

**Chapter 30: Lenses****Pinhole Camera****81****Camera Obscura****Purpose**

To observe images formed by a pinhole camera and to compare images formed with and without a lens

**Required Equipment/Supplies**

covered shoe box with a pinhole and a converging lens set in one end, an open end opposite, and glassine paper inside the box (as in Figure A) piece of masking tape

**Discussion**

The first camera, known as a *camera obscura*, used a pinhole opening to let light in. The light that passes through the pinhole forms an image on the inner back wall of the camera. Because the opening is small, a long time is required to expose the film sufficiently. A lens allows more light to pass through and still focuses the light onto the film. Cameras with lenses require much less time for exposure, and the pictures have come to be called “snapshots.”

**Procedure**

**Step 1:** Use a pinhole camera constructed as in Figure A. Tape the foil flap down over the lens so that only the pinhole is exposed. Hold the camera with the pinhole toward a brightly illuminated scene, such as the scene through a window during the daytime. Light enters the pinhole and falls on the glassine paper. Observe the image of the scene on the glassine paper.

1. Is the image on the screen upside down (inverted)?

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2. Is the image on the screen reversed left to right?

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**Step 2:** Now seal off the pinhole with a piece of masking tape, and open the foil door to allow light through the lens. Move the camera around. You can watch people or cars moving by.

Observe images on screen of camera with pinhole.

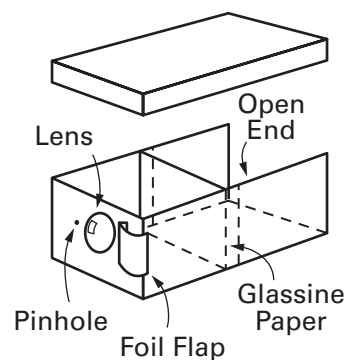


Fig. A

Observe images with lens.

3. Is the image on the screen upside down (inverted)?

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4. Is the image on the screen reversed left to right?

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**Step 3:** A pinhole camera focuses equally well on objects at all distances. Point the camera lens at a nearby object to determine whether the lens focuses on nearby objects.

5. Does the lens focus on nearby objects?

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*Draw ray diagram.*

**Step 4:** Draw a ray diagram as follows. Draw a ray for light that passes from the top of a distant object through a pinhole and onto a screen. Draw another ray for light that passes from the bottom of the object through the pinhole and onto the screen. Show the image created on the screen by the pinhole.

## Analysis

6. Why is the image created by the pinhole dimmer than the one created by the lens?

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7. How is a pinhole camera similar to your eye? Do you think that the images formed on the retina of your eye are upside down?

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