

Science

Experiment with Chromatography

Purpose:

- Learn about the process of chromatography
- Separate candy dyes using paper chromatography
- Demonstrate that science is fun

Background:

Colored candies contain many dyes as indicated on the ingredients portion of the candy wrapper. To determine the different dyes used in each colored candy, we can dissolve the candy dyes and separate them using a scientific process called chromatography.

When a dissolved colored candy dye is placed on filter paper and placed in a salt developing solution, the dye travels up the filter paper. If the colored candy contains more than one dye, the dyes separate as they move up the paper. This occurs because some dyes stick more to the paper while other dyes are more soluble in the developing solution. The separated dyes travel to different heights on the paper creating separate bands.

In chromatography terms, the salt solution is called the mobile phase and the paper is called the stationary phase. The term affinity is used to describe the tendency of a dye to prefer on phase over another. Dyes that travel the shortest distance on the paper have more affinity for the paper (stationary phase). Dyes that travel the longest distance on the paper have more affinity for the salt solution (mobile phase).

Activity 1: Experiment with Chromatography

Supplies (for each group):

- Skittles or M&Ms candies (1 of each color)
- Coffee filter paper
- Pencil (do not use a pen or marker)
- Scissors
- Ruler
- 6 toothpicks
- Empty 2 liter bottle with cap (thoroughly rinsed)
- Tall glass
- Aluminum foil (20 cm x 10 cm piece)
- Water
- 1/8 teaspoon table salt
- Eye dropper

Work in groups of two. To make candy color solutions, use the eyedropper to place 6 drops of water spaced evenly on the piece of aluminum foil. Place one color candy on each drop and allow a minute for the color to come off the candy and dissolve in the water. Remove candy from water and dispose.

Cut the filter paper into an 8cm x 8 cm square and draw a line 1 cm from one edge of the paper with a pencil. Keeping about 0.5 cm between the first and last dots and the paper edge, place 6 dots on the line equally spaced. Under the line label each dot with a different color candy.

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Adapted from: Science is Fun <http://www.scifun.org/homeexpts/candy.htm>



1 activity for grades 3-8. Allow 60 minutes. Science Standard - Investigation
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To place the colors on the filter paper, dip a toothpick in one of the colored solutions and lightly touch it to the appropriate labeled dot. Make sure to keep the dot of color small (about 2 cm). Repeat with all the color solutions using a different toothpick for each color. After all the color spots dry, repeat the process two more times to darken the spots with color. Again, make sure to designate one toothpick per color. After the filter paper completely dries, fold in half vertically so the paper can stand with the spots on the bottom.

Make a developing (1% salt) solution by combining 1/8 teaspoon of salt with 3 cups of water in the 2 liter bottle. After screwing on the cap tightly, shake bottle until all the salt is dissolved.

Pour the developing solution into the tall glass so that the solution is 0.5 cm deep at the bottom of the glass. Put the filter paper with the dots on the bottom in the solution. The solution level should be below the dots when the filter paper is initially put into the glass. When the developing solution reaches 1 cm from the top edge of the filter paper, remove the paper and lay on a flat surface to dry.

Discussion:

1. As the salt developing solution travels up the filter paper, what do you observe?
2. After drying the filter paper, compare the spots from the different colored candies. What candies contained only one dye and what candies contained mixtures of dyes?
3. Some of the different candies may contain the same type of dye. Do certain colors from different candies travel to the same height?

4. Read the candy wrapper label and see if you can identify any of the color names from the label with the colors on your filter paper.

