Name: _____ Class: _____ Date: _____

Checking Out Images

Learner Outcomes:

- Demonstrate the formation of real images, using a double convex lens, and predict the effects of changes in the lens position on the size and location of images (*e.g. demonstrate a method to produce a magnified or reduced image by altering the placement of one or more lenses*)

Key Terms:

Concave	Diffuse	Real image
Convex	Focused	

Background Information:

Research question(s): How does the distance between and object and a convex lens affect the image formed?

Materials:

Cardboard stand	Battery and wires	Meter stick
White paper	Convex lenses	
Light bulb	Modeling clay	

Procedure:

1. Measure the height of the glass part of the light bulb.
2. Tape the paper onto the cardboard stand to make a screen.
3. Determine the focal length of the lens.
    a. Place the lens between the stand and the lit bulb.

This investigation / activity has been adapted from:
Mah K, Martha J, McClelland L, et al. *Science in Action 9.* Toronto, ON: Addison Wesley.

   b. Move the screen and bulb slowly in and out until you see an upside down bulb the same size as the original on the screen
   c. Measure and record the distance between the bulb and the lens, divide the value by two.
4. Measure and record the bulb height and focal length.
5. Place the bulb more than twice the focal length away from the lens. Move the screen until the image comes into focus. Record:
   a. The distance from the bulb to the lens
   b. The position of the image
   c. The size of the image
6. Place the bulb just over one focal length away from the lens. Move the screen until the image comes into focus. Record your results as in step 5.
7. Repeat step 6 again placing the bulb less than one focal length away from the lens.
8. Repeat steps 1-5 using two convex lenses. Record your results.

Observations:

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Analysis:

1. Is the image formed by a convex lens always upside down? If not, under what conditions is it up right?

2. What happens to the size of the image as the bulb moves toward the lens? What happens to the image position?

3. What happens when the bulb is placed inside the focal length of the lens?

4. What effect does using two convex lenses together have? Predict the effect of lens thickness on focal length and images size.

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Conclusion: Summarize how lens placement affects image size and location.

Extension:

1. Convex lenses are often used in projectors. You may have used a projector to give a slide or film presentation. What happens to the4 size of the image as the projector is moved closer to the screen? Explain what is happening in terms of what you learned about convex lenses. How do you think projectors overcome the 'upside down' problem?

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