



California State University of Bakersfield, Department of Chemistry

## Camera Obscura



### Standards:

1-PS4-2. Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.

1-PS4-3. Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.

4-PS4-2. Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.

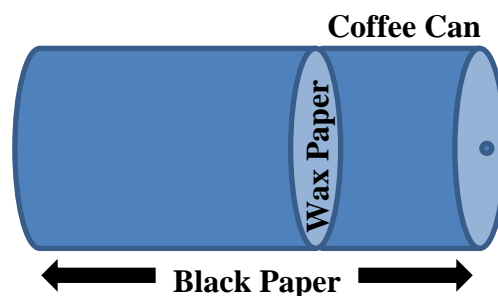
### Introduction:

*The camera obscura, also known as the pinhole camera, has been in use for many centuries. The term “camera obscura” is Latin for “dark room,” as it originated as a dark room with a small hole in the wall. This hole would allow outside light to pass through, projecting an upside-down image on the opposite wall. Light travels in straight lines called rays. When these rays reflect off of an object, they reflect in all directions. Only those rays reflecting at the angles necessary to pass through the hole are able to reach the wall and create the image. In this activity, a coffee can will act as the “room” and wax paper as the “opposite wall.”*

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### Materials:

- Gallon-size paint can or coffee can
- Wax paper
- Masking tape
- Black construction paper (large sheet)
- Hammer
- Hole-punch or large nail



### Safety:

- Always have an adult with you to help you during your experiment.
- Wear eye protection when punching the hole in the can.

### Procedure:

1. Use the hammer and hole-punch (or nail) to create a hole in the bottom (center) of the coffee can (approximately 6mm in diameter).
2. Use a piece of wax paper to cover the open-end of the can. The paper should overlap the can's edge and be secured using masking tape. Make sure the paper appears smooth and is not wrinkled.
3. Cut the black construction paper so that its length is twice that of the can. The width of the paper should be greater than the circumference of the can (usually 1.5x).
4. Wrap the construction paper around the can, creating a long cylinder. Secure the paper with masking tape. The bottom of the coffee can should be at the bottom of the cylinder, the wax paper in the middle.
5. Take the camera obscura outside on a sunny day and look at various objects through the open-end of the cylinder. NEVER LOOK AT THE SUN!

### Questions:

1. What do you see? How does the image you see on the wax paper differ from what you would see without the camera?
2. Have a lab partner walk across your field of vision from left to right. What direction is their image walking in the camera?

### References:

1. La Porta, Arthur. Camera Obscura. [http://www2.physics.umd.edu/~alaporta/PHYS107\\_s12/4-Phys107-Ch%201.pdf](http://www2.physics.umd.edu/~alaporta/PHYS107_s12/4-Phys107-Ch%201.pdf) (accessed July 16, 2014).
2. Wilgus, Jack & Beverly. The Magic Mirror of Life: An Appreciation of the Camera Obscura. <http://brightbytes.com/cosite/what.html> (accessed July 23, 2014).