

Art and Optics

Student Resource

Name: _____

Overview

This resource supports students in engaging the RLC Presents: Art + Science video, [In the Lab: Art and Optics](#). Complete the activities using the worksheets below to investigate the science of optics and the structures and functions of the human eye. Use the vocabulary you learn in station one to complete the additional stations.

Table of Contents

1. Overview	Page 1
2. “See, Think, Wonder”	Page 2
3. Initial Model/Explanation	Page 3
4. Optics Inquiry Stations	Page 4–10
5. Final Model/Explanation	Page 11
6. Learning Reflection	Page 12
7. Possible Extensions	

**Your teacher may provide additional prompts to explore the collection and respond creatively.*



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Name: _____

“SEE, THINK, WONDER”

Look at the object in front of you and reflect on how humans are able to see. Complete the chart below. Sentence starters are provided to help you get started.

<p>What questions do you have about how humans see?</p> <p><i>I wonder...</i></p>	<p>Do you think you see this object the same as other people?</p> <p><i>I think I see this object the same as other people because...</i></p> <p><i>I think I see this object differently from other people because ...</i></p>	<p>What questions do you have while looking at the object?</p> <p><i>Seeing ... makes me wonder...</i></p> <p><i>I wonder why ...</i></p>

Name: _____

INITIAL MODEL/EXPLANATION

Initial Model/Explanation

Together our brain and eyes allow us to see an object. In the space below, create a diagram and explanation that describes how you are able to see an object in front of you in a room when there is light.

How do you think you are able to see an object in front of you?

Explain your answer in words, pictures, or a combination of both. This is an educated guess, you will have an opportunity to revise your response after learning more.

Name: _____

STUDENT OPTICS INQUIRY STATIONS

Station 1: Optics Vocabulary Sort

Your teacher will provide you with a set of cards with terms, and a set of cards with the definitions for each of the terms. There will also be a set of images or objects that connect to those terms.

1. Match each word card with the correct definition.
2. Find an image or object that connects to each term and definition.
3. Use the connections you created to complete the chart below. For the “Image or Memory Clue” column, you can draw the image provided or something else that will help you remember what the term means.

Term	Definition	Image or Memory Clue
Optics		
Visible Light		
Reflection		
Refraction		
Transparent		

Translucent		
Opaque		
Converge		

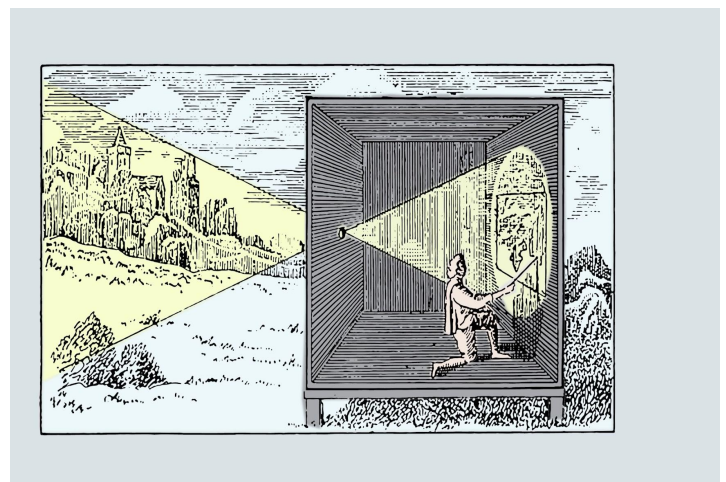
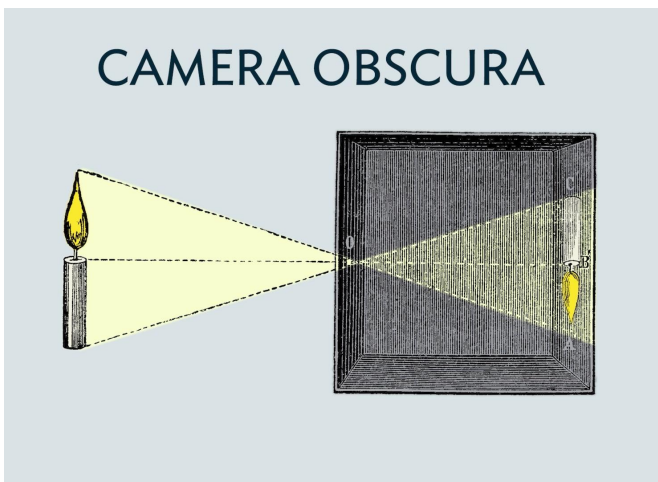
Station 2: Reflecting and Refracting Light

1. Using the flat mirror and flashlight, experiment with what happens when you shine the light on the mirror at different angles.
 - What do you notice happening when you shine the light at the flat mirror?
 - Draw a simple diagram showing what happens to the light rays when they leave the flashlight and reflect off the flat mirror. Be sure to include the flashlight, mirror and light in your diagram.
2. Using the concave mirror and flashlight, experiment with what happens when you shine the light on the mirror at different angles.
 - What do you notice happening when you shine the light at the concave mirror?
 - How is this different from what happens when you shine the light on the flat mirror?
 - Draw a simple diagram showing what happens to the light rays when they leave the flashlight and reflect off the concave mirror. Be sure to include the flashlight, mirror and light in your diagram.
3. Using the magnifying glass and flashlight, experiment with what happens when you shine the light on the magnifying glass at different angles.
 - What do you notice happening when you shine the light at different angles at the magnifying glass?
 - What happens to the light rays when they leave the flashlight? Draw a simple diagram showing what happens to the light rays when they leave the flashlight. Be sure to include the flashlight, magnifying glass and light in your diagram.

4. Draw what the pencil looks like when it is lying on the table. Place the pencil into the cup of water and draw what it looks like now.

Pencil lying on the table	Pencil in the cup of water

- Using your optics vocabulary from Station 1 and your experimenting from Station 2, what do you think is happening with the light that changes the look of the pencil?
5. In the video, conservator Jim Iska models using a camera obscura to demonstrate the principles of optics. A camera obscura, Latin for “dark chamber,” is an optical device that has been used for over 2,000 years by philosophers, scientists, and artists to experiment with light and images. It is a box with a small pinhole that allows light to pass through in straight lines to form an image at the back of the chamber. Looking at the example images below, answer the following questions.



- Draw arrows along the edges of the light to show what direction the light is traveling in.
- Why do the images on the wall inside the chamber appear upside down and reversed?

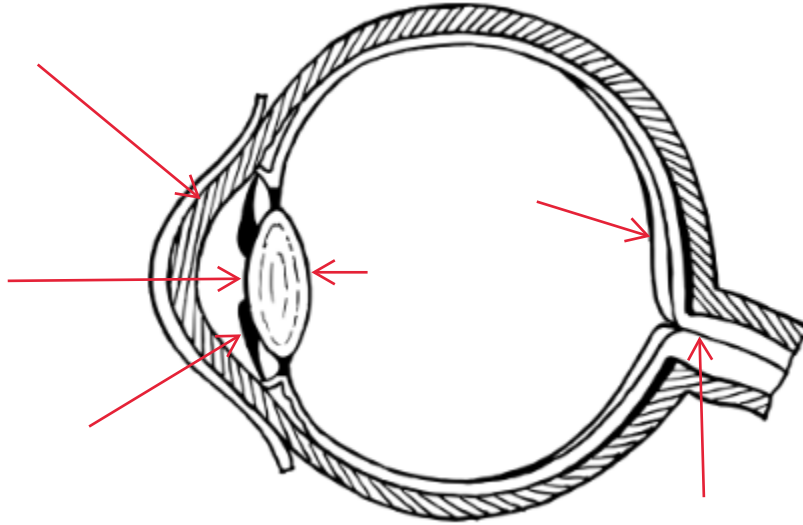
Station 3: Creating Images with Optical Devices

1. Have one person in the group hold the magnifying glass as shown in the first image on the [Optical Devices Instruction Sheet](#). Another person will hold the plain white paper. Experiment with slowly changing the distance between the light bulb, magnifying glass, and paper until a clear image is visible on the paper.
 - What image did you create on the paper? What do you notice about the image you created on the paper?
 - Based on what you have learned, what is the magnifying glass doing with the light from the light bulb to make the image appear?
 - Draw a simple diagram showing how the light is moving in this situation. Include the light bulb, magnifying glass, and paper.
2. Recreate the set up shown in the second image on the [Optical Devices Instruction Sheet](#) that places a piece of paper between the light bulb and the concave mirror. Experiment with the distance between the light bulb, concave mirror, and paper until a clear image is visible on the paper.
 - What type of material is the sheet of paper that it allows the light to pass through? (Look at your [vocabulary from Station 1](#))
 - What image is visible on the paper?
 - What is the mirror doing with the light to help create the image?
 - Draw a simple diagram showing how the light is moving in this scenario.
 - If the white piece of paper in this setup was replaced with a piece of cardboard, how would that change the image created? Explain why this change would happen?

Station 4: Parts of the Eye

Our eyes work using the same optical principles that create images in cameras, including the camera obscura. You will explore the parts of the eye to learn how they form images.

1. Label the parts of the eye diagram using the Parts of the Eye text as a guide.



2. Read the Parts of the Eye and summarize the function of each part of the eye in the chart. Create a memory clue to help you remember the function of each part.

Structure or Part of the Eye	Function	Memory Clue
Cornea		
Iris		
Pupil		

Lens		
Retina		
Optic Nerve		

3. Create a simple diagram that shows how light moves to and through the parts of the eye.

- What do you think would happen to your vision if your cornea became cloudy instead of completely transparent?
- What do you think would happen to your vision if a person was born with a cornea that was not curved, but flat?
- If our brain didn't process the image, how would we see the world?

Name: _____

FINAL MODEL/EXPLANATION

Final Model/Explanation

Revise your model on page 3 or create a new model below after you have completed the inquiry stations.

How are you able to see an object in front of you?

Explain your answer in words, pictures, or a combination of both. Be sure to include knowledge you learned from the inquiry stations.

Name: _____

REFLECTING ON MY LEARNING

Choose one question from each column and respond to it in the box below.

What was the most challenging part of today's learning? Be sure to explain.	What activity did you like the best? Why?	How can you apply what you learned today in the real world?	Write two questions you still have after completing today's learning.
What did you do today that helped you learn best? Be sure to explain.	Which activity did you like the least? Why?	What does today's learning help you understand better?	