



FILTERED LIGHT

ACTIVITY INSTRUCTIONS

<http://www.ncsciencefestival.org/starparty>

OBJECTIVE

Learn how light filters block certain energies of light while allowing others to pass through.

SUGGESTED AGE RANGE

Ages 4 and up

ACTIVITY DURATION

10 minutes

SETTING

Indoors or outdoors. Avoid direct sunlight or complete darkness.

PROCEDURE

1. Invite participants up to the table by asking them a question, such as: Do you want to draw a picture? Do you want to see a magic trick? Do you ever wonder how astronomers learn about objects in space that are too far away to travel to?
2. Ask the participants to draw a simple picture on a white card using the blue and pink highlighters. Ask them to keep the pink and blue separate, and to try and remember which part of the drawing is which color. Give the participants about 1 minute to complete their drawing.
3. Hand your visitors the blue and red filters and ask them to look through the filters one at a time at their drawings. Do they notice anything change? Are any parts of their drawings easier to see? Does anything disappear?

MATERIALS

- Blue filters in cardboard frame
- Red filters in cardboard frame
- Pink and blue highlighters (Sharpie™ brand)
- Red and blue grease pencils (wax writing tools)
- White paper cards
- Black paper cards
- Space images



PREPARATION

1. Make sure filters are intact and ready to use, and that you have enough white and black paper for your anticipated group size.
2. Make sample drawings to use in case you run out of materials, have groups passing through quickly, or have very young astronomers so that you can skip the drawing step and keep the fun with filters. **Highlighters should be used on white paper and grease pencils on black paper.**
3. Review explanations below in **ADDITIONAL NOTES** for a white background versus black background—it's tricky!

PROCEDURE (CONTINUED)

4. Explain to your participants that the filters block certain energies of light while allowing others to pass through. Use the red filter as an example—it will only allow red (pink in this case) light to pass through the filter and to our eye.
5. Ask your participants: Do you see the pink parts of your drawing when you use the red filter? (No!)
6. Explain that white light contains all the other colors of light as well, so the pink parts of the drawing get swallowed up and blended in with the red and pink light bouncing off our white paper, and we can't see it very well. Instead, we can see our blue markings through the filter. The blue acts almost like a screen to prevent red light from bouncing off the white paper and through the filter, which is why we can see the blue markings through the red filter.
7. Encourage your guests to try this out and again see the differences between the blue and red filters with their drawing on white paper.
8. Repeat this process with the grease pencils and the black pieces of paper. Ask again for a simple drawing with the two colors, and then for participants to view their drawings through the filters. Is what they see similar to what they saw with the drawings on the white paper? Do parts of the drawing stand out or fade away? What is different?
9. Using the red filter again, explain that the black paper does not contain all the other colors of light like the white paper does, and so only the red light from our red markings comes through the red filter for us to see! The other kinds of light are blocked by the filter.
10. Ask the visitors why scientists like astronomers may find filters like these useful for exploring objects that are very far away in space. Remind them that we cannot touch, or hear, or smell these objects—we can only see them by using devices like telescopes.
11. Lead the visitors to understanding that using these filters can give astronomers pieces of information that they can then fit together like a puzzle to know more about our universe. In addition to filters, many NASA telescopes use spectrometers and other instruments for breaking up and analyzing light.
12. Encourage visitors to use the filters to examine the space images you have on the table. How does the filter make the picture look different? Does it reveal details that were more difficult to see before?

ADDITIONAL NOTES

Remember:

- A **red filter** blocks all kinds of light other than **red light**. A **blue filter** blocks all kinds of light other than **blue light**.
- On a **white background** you will see the **other color** through the filter. This is because white is made up of all other colors, and in the case of the red filter there is both red from the marker and red from the background coming through the filter, so they blend together. You can almost think of the blue color as blocking the red light from the paper from coming through the filter. The opposite is true for using the blue filter—you will see the red markings of your drawing.
- On a **black background** you will see the **same color** come through the filter. This is because black is the absence of color, and so for the red filter the only red traveling through the filter is what is part of the drawing. For the blue filter, the only blue coming through the filter will be from the drawing.

MORE RESOURCES

Watch a 4-minute activity training video at <https://vimeo.com/245834788> and a 4-minute content training video at <https://vimeo.com/245835285>

CREDIT

This activity is modified from “Exploring the Universe: Filtered Light,” which was developed by the National Informal STEM Education Network (NISE Net): <https://www.nisenet.org/catalog/exploring-universe-filtered-light-2018>



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