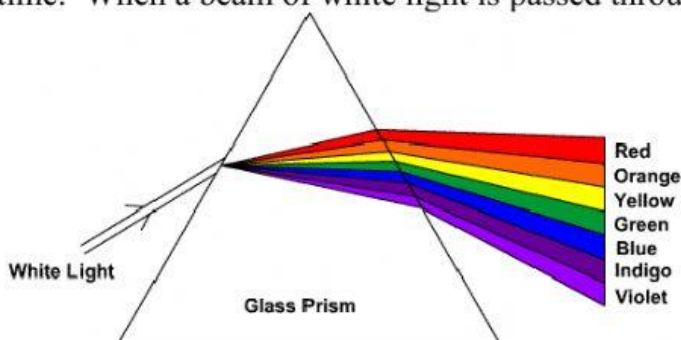


## PHYSICS: Light and Optics

### Activity: PHET Mixing Color Light

Electromagnetic radiation (EMR) is light, and there are seven classes of electromagnetic radiation in the electromagnetic spectrum. Visible light is the most narrow band of electromagnetic radiation. The human eye can only detect light between wavelengths of 380 nm (limit of violet) to 760 nm (limit of red). nm is the unit nanometers.  $1 \text{ nm} = 1.00 \times 10^{-9}$  meters, or, there are 1 billion (1,000,000,000) nanometers in 1 meter.

**White light** is seen by the eye when all colors of the visible spectrum are mixed together and arrive at the eye at the same time. When a beam of white light is passed through a prism, the wavelengths of visible light, the colors, are separated. **But what happens when you combine different colors of light in different proportions?** Do you see white light again, or do you see other colors?



### INSTRUCTIONS

Open a web browser and go to: PHET Color Vision

[http://phet.colorado.edu/sims/html/color-vision/latest/color-vision\\_en.html](http://phet.colorado.edu/sims/html/color-vision/latest/color-vision_en.html)

Choose the RGB LIGHTS

1. Under the human's chin, press PAUSE to pause the simulation; press PLAY arrow to start the simulation.
2. All of the flashlights are turned off when the toggles on each flashlight are in the down position. If the toggles are slid up, the flashlight will release an increasing amount of light.
3. You will mix light from the red, green, and blue flashlights with different amounts of intensity. 4. The percentages represent the intensity of light from the flashlight. 0% means off. 100% means full intensity of light. 50% means half intensity. 25% means  $\frac{1}{4}$  intensity.

Light intensity is based on the number of light waves released by the lights. When the light is at 100% intensity, it is releasing the maximum amount of light. When the light intensity is 50%, it is releasing half of the maximum amount of light. When the light intensity is 0%, no light is released.

4. Drag and drop the color seen by the human on to the line next to the combination of colors mixed. Each option is used only once.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**PHYSICS: Light and Optics**  
**Activity: PHET Mixing Color Light**

Drag and drop the observed color into the chart based on which intensities of primary colors of light were mixed. Each option is used only once.

|                  |                    |                      |                     |
|------------------|--------------------|----------------------|---------------------|
| <b>Blue</b>      | <b>Violet</b>      | <b>Orange</b>        | <b>Azure Blue</b>   |
| <b>Cyan</b>      | <b>Light gray</b>  | <b>Rose Pink</b>     | <b>White</b>        |
| <b>Dark gray</b> | <b>Magenta</b>     | <b>Red</b>           | <b>Yellow</b>       |
| <b>Green</b>     | <b>Medium gray</b> | <b>Seafoam green</b> | <b>Yellow-green</b> |

**Data Table**

|     | <b>Intensity of Light Source (0 to 100%)</b> |              |             |                                |
|-----|----------------------------------------------|--------------|-------------|--------------------------------|
|     | <b>Red</b>                                   | <b>Green</b> | <b>Blue</b> | <b>Color seen by the human</b> |
| #1  | 100%                                         | 0%           | 0%          |                                |
| #2  | 0%                                           | 100%         | 0%          |                                |
| #3  | 0%                                           | 0%           | 100%        |                                |
| #4  | 100%                                         | 100%         | 0%          |                                |
| #5  | 100%                                         | 0%           | 100%        |                                |
| #6  | 0%                                           | 100%         | 100%        |                                |
| #7  | 100%                                         | 50%          | 0%          |                                |
| #8  | 50%                                          | 100%         | 0%          |                                |
| #9  | 100%                                         | 0%           | 50%         |                                |
| #10 | 50%                                          | 0%           | 100%        |                                |

|     | <b>Intensity of Light Source (0 to 100%)</b> |              |             |                                |
|-----|----------------------------------------------|--------------|-------------|--------------------------------|
|     | <b>Red</b>                                   | <b>Green</b> | <b>Blue</b> | <b>Color seen by the human</b> |
| #11 | 0%                                           | 100%         | 50%         |                                |
| #12 | 0%                                           | 50%          | 100%        |                                |
| #13 | 25%                                          | 25%          | 25%         |                                |
| #14 | 50%                                          | 50%          | 50%         |                                |
| #15 | 75%                                          | 75%          | 75%         |                                |
| #16 | 100%                                         | 100%         | 100%        |                                |

**Follow-up Questions. Answer in Complete Sentences**

|                                                                                   |  |
|-----------------------------------------------------------------------------------|--|
| 1. What is white light?                                                           |  |
| 2. What is the color black?                                                       |  |
| 3. What happened to the colors in #13, #14, #15, and #16?<br>Why did this happen? |  |

**On your own.** Create five different mixtures of light different from the combinations above.. Mix the color light together with different intensities. Identify to the best of your ability, the color seen by the human. (for simplicity, mix light in 25%, 50%, 75% or 100% intensities.)

|   | <b>Intensity of Light Source (0 to 100%)</b> |              |             |                                |
|---|----------------------------------------------|--------------|-------------|--------------------------------|
|   | <b>Red</b>                                   | <b>Green</b> | <b>Blue</b> | <b>Color seen by the human</b> |
| A |                                              |              |             |                                |
| B |                                              |              |             |                                |
| C |                                              |              |             |                                |
| D |                                              |              |             |                                |
| E |                                              |              |             |                                |