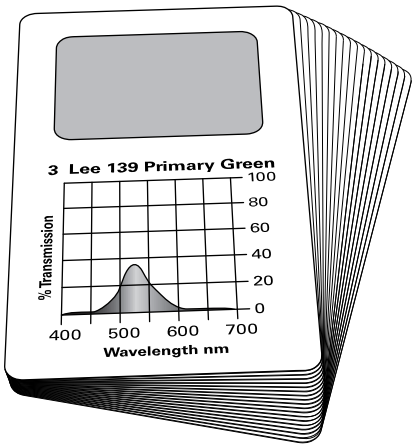
Color Mixer Accessory Kit

OS-8495



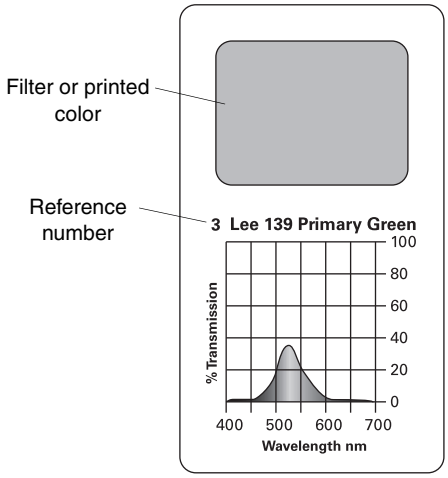
Equipment

Included Items	Quantity
Filter cards	7
Printed cards	11

Recommended Item	Part number
Color Mixer	OS-8496

Introduction

The Color Mixer Accessory Kit OS-8495 consists of 18 2.5 inch by 3.5 inch (64 mm by 89 mm) cards. Each card is labeled with a number that will be referred to when the card is to be used in one of the activities described in this manual. There are seven cards that have a filter attached to the card and 11 cards that are printed with different colors of ink.



Filter Cards

Each filter card has the characteristic transmission curve printed on the card as well as the filter manufacturer (Lee) and the manufacturers filter number. The transmission curve information will be used in activities outlined in this manual and was taken directly from the published data available at the manufacturers website.

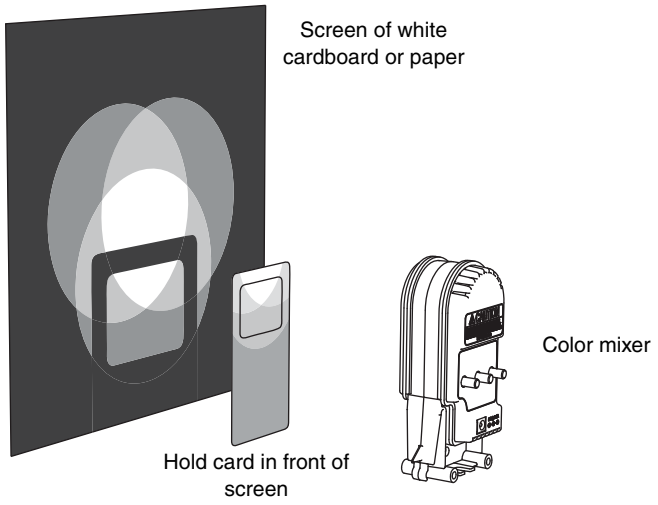
Printed Cards

Each of the cards in this set has been printed with an ink defined by the Pantone color matching system. The Pantone number is shown on the card. The relative intensity of reflected light from an incandescent source has been characterized at different wavelengths and is shown on the printed Intensity vs Wavelength graph on the card. The relative low level of UV and blue light emitted by incandescent sources results in low values of relative intensity for colors on this end of the spectrum.

Manual

This manual provides a number of activities that the Color Mixer Accessory Kit can accomplish in conjunction with the Color Mixer OS-8496.

Activities



Typical activity

Additive Color Mixing

Students will learn how 3 colors of light (Red, Blue and Green) add together to create the full range of colors.

1. Turn the red LED fully on with the blue and green LED's off. What do you predict will happen as the intensity of the green LED is gradually increased?

2. Gradually increase the green LED and note the range of colors that is formed where the green and red circles of light overlap. Were your predictions accurate?

3. Now turn off the red and turn the green fully on. What do you predict will happen as the red is gradually increased in intensity?

4. Gradually increase the intensity of the red and note the colors that are formed in the overlapping segment. Were your predictions accurate?

5. Repeat the steps above for both green and red with the blue source. For each of the colors listed below, create a description of the colors of light that when mixed create that color. For some you will need to describe the relative intensity (low, medium, high) of each color.

Red=

Blue=

Green=

Pink=

Purple=

Yellow=

Orange=

White=

Turquoise=

LED television screens create the full range of colors that we see by varying the intensity of small LEDs that are clustered together in groups of three with each group having a red, blue and green LED. You should now see that an almost infinite number of colors can be created by this method.

What Filters Do

Using a range of filters students will learn the meaning of transmission, subtractive color mixing, and neutral density filters. In this activity students will use cards 1–4 of the OS-8495 Color Mixer Accessory Kit and the OS-8496 Color Mixer and the Color Mixer Emission Spectral Chart.

1. What does a light filter do? Look at each of the four filters that you have been given and predict what will happen to the red light from the Color Mixer when the filter is placed between the mixer and a white screen. Make a chart and list your predictions.

2. Turn on only the red source and look at the screen as each of the filters is placed between the screen and the mixer. Write your observations on the chart and compare with your predictions.

3. Based on what you saw with the filters and their interaction with the red light, create a second chart and predict what will be observed when the filters are placed in front of the blue source. Turn on the blue source and compare your predictions with observations. Where were your predictions wrong?

4. Perform the same prediction and observation activity with the green source and filters. What is different between the red, blue, and green filters? Why would this be?

5. Review the emission curves for the OS-8496 and the filter transmission curves on the red, blue and green cards. Create a graph which overlays the transmission and emission curves. Explain why the blue filter allows some of the green led light to show on the screen using the overlay graph in your explanation.

6. Explain the difference between the action of the #4 filter and the rest of the filters. How does it differ and why?

Advanced Filter Lab

Using filter data and Color Mixer emission data students will first do a quantitative analysis of the transmission of light and then compare their predictions with observed values. Each student group should be given a filter card 5, 6, or 7 of the Color Mixer Accessory Kit and the Emission Spectral Chart of the Color Mixer.

1. You have been given a filter and the data for its transmission characteristics. Create an overlay of this filters transmission curve with the spectral emission curves for the LEDs used in the Color Mixer.

2. Draw the overlapping circles that occur when all three of the Color Mixer sources are turned on.

3. Based on analysis of the overlay you have created label each of the seven regions in the overlapping circles with the relative intensity (none, low, medium, high) of each light (red, blue, green) that should be present in that segment after passing through the filter.

4. Based on the mix of light (red, blue, green) that is predicted, label each of the seven segments with the color you expect to observe when the filter is placed in front of the mixer with all sources turned on.

5. How are your predictions different from what you observe?

Absorption vs. Transmission

Using printed cards of different colors, the color mixer, and filter cards, students will explore the meaning of absorption and reflection of light. Students will need the OS-8496 Color Mixer, a white screen and cards 8–11 of the OS-8495 Color Mixer Accessory Kit.

Note: Ambient light in the room will make observation of some things difficult. Decrease room lighting as low as possible to enhance this lab.

1. Predict what each of the cards will look like when illuminated only by the red source.

2. Place each card (red, blue, green and white) in front of the red source and note your observations. How does your prediction differ from your observation.

3. What does the red card do to the light when the red light strikes it?

4. What do the other cards do to the light when the red light strikes them?

5. Based on what you observed with the red source, predict how the same cards will appear when illuminated by the green and blue sources.

6. How were your observations different from your prediction?

7. Explain why the white card exhibits the same brightness for all three sources.

8. Discuss the difference between a filters' interaction with light and an inks' interaction with light.

Advanced Absorption Lab

Using relative intensity data given on the printed card and emission data for the Color Mixer students will predict how the card will appear when viewed in each of the segments of the color mixer display and compare their predictions with observations. Students will need white, grey, and black cards (11–13), and an orange, pink, *or* purple card (14–16).

1. You have been given white, grey, and black cards. Observe each card when illuminated by the red, green, and blue sources, one at a time. How does their appearance vary based on the source color? In what way are the results similar?

2. If an ink is too bright how might it be "toned down"?

3. You have been given a card (#14–16) that is not a primary color. The relative intensity of reflection vs. wavelength is printed on the card. Create an overlay of this card's relative intensity curve with the spectral emission curves for the LEDs used in the Color Mixer.

4. Draw the overlapping circles that occur when all three of the Color Mixer sources are turned on.

5. Based on analysis of the overlay you have created, label each of the seven regions in the overlapping circles with the relative intensity (none, low, medium, high) of each light (red, blue, green) that should be present in that segment after striking the ink on the card.

6. Based on the mix of light (red, blue, green) that is predicted, label each of the seven segments with the color you expect to observe when the ink is placed in front of the mixer with all sources turned on.

7. Place the ink section of the card in each of the seven segments and note the color you see. How do the observed values differ from the predicted values?

Casting Shadows

Students explore the shadows created by the color mixer's three separate light sources. Because the color mixer has three LEDs that are spaced about 1 cm apart on the circuit board, each LED acts as a point source of light.

1. Move a pencil or pen across the front of the color mixer about 2_cm (1_inch) in front of the mixer and observe the shadow.

2. What do you see? Draw a ray diagram labeling the source color and shadow color such that all shadows observed can be explained based on the source position, the pen position, and the shadow position.

Fluorescence Lab

Students explore the phenomena of a fluorescent ink that only appears different when illuminated with the correct wavelength of light. Students will be using the OS-8496 Color Mixer and cards 17 and 18 of the OS-8495 Color Mixer Accessory Kit.

1. Observe cards 17 and 18 under normal light. What differences do you see?

2. Observe card 17 under the red, blue, and green sources individually. What colors does the card appear to be when illuminated by each of the source colors?

3. Perform the same observations using card 18. What colors does the card appear to be when illuminated by each of the source colors?

4. How is it possible for blue illumination to result in your observation?

Technical Support

For assistance with any PASCO product, contact PASCO at:

Address:	PASCO scientific 10101 Foothills Blvd. Roseville, CA 95747-7100
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Fax:	(916) 786-7565
Web:	www.pasco.com
Email:	support@pasco.com

For more information about the Color Mixer Accessory Kit and the latest revision of this Instruction Sheet, visit the PASCO web site at www.pasco.com and enter OS-8495 in the Search window.