LET'S DO CHEMISTRY

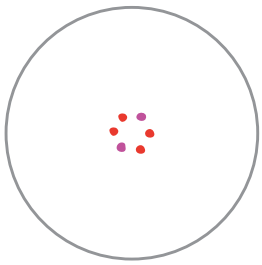
Chemistry is Colorful

EXPLORE SCIENCE

Make a colorful pattern

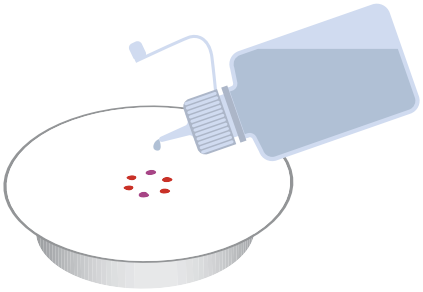
Choose two different colored markers and create a small design on a filter paper disk. *Do not use a black marker this time!*

It is best if one color is a primary color (red, yellow, blue) and one is a secondary color (purple, green, orange).



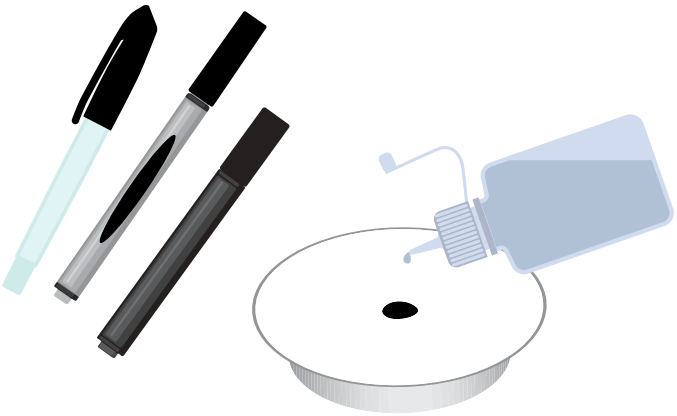
Simple circular designs work well.

Place the disk onto a white lid and use a dropper bottle to squeeze a few drops of water onto the filter paper directly over your design. What happens to the ink as it mixes with the water and moves on the paper? Compare the two colors. How are they different?

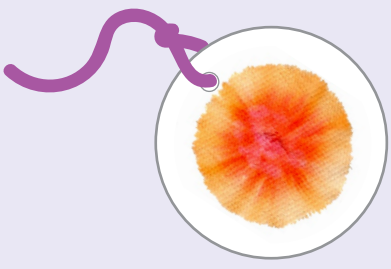


Solve a mystery!

Now choose one of the three black markers. Make an eraser-sized circle in the center of a new piece of filter paper and fill it in. Place this disk onto a lid and add a few drops of water. Now what happens? What colors do you see?



Compare the filter paper pattern, or *chromatogram,* that you made with the black marker to the mystery chromatograms labeled "A," "B," and "C." Which mystery chromatogram matches yours? Check your guess by flipping the filter papers up.



Let's keep exploring! Turn your chromatograms into bookmarks or hanging decorations. Punch a hole in one edge and tie a piece of yarn through the hole. They should dry quickly as you continue your day.

Chemists study how different materials behave and change, and how materials interact with each other.

In this activity we used a chemical process called *paper chromatography.* The water moves through the filter paper carrying the marker pigments and separating the different color molecules in each marker. Black markers are made by mixing many different colors. All of the different marker brands in this activity look black on the paper, but each company uses a different mix of pigments. Chromatography reveals which colors combine to make which black marker. Mystery solved!

Marker makers all mix different colored pigments to make their colors.

With paper chromatography the water carries different color molecules at different speeds depending on the size of the molecule and how attracted the molecule is to the paper. For example, pigments in the secondary color orange (made from a combination of primary colors) separates out to show a range of yellows and reds.

Chemistry can help us understand our world and solve challenges.

Chemists use the process of chromatography to separate and analyze the different parts of a mixture. Different methods of chromatography use different materials (besides paper) to separate mixtures. Scientists can make chromatograms of fall leaves to show how the different leaf pigments that give plants their color break down in cooler weather. Chromatography can also be used by law enforcement in crime scene investigations, by art experts to determine original paint pigments in restoration projects, and even when analyzing food. In fact, British authorities used chromatography to discover that some meat markets were selling horse meat as ground beef!

Green plants are green because they contain a pigment called *chlorophyll*. In some leaves, like those of a sugar maple, the chlorophyll breaks down in the fall and the leaves change to red, yellow, or orange.

What challenges do you want to explore and solve with chemistry?