

Mixing Cold Light

Overview: You can demonstrate how the primary colors of light mix together using glow sticks. The glow stick gives off its own light through a chemical reaction called chemiluminescence, which isn't the same as mixing paint together, since cups of paint are reflecting light, not generating it. It's like the difference between the sun (which gives off its own light) and the moon (which you see only when sunlight bounces off it to your eyeballs).

What to Learn This

Materials

- disposable test tubes
- red, green, and blue true-color light sticks (one of each)
- scissors (with adult help)
- gloves
- goggles
- strainer, such as a coffee filter or bit of cheesecloth

Experiment

1. Bend the light sticks to break the glass inside the container (you'll hear a little "crack"). Do this for all three light sticks. This will activate the sticks.
2. Slap your gloves on your hands and goggles on your eyes. No exceptions.
3. Stand over a sink and carefully cut one end off of the light sticks. Get an adult to help, as the plastic can be stiff to cut through.
4. Carefully pour a tiny amount of one of the colors into your test tube. If bits of glass come out also, use the cheesecloth as a strainer to catch the pieces of glass from inside the tube.
5. Now add a second color and swirl gently to mix. Record your observations in the data table.
6. Repeat steps 4 and 5 for your data table.
7. Note: You may not need all of the red, due to its level of color concentration. Only add about half of the red and swirl until the colors are completely mixed. Add more red if needed to adjust the color.
8. When you are done with this lab, discard the bits of glass in the trash and flush the liquid down the sink with plenty of water.

Mixing Cold Light Data Table

| Color #1 | Color #2 | Color #3 (optional) | Resulting Color |
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Reading

When we talk about light, its three primary colors are actually red, green, and blue. As a painter, you already know that mixing these three colors together would get a muddy brown. But as a scientist, when you mix together three cups of cold light, you will get something different. You'd get white light.

The key is that we would be mixing light, not paint. Mixing the three primary colors of *light* gives white light. If you took three light bulbs (red, green, and blue) and shined them on the ceiling so they overlap, you'd see a white spot where the three converge. And if you could magically un-mix the white colors, you'd get the rainbow (which is exactly what prisms do).

If you're thinking yellow should be a primary color – it *is* a primary color, but only in the artist's world. Yellow *paint* is a primary color for painters, but yellow *light* is actually made from red and green light. There's an easy way to remember this: think of Christmas colors – red and green merge to make the yellow star on top of the tree.

The cold light is giving off its own light through a chemical reaction called chemiluminescence, whereas the cups of paint are only reflecting nearby light. It's like the difference between the sun (which gives off its own light) and the moon (which you see only when sunlight bounces off it to your eyeballs).

Note: If you're wondering if the real primary colors for painters are cyan, magenta, and yellow, you're right... but some folks still prefer to think of the primary colors as red-yellow-blue... either way, it's really not important to this experiment which primary set you choose, since the experiment deals with light, not paint.

Exercises

1. What color do you get when you mix blue and green liquid lights?
2. What happens when you start to add the red light?
3. What is your final color result when mixing red, blue, and green lights?
4. How would your result differ if you instead mixed red, blue and green *paints*?

Answers to Exercises: Mixing Cold Light

1. What color do you get when you mix blue and green liquid lights? (answers vary – green to blue)
2. What happens when you start to add the red light? (the color starts to pale)
3. What is your final color result when mixing red, blue, and green lights? (white)
4. How would your result differ if you instead mixed red, blue and green *paints*? (it would be a brown color)