

Chromatography

PROBLEM

How do you separate the pigments in inks and dyes?

INTRODUCTION

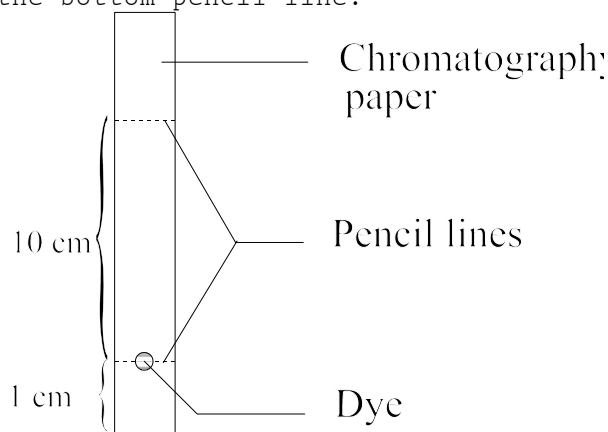
Black ink looks black because it reflects very little light. Behind the black color is often an array of different colored pigments that absorb different colors of light, accounting for the blackness of the ink. These pigments can be separated by chromatography. Chromatography can be done using paper. A spot of dye is placed on paper and the paper is dipped into a solvent. As the solvent is absorbed by the paper, it passes through the dye. When the solvent passes through the spot of dye, the pigments dissolve and are carried along the paper with the solvent. Some of the pigments are more attracted to the paper than others. Some are more attracted to the solvent. As a result, the pigments travel at different rates and they become separated. In this laboratory investigation, you will separate the pigments in various inks by paper chromatography.

MATERIALS (per group)

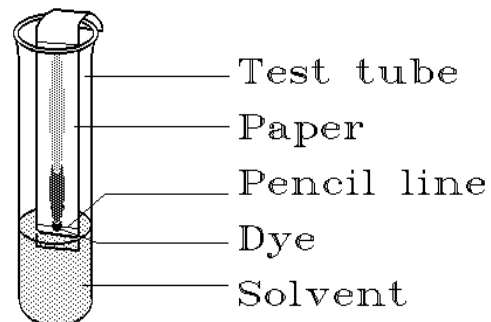
cellophane tape; chromatography paper; pencil; pens (black ink, blue ink, etc.); ruler; solvent (ammonia and alcohol); test tubes (5); test tube rack

PROCEDURE

- Using a pencil and a ruler, draw a line across a strip of chromatography paper 1 cm from the bottom. Then draw a second pencil line across the chromatography paper 10 cm away from the first line as shown in the diagram to the below. Using a black pen, draw a spot in the center of the bottom pencil line.



- Fill a test tube to a height of 2 cm to 3 cm with solvent. Place the chromatography paper inside the test tube in such a way that the bottom end is in the solvent, but the spot of ink is above the solvent as shown in the diagram to the right. Fold the upper end of the paper over the lip of the test tube.
- Place the test tube in a test tube rack. When the solvent level climbs to the top pencil line, remove the paper from the test tube and let it dry.



4. Tape the piece of chromatography paper with the separated ink to your laboratory paper in the observation section below. Label it (type of ink and color).
5. Repeat the procedure with other color inks.

OBSERVATIONS

[Tape chromatography paper in the space below.]

CONCLUSIONS

1. In step 1, why are the lines drawn in pencil rather than in ink? _____

2. If a dye is strongly attracted to the chromatography paper, but is not soluble in the solvent, where would the spot of dye be found when the solvent reached the top of the paper? _____

3. Suppose several pens contain the same color black ink. How could you determine if the inks contain the same mixture of pigments? _____

4. How can chromatography be used to identify substances? _____

5. How do you separate the pigments in inks and dyes? _____

