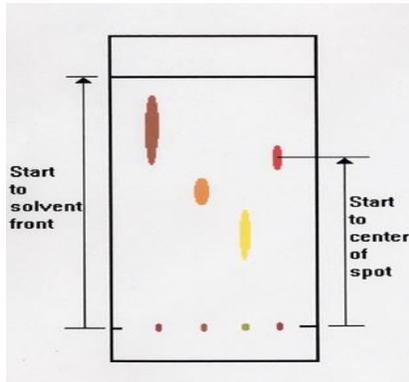


CHROMATOGRAPHY REFERENCE

Forensic Analysis of Inks using Paper Chromatography



A possible situation...

A forged check was identified on campus and the local crime lab is going to help. There are four suspects and their pens have been confiscated. Determine which pen wrote the forged check, if any at all.

Background: In this experiment, you're using a technique called chromatography. The name comes from the Greek words chroma and graph for "color writing." The technique was developed in 1910 by Russian botanist Mikhail Tsvet. He used it for separating the pigments that made up plant dyes.

Paper chromatography is also way to analyze mixtures, such as ink, by separating them into the original chemicals that are included in their makeup. Crime scene investigators use chromatography to identify and separate many different substances. Detectives often use chromatography to identify drugs from narcotics to aspirin in blood and urine.

Objectives:

Examine and compare ink samples between the forged check (unknown) and known brands of black markers.

Materials:

Felt-tip suspect markers
Water

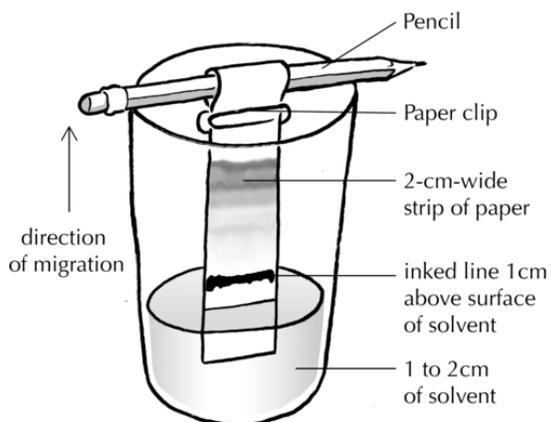
Crime lab protocol:

1. Measure 1 cm from the bottom edge of the chromatography paper (paper towel, coffee filter, or napkin) and draw a straight **pencil** line from side to side. This is called the front line.
2. Each pen is to be dotted into its own "lane" on the front line. See the diagram on page 1 for details. Allow the spots of ink to dry. Label below each dot using pencil, a letter or number to represent each sample.

3. Put a hole in the top of the spotted paper (spots at the bottom). Slide a pencil, popsicle stick or skewer through the hole and hang the paper into a cup of water. Make sure there is just enough water so that the paper's edge is in the water but the water level does not touch the ink.



An alternate way is to roll the paper around a pencil to hang the paper.



4. Patiently wait as the water moves up the paper. The ink will usually separate into different colors. Once the water is most of the way up the paper, take the paper out of the cup. Use a pencil to draw a line across the paper to show the height the water reached.

5. Repeat using a new piece of chromatography paper (towel, filter or napkin).

6. Compare the chromatograms of the same markers ... can you see that they have the same pattern of colors? If the second chromatogram wasn't labeled, how would you know which pen was which?

7. In the science crime buster event, you will need to identify which marker was used by making chromatograms of the suspects' pens and comparing these to a chromatogram of ink found at the crime scene.

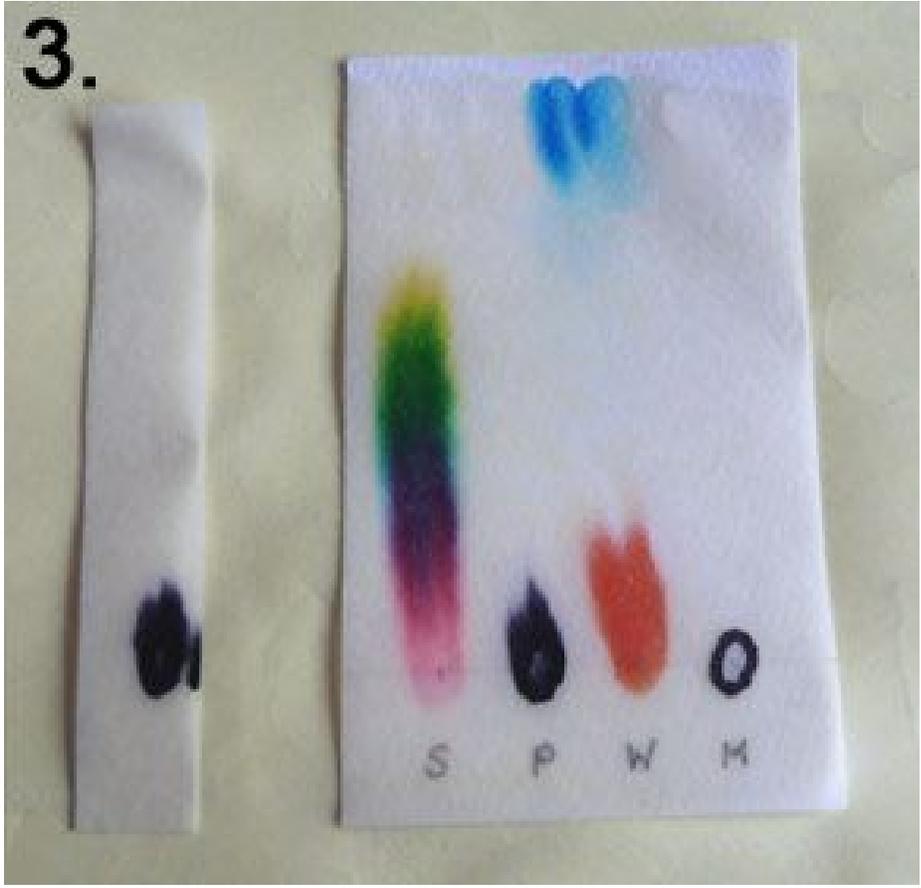
NOTICE HOW EACH OF THESE BLACK INKS HAVE A DIFFERENT LOOKING CHROMATOGRAM



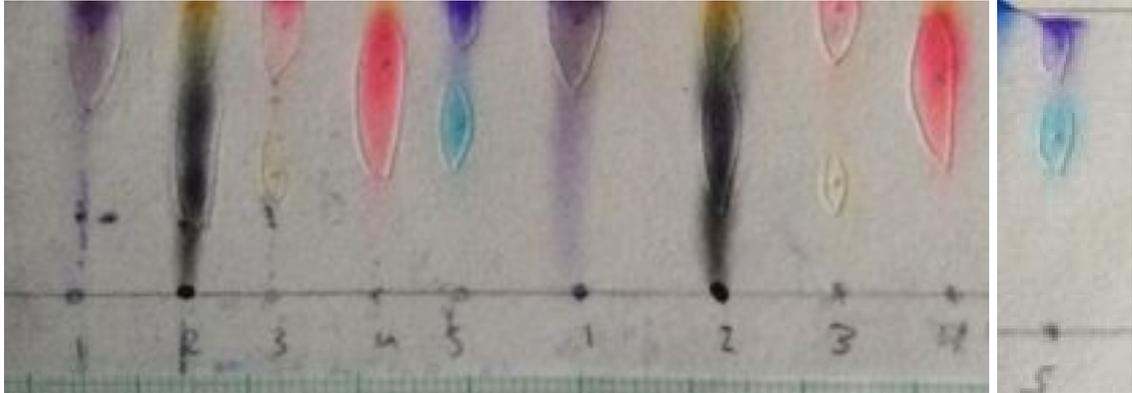
Which marker do you think made this chromatogram?



Which marker chromatograms match in picture 3?



Notice how the 2 lines number 1 have similar characteristics as does the lines labeled 2 are similar to each other as are 3 and 4 and 5 sets



Here you can see that the chromatograms shows that each color is unique and there are no repeats in this group of markers.



Unknown powder chart on the next page...

Unknown Powders:

1. Observe the powders - look for color if they are crystals
2. To test the reactions of powders with vinegar and iodine:
 - a. Put a small amount of the substance in a cup.
 - b. Add a couple of drops of vinegar or iodine.
 - c. Adding vinegar might cause bubbles and iodine could change the color of the iodine from light brown to purplish black.
3. To test if the substance dissolves in water:
 - a. Put a small amount of the substance in a cup.
 - b. Add a spoonful of water – see if the substance dissolves, floats on the water, or sinks to the bottom

Substance	Appearance (describe how it looks)	Powder in the water?	Vinegar on the substance?	Iodine on the substance?
Salt				
Sugar				
Flour				
Cornstarch				
Baking soda				
Sand				
Chalk				
Yeast				