces of heavy paper
- aluminum foil
- wax paper
- 2 rubber bands
- pin
- tape
- light source (classroom light or the sun)

### **PROCEDURE:**

1. Gather all materials.
2. Roll a piece of the heavy paper to make a tube. Tape the seam to secure the tube.
3. Cover one end of the tube with wax paper and tape it to the tube.
4. Roll the second piece of paper around the tube so that it forms a second tube.
5. Tape the second tube so that it forms a tube that can snugly slide over the end with wax paper and slide it enough so the end with wax paper is inside the second tube.
6. Cover the end of the second tube on the side of the wax paper with foil, and secure it with a rubber band.
7. Poke a small hole in the foil with a pin (see picture on the next page).



8. Hold the foil end up to light source such as a window and look through the uncovered end of the inner tube. You may adjust the focus by moving the inner tube back and forth.

**SAFETY CONCERNS**

- When using a sharp object such as a pin, always hold it on the non-sharp area, and after use always put it back in the designated area.

**OBSERVATIONS/DATA:**

1. Describe what you see when you look into the pinhole viewer. You may use drawings in your explanation.

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2. Look through the viewer again. After your eyes have adjusted, slowly move closer to the object that you are viewing. Describe what happens to the view.

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3. Use the viewer, and walk away from the object that you are viewing. Describe what happens to the view.

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4. Make the pinhole a little larger, and describe with words what happens to the image.

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5. Make the pinhole even larger and describe with words what happens to the image.

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6. Make two holes in the foil and describe the results.

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**CONCLUSION:**

1. Was your hypothesis correct?

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2. Explain how the property of light causes the image to look upside down on the wax paper side of the viewer.

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**EVALUATION/ANALYSIS:**

Answer the following questions in complete sentences. Be sure to use your detailed observations to support your answers.

1. Write a statement that explains how the size of the opening affects the image produced.

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2. Write a statement that explains what happens to the image as the distance between the viewer and the object changes.

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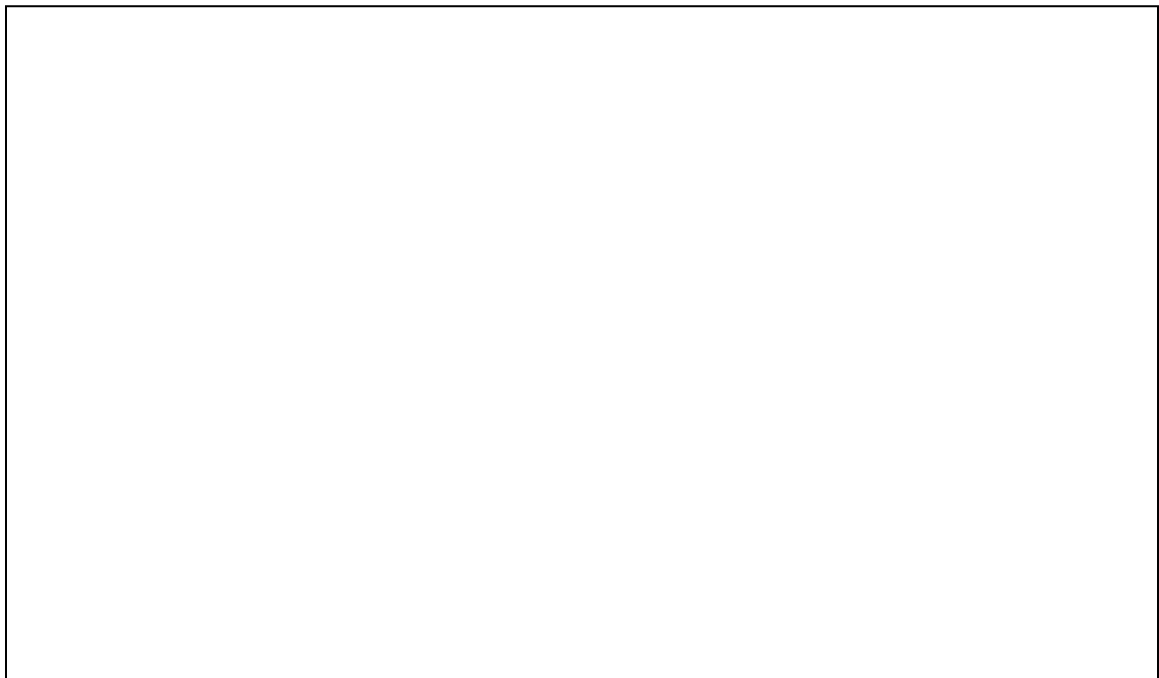
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3. Why was the image upside down?

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4. Draw and label a diagram of how the pinhole viewer works.



5. Explain why you got the answer that you did when there were 2 holes in the foil.

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6. What do you think would happen if there were more than 2 holes?

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## Goal 3 Standards Checklist

(This can be observed during the discussion segment of the lesson and/or the lab investigation segment of the lesson.)

<b>Goal 3 Standards</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>
Demonstrated creative and critical thinking skills.				
Efficiently used time and materials.				
Worked cooperatively with others in an effective and positive manner.				

4- Excellent

3- Very Good

2- Good

1- Needs Improvement