

Black is Black – Or is it?

This activity explores capillary action - how water moves up paper - and chromatography - how different elements of the ink are carried along at different rates, allowing you to see that black ink is actually made up of many different colors.

Directions

1. Start by folding the coffee filter in half three times to form a triangle. If necessary, use a paper clip to hold it together.
2. Make a $\frac{1}{4}$ inch dot with the black marker about a $\frac{1}{2}$ inch above the point of the triangle. Allow the black dot to dry.
3. Put $\frac{1}{2}$ inch of water in the bottom of the cup.
4. Place the tip of the coffee filter in the cup, making sure the dot does not enter the water.
5. Finally, watch closely to what happens as the filter absorbs the water.

Food (Or Drink?) For Thought

- What did you discover about the color black?
- Try experimenting with other marker colors and making predictions to see if your hypothesis is correct.

Materials

(1) white basket-style coffee filter *

- Paperclip
- Water
- Clear plastic cup
- Ruler
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Black felt tip pen or marker (not a permanent ink) * Pilot Razor Point or other water based markers work well Sharpie and Expo White Board markers do not work

* You will need more than one coffee filter and other marker or pen colors to perform this experiment

Explanation

Most nonpermanent markers use inks that are made of colored pigments and water. On a coffee filter, the water in the ink carries the pigment onto the paper. When the ink dries, the pigment remains on the paper.

When you dip the paper in water, the dried pigments dissolve. As the water travels up the paper, it carries the pigments along with it. Different-colored pigments are carried along at different rates; some travel farther and faster than others. How fast each pigment travels depends on the size of the pigment molecule and on how strongly the pigment is attracted to the paper. Since the water carries the different pigments at different rates, the black ink separates to reveal the colors that were mixed to make it.

Why does mixing many colors of ink make black?

Ink and paint get their colors by absorbing some of the colors in white light and reflecting others. Green ink looks green because it reflects the green part of white light and absorbs all the other colors. Red ink looks red because it reflects red light and absorbs all the other colors. When you mix green, red, blue, and yellow ink, each ink that you add absorbs more light. That leaves less light to reflect to your eye. Since the mixture absorbs light of many colors and reflects very little, you end up with black.