INVESTIGATING THE CHEMISTRY OF COLOR-CHANGING MARKERS

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Objective

Color changing markers, sometimes called *Magic Pens*, are not magic. They depend on some simple chemistry. In this investigation, we will investigate the chemistry behind the color-changing markers.

Materials

1 set of color-changing markers
cotton swabs (Q-Tips or similar)
plastic cups, 3 ounce
5% acetic acid solution (vinegar)
5% sodium bicarbonate solution (baking soda – mix 1 tsp. baking soda with 3 ounces water)
5% sodium hypochlorite solution (Chlorox bleach or equivalent)
3% hydrogen peroxide solution
water
red cabbage leaf

Safety

Wear safety goggles when working with chemicals

Sodium hypochlorite solution (Chlorox bleach) releases chlorine gas which is irritating to the nasal passages and mucus membranes. It is toxic in large quantities. Work in a well ventilated area. Sodium hypochlorite solution can be irritating to the skin and can permanently bleach your clothing. Take care in handling this material. If the fumes become irritating, leave the area and get some fresh air. If the material gets on your skin or clothes, wash it off immediately.

Procedure

Use each of the color markers to color in the boxes on the Experiment and Data Page.

Take a piece of red cabbage leaf, roll it up and use it to color in the indicated box on the Experiment and Data Page.

Obtain small amounts of each solution, 5% acetic acid solution, 5% sodium bicarbonate solution, 5% sodium hypochlorite solution, 3% hydrogen peroxide solution, and water, in labeled plastic cups.

Use the color change wand, from the marker set, to draw a vertical line, under the "Color change wand" heading, through all of color boxes on the experiment and data page. What is the effect of the color change wand on each of the colors?

Dip a cotton swab in the water. Use the wet cotton swab to draw a vertical line, under the "Water" heading, through all of color boxes on the experiment and data page. What is the effect of the water on each of the colors?

Dip a new cotton swab in the acetic acid solution (vinegar). Use the wet cotton swab to draw a vertical line, under the "Acetic acid" heading, through all of color boxes on the experiment and data page. What is the effect of the acetic acid on each of the colors?

Repeat this procedure, using a new cotton swab for each solution, with the sodium bicarbonate, sodium hypochlorite and the hydrogen peroxide solutions. Observe the effect of each solution on each of the colors.

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EXPERIMENT AND DATA PAGE

Color of marker	Color change Wand	Water	Acetic Acid	Sodium Bicarbonate	Sodium Hypochlorite	Hydrogen Peroxide
Black						
	Color this box					
Purple						
	Color this box					
Blue						
	Color this box					
Green						
	Color this box					
Yellow						
	Color this box					
Red						
	Color this box					
Red Cabbage						
	Color this box					

Results and Questions

1. What is the effect of the color change wand on each of the colors? (Tell any color changes that occur.)

2. What is the effect of the water on each of the colors? (Tell any color changes that occur.)

3. What is the effect of the acetic acid on each of the colors? (Tell any color changes that occur.)

4. What is the effect of the sodium bicarbonate on each of the colors? (Tell any color changes that occur.)

5. What is the effect of the sodium hypochlorite on each of the colors? (Tell any color changes that occur.)

6. What is the effect of the hydrogen peroxide on each of the colors? (Tell any color changes that occur.)

7. What causes the markers to change color? Acid? Base? Bleach? Use your results to explain your answer.

8. Once a color changing marker has changed color, can the color change be reversed? Try this using the solutions supplied. Tell your results.