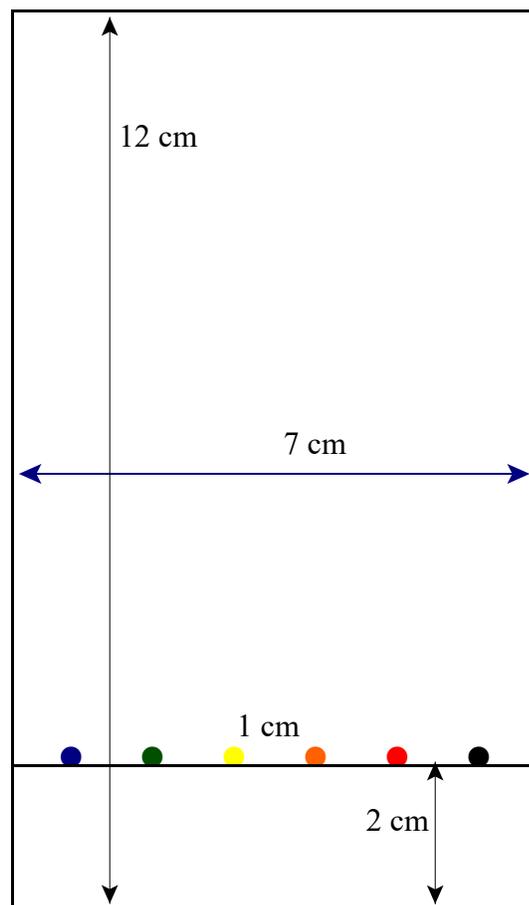
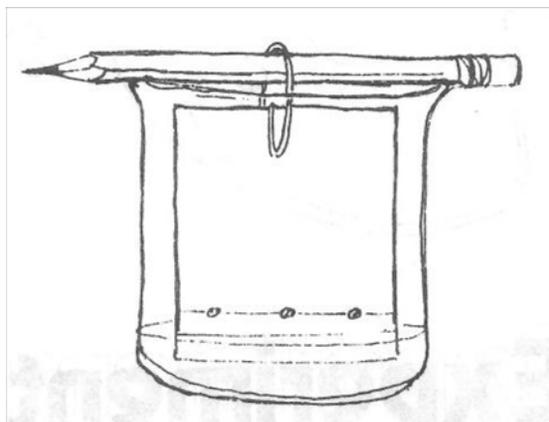


STATION 6

PAPER CHROMATOGRAPHY: USE THE INSTRUCTIONS AND DIAGRAMS TO OBTAIN A CHROMATOGRAM OF SEVERAL COLORS OF ECHO VIS-A-VIS FELT TIP PENS.

1. Are the pigments used in the felt tip pens single substances or mixtures?
2. Are the pigments in the green pen found in either the blue or yellow pens?

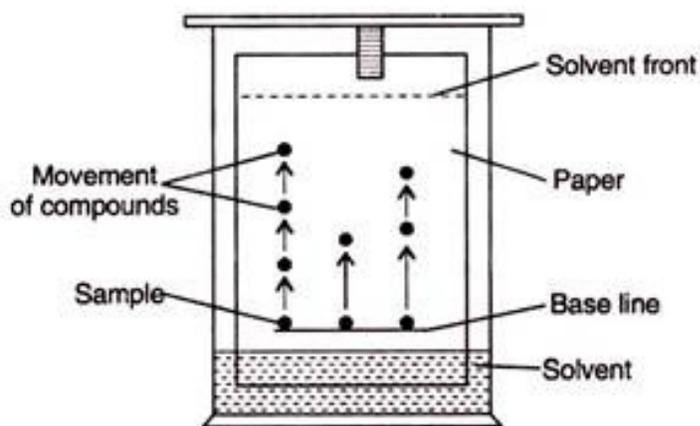
Using the felt tip pens, place spots of 6 pens on the precut paper following the format in the image to the right. Suspend the paper from a paper clip on a pencil into one of the plastic containers with water. Lower the paper carefully so that the water level is about half way between the bottom of the paper and the spots. Do not touch the container again until the solvent reaches about 2 to 3 cm from the top of the paper. While the chromatogram is developing, feel free to visit other stations. After removing the paper from the container, allow the paper to dry and then answer the questions above.



Concepts - Paper Chromatography.

It is generally possible to separate mixtures into substances by taking advantage of differences in physical properties. For example, sand and salt can be separated and isolated using filtration. Water and salt can be separated by distilling (boiling off) the water. The gaseous water can be condensed and collected and the salt will remain in the distillation pot. Another commonly used physical separation process is called chromatography (the first example of chromatography involved separation of colored compounds leading to the name chromatography which means writing in colors). Chromatography utilizes a two phase system. In today's experiment, one of the phases will be a solid or the chromatography paper. The second or moving phase will be the liquid water. The goal of the experiment will be to partially separate the pigments of felt tip pen inks. In addition to the separation, chromatography does provide information that can help with identification..

Spots of the mixtures of interest are spotted on a piece of chromatography paper. The paper is suspended so that the bottom of the paper is in the water with the spots above the level of the water. Due to capillary action, the water will immediately begin to move up the paper. When the water reaches the spots, the substances in each spot will have a choice. If the



substance is very soluble in water, it will dissolve in the water and move up the paper with the water. If the substance prefers being absorbed on the paper to being dissolved in water, the substance will stay in place. If the solvent (in this case water) has been chosen appropriately, the substances will have different distribution ratios between the water and paper. As a result, the substances will move up the paper at different rates resulting in separation of the mixture. By comparing the color and distance moved of each migrated spot from each mixture, it is possible to determine if the substances in the original spot are the same or different. To be the same, both color and distance moved must be the same.

Station 6 - Answers to questions.

1. The chromatograms reveal that most of the colored spots have separated into two or more colors. This means that the pigments are mixtures of more than one substance.
2. The green spot separates into blue and yellow spots. Spots with the same colors and distance moved are also present in the blue and yellow pen results. Thus the green pigment was made from some of the same pigments as the blue and yellow pigments.

Reasonably priced chromatography paper is available at:
https://sargentwelch.com/store/catalog/product.jsp?product_id=8869823

