Color Chromatography

Resources

Exploratorium explanation of the experiment:
https://www.exploratorium.edu/science_explorer/black_magic.html

Basics of chromatography (Khan Academy):
https://www.khanacademy.org/test-prep/mcat/chemical-processes/separations-purifications/v/basics-of-chromatography

Learning Objective

Students will learn about the basics of colors and how we make them. In addition, students will explore the process of chromatography and how we it applies to today's science.

Materials List

Assumes 25 kids

- 25 Plastic Cups
- 25 Coffee Filters
- Lots and lots of washable markers (Expo will not work)
- 25 pipe cleaners, if making butterflies

Estimated Time: 30-40 minutes

Prep

- Fill each cup about ¾" with water beforehand

Vocab Terms

***Chromatography* –** The separation of a (liquid or gas) mixture by passing it through a solid medium, where individual components separate by travelling through the medium at different rates.

*note: add page break before starting actual lesson, as done in this document

1. Explanation of Colors
2. Activity
3. Explanation of Chromatography
4. Optional Butterflies
5. Review

***Huge note for this event**: Gauge your audience. If your event has a lot of young kids, they won't understand a lot of this stuff. Don't waste your time on the nuances of color science if the oldest kid is in kindergarten. Ask a lot of questions to check for understanding. If there's something you just know they're never gonna understand, move on. They'll just enjoy the pretty colors.*

1. **Explanation of Colors**
    a. **Ask (while holding an object of one color):** What color is this object?
        i. Keep taking answers to the question. Obviously, the first student will probably say the "correct" answer (e.g. the blue paper is blue), but keep asking for more opinions.
        ii. Assuming the object is blue, tell them that the object is actually every color *but* blue. *gasp* *what??* *child faints*
    b. Explain that we see color because of light
        i. This makes sense, right? When you're in a really dark room, you aren't seeing a whole lot of color, unless you're ~~Mark Zuckerberg~~ a lizard person with night vision.
    c. Explain that the colors we see are from the light bouncing off the object and into our eyes.
        i. That means that the light we see is actually just what's being deflected off the object, and the actual color of the object is everything *except* what you see, since the object is absorbing all those colors
            1. *Pro tip! Use a lot of hand gestures for this part. If they understood what we just covered, awesome! That was the hardest part.*
    d. Now that we know a little bit more about colors, let's get into the activity!
2. **Activity: Chromatography filters**
    a. Pass out a coffee filter to each kid along with enough washable markers for each table

b. Give students time (5-10 minutes) to draw whatever they want on t[illegible] Ideally, it'll be a pattern and not a drawing of a thing since it will become distorted.

i. Try not to have them draw too close to the center of the coffee filter. Anything inside the smoother center circle of the coffee filter is less likely to separate properly and create the desired effect

ii. Make sure as many kids as possible are using black. It's the color that separates the best, and we want to be able to talk about it in the review.

c. Once they've finished coloring, have them folder the filter in half three times (i.e. into eighths).

d. Then, have them place the filters into the cups of water.

i. Check out this stock photo below for an example:

e. Give them about 3-4 minutes to watch the colors spread

i. Note: You can have them keep it in the water for longer, and it will spread more, but the process slows down. It's a careful balance with a point of diminishing return.

f. Remove the filters from the water. Take them outside to dry if you can. If not, let them dry on their tables.

g. While they dry, explain the next part

3. Explanation of Chromatography

a. Ask: What did students notice?

i. The colors separated!

b. If someone hasn't already mentioned it, **ask:** what did students with the color black notice?

i. Hopefully, they'll mention that it separated into a bunch of different colors, especially black, blue, and purple

ii. Make sure students have seen an example of how the blac[illegible] into different colors. If you'd like, walk around the room with some examples of a black filter to show them

c. Explain to them that this spreading out of colors is called **chromatography**

i. Write it on a whiteboard!

ii. Chromatography is when a mixture passes through something solid and spreads out

1. In this case, the color black is made by mixing blue and purple dyes. The colors that make up black spread out and up the filter at different speeds, so we're able to see each one of those colors

iii. Chemists use chromatography a lot to separate mixtures and see what's inside of something.

1. Examples: observing the components of pollutants or determining the ingredients in a flavor or scent

4. **Optional Chromatography Butterfiles (as time allows, feel free to skip to review)**

a. If the filters are dry enough, pass out some pipe cleaners

b. Have students scrunch up the filters in the middle, and wrap a pipe cleaner around it

c. Look! You have a butterfly now. Nice.

5. **Review**

a. What color is [same object used as last time]?

i. Why?

b. What allows us to see color?

i. Answer: light!

c. What is chromatography?

d. How do we use it?