Name: _____   Date: _____

Student Exploration: Color Absorption

Vocabulary: absorb, primary colors, reflect, transmit, transparent

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)

A set of **primary colors** can be mixed to form all other colors. The three primary colors of pigment are cyan (light blue), magenta (neon pink), and yellow. If possible, get three crayons – light blue, pink, and yellow.

1. What color do you get when you mix cyan (light blue) and yellow? _____

2. What color do you get when you mix cyan and magenta (pink)? _____

3. As you add more colors, does the resulting color get lighter or darker? _____

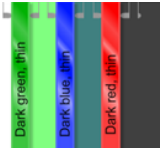**Gizmo Warm-up: Mixing Light**
In the *Color Absorption* Gizmo, you can mix different colors of light instead of pigments (like paints or crayons).

1. Observe the three primary colors of light. What are they?

    _____

2. You can click on the lights to turn them on or off. What colors are formed by the following light combinations?

    Red and green light: _____   Red and blue light: _____

    Green and blue light: _____   Red, green, *and* blue light: _____

3. As you add more colors of light, does the resulting color get lighter or darker? _____

4. How is mixing the primary colors of light related to mixing the primary colors of pigment?

    _____

    _____

Activity A: **Absorption and Transmission**	Get the Gizmo ready: • Check that all three lights (red, green, and blue) are turned on.	

Introduction: If light is blocked by an object, it is either **reflected** or **absorbed**. If light passes through an object, it is **transmitted**. Objects that transmit light without blurring are **transparent**.

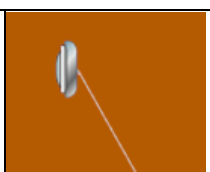**Question: How does colored glass transmit and absorb light?**

1. Observe: Drag each shade of colored glass into the light box, one at a time. What do you

   notice? _____

   _____

2. Predict: What color of light will be transmitted by the **Dark red, thick** glass? _____

3. Experiment: For each glass color, turn on the red, green, and blue lights separately. Record the color that results from each combination of glass and light.

Glass	Red light only	Green light only	Blue light only
Dark red, thick			
Dark green, thick			
Dark blue, thick			

4. Analyze: If a color of light passed through a piece of glass, it was transmitted. If most of the light was blocked by the glass, it was absorbed. Fill in the blanks below.

   A. Red glass transmits _____ light and absorbs _____ and _____ light.

   B. Green glass transmits _____ light and absorbs _____ and _____ light.

   C. Blue glass transmits _____ light and absorbs _____ and _____ light.

5. Draw conclusions: How can you predict what colors will be transmitted and absorbed by

   certain color of glass? _____

   _____

   _____

Activity B: Making colors	Get the Gizmo ready: • Turn on all three lights. • Remove all the glass from the light box.	

Question: How can you filter light to create different colors?

1. <u>Observe</u>: Experiment with different combinations of lights and pieces of glass. See what colors you can create!

2. <u>Challenge</u>: Try to create the following colors using the Gizmo. Use the **R G B** graph to see that each color matches the goal. (Hint: You don't have to start with all three lights on.)
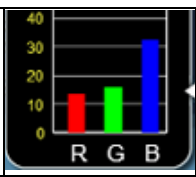
   When you solve one of the challenge colors, click the camera icon to take a snapshot, and then paste the image into a blank word-processing document. Record your solutions below.

Challenge				Solution	
Color	**R**	**G**	**B**	**Lights used**	**Glass used**
Orange	100	50	0		
Deep purple	70	0	70		
Dark gray	25	25	25		
Brown	50	25	0		
Sea foam	0	50	50		

3. <u>Analyze</u>: Is there more than one way to make a particular color? Try to find at least two ways to make "sea foam." If possible, see if your classmates found a solution that you did not.

   _____

   _____

4. <u>Extend your thinking</u>: Use the Gizmo to create your favorite color. Take a snapshot of your color and paste it into your document. Describe your color and how you made it.

   _____

   _____

Activity C: **Color analysis**	Get the Gizmo ready: • Turn on all three lights. • Remove all of the glass from the light box.	

Question: How much light is absorbed by different types of glass?

1. Observe: Compare the effects of thick vs. thin glass, and dark vs. light glass.

2. Form hypothesis: How do the thickness and darkness of glass affect the amount of light that

   is transmitted? _____

   _____

3. Experiment: The bar graph shows the amount of red, green, and blue light measured by the probe. Use the graph to help you answer the following questions. Be sure all lights are on.

   A. How many pieces of thin, light glass have the same effect as one thick, light glass?

      _____ Explain: _____

      _____

   B. How many pieces of thin, light glass have the same effect as one thin, dark glass?

      _____ Explain: _____

      _____

   C. How many pieces of thin, light glass will have the same effect as one thick, dark glass? (Hint: More than are available in the Gizmo!)

      _____

4. Extend your thinking: Water is just a little bit blue in color. Why does a glass of water appear to have no color at all, but the ocean is a deep blue color?

   _____

   _____

   _____

   _____