

Name: _____

Date: _____

A Lab on Chromatography Inks Analysis

Did Pete Cheat?

A Lab on Chromatography of Inks

Introduction:

How does paper chromatography work?

Chromatography is a technique that is used to separate and to identify components of a mixture. This analytical technique has a wide range of applications in the real world since many substances are mixtures of chemical compounds. You may not realize it, but black ink is a mixture of several different colors. The inks in pens are made of a mixture of dyes. The inks show a variety of colors when a solvent, such as water, passes through them. In paper chromatography, the sample mixture is applied to a piece of filter paper, the edge of the paper is immersed in a solvent, and the solvent moves up the paper by capillary action. Components of the mixture are carried along with the solvent up the paper to varying degrees, depending on the compound's preference to be absorbed onto the paper versus being carried along with the solvent. The paper with the separated components of the ink mixture is known as a chromatogram.

Different types of water-soluble ink pens vary in their composition. Two different brands of pens will give two dissimilar chromatograms. Therefore, if ink samples are taken from separate locations on a document that was written with one pen, all samples should produce the same chromatogram. By using chromatography, forensic scientists can determine whether a document contains two or more different inks. One drawback of using ink chromatography in forensic science is that it destroys the evidence. The document under suspicion must have areas cut from it so the ink can be analyzed.

In summary, if an entire document has been written with the same ink, then tests applied to different portions of the document should produce the same results. If the chromatograms produced are the same, the forensic scientist can assume the inks are the same. Diverse solvents can be used in ink chromatography. For inks that are water soluble, water is the solvent of choice. For inks that are not soluble in water, methanol, ammonium hydroxide, ethanol, acetone, or hydrochloric acid can be used as solvents.

Background Information

Pete Greer owns a computer business and he has become quite successful in the last several years. To save money, Pete refuses to hire an accountant to help him file his income taxes. When preparing his taxes, Pete can rarely find the receipts that verify the deductions he claimed as business expenses. About a month ago, Pete received a card from the IRS notifying him that his income taxes for the last four years were going to be audited. Pete was instructed to gather all his supporting documentation. Pete panicked and began collecting everything he could find. He found some of the receipts from the purchase of computer equipment for the new business. However, he could not find them all. Pete was not sure that he has all of the documents he needed to back up the numbers he filed on his taxes. He considered changing the amounts on several receipts.

Did Pete change any of the numbers on the receipts that verify his business expenses? You are the forensics scientist who must answer this question.

Objective

You will use chromatography to determine whether a document in question was written with one or two ink pens.

Procedure (For a lab group of 3-4)

1. Obtain two pieces of filter paper, cut the filter paper into 4 sections, then cut the one end at an angle.
2. Label each strip w a #1-4 and draw a line (IN PENCIL) across the bottom of the paper 1 cm above the angled tip.



(should be cut at angle)

3. Place a dot of one of the ink samples on the line from #2. At the top of filter paper label the type of ink source 1 - Red ball point pen 2- Red felt tip pen 3- Red wet erase maker 4- red permanent marker



(should be cut at angle)

4. Attach each strip to a long stretched out paper clip in an empty beaker, the pointed tip nearly touches the bottom but don't touch!
Remove paper clip line, fill bottom of beaker with 1 cm of water or alcohol (1-2 do water, 1-2 do alcohol in separate beaker).



(should be cut at angle)

5. The key to lab-tips of paper touch solvent (water or alcohol) but dot of ink remains above)

6. Let run for 20=25 minutes

1. Write the equation for RF value (page 450 textbook):

2. Complete the following data table for each solvent:

Solvent 1: Water

Ink Source	Distance Compound Traveled	Rf Value	Description of Source & Stain
1-			
2-			
3-			
4-			

Solvent 2: Alcohol

Ink Source	Distance Compound Traveled	Rf Value	Description of Source & Stain
1			
2			
3			
4			

2. Describe the difference between how the colored sharpie separated compared to the others.

3. Is water always a good solvent in ink separation? Explain your answer. (Hint: look at how your results turned out)

4. How could a teacher use ink chromatography to determine whether or not a student has changed his or her answers after a test has been graded and returned?