

PAPER CHROMATOGRAPHY

INTRODUCTION

Paper Chromatography is a very simple method of qualitative analysis. It is used to analyse simple substances such as inks, dyes and plant pigments that contain covalent compounds. These substances are not pure. They are mixtures containing a variety of different compounds.

AIM

To identify the pure coloured inks present in the ink from a purple felt-tipped pen.

MATERIALS

Pure ink samples of the following colours:

- Blue
- Red
- Green
- Yellow

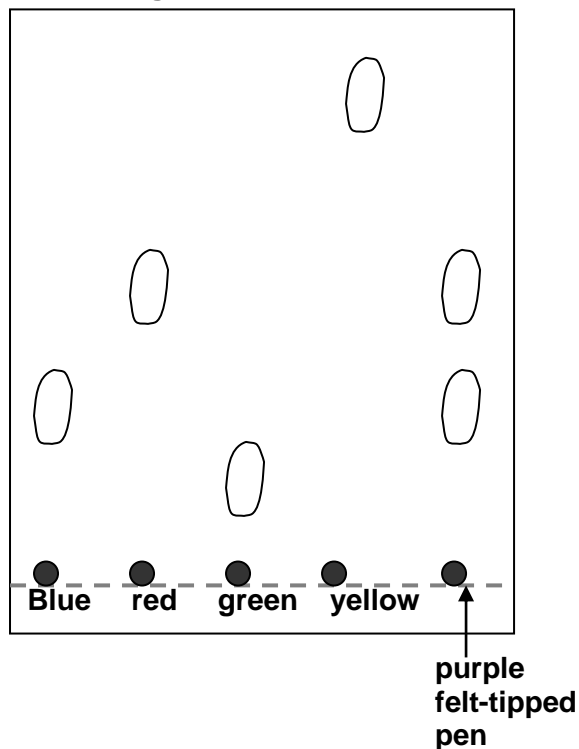
Purple felt-tipped pen
2 strips of chromatography paper
25 mL of 1% salt solution
2 × 250 mL beakers
Pencil and ruler

METHOD

1. Pour 1% sodium chloride solution into a 250 mL beaker to a depth of about 1 cm.
2. Using a pencil, draw a line (origin line) across the width of a piece of chromatography paper. This line should be about 2 cm from one end of the paper.
3. On or just above the origin line, place a spot of each of the pure ink samples. Place a spot from the purple felt-tipped pen at the far right hand side of the origin line.
4. Attach a paper clip at either end at the top of the chromatography paper. Now hang the paper in the beaker by allowing the paper clips to sit on the top of the beaker. Make sure that the origin line and spots of ink are not immersed in the solvent.
5. Allow the solvent to rise up the chromatography paper until it gets to a height that is about 1 cm from the top.
6. Remove the strip of paper from the beaker and immediately record the level the solvent reached by using a grey lead pencil and ruler to draw a line across the solvent front.
7. Allow the paper to dry and determine which pure samples were present in the purple felt tipped pen.

SAMPLE RESULTS

Chromatogram



DISCUSSION QUESTIONS

QUESTION 1

Which pure coloured inks were present in the purple-felt tipped pen?

QUESTION 2

Suppose that there were no pure samples of blue, red, green or yellow inks available for this experiment. Would it still be possible to determine the identity of the components that came from the purple felt-tipped pen? Explain

QUESTION 3

Why are R_f values always less than 1?

QUESTION 4

Would you expect the same chromatogram to be produced using different solvents? Explain.

QUESTION 5

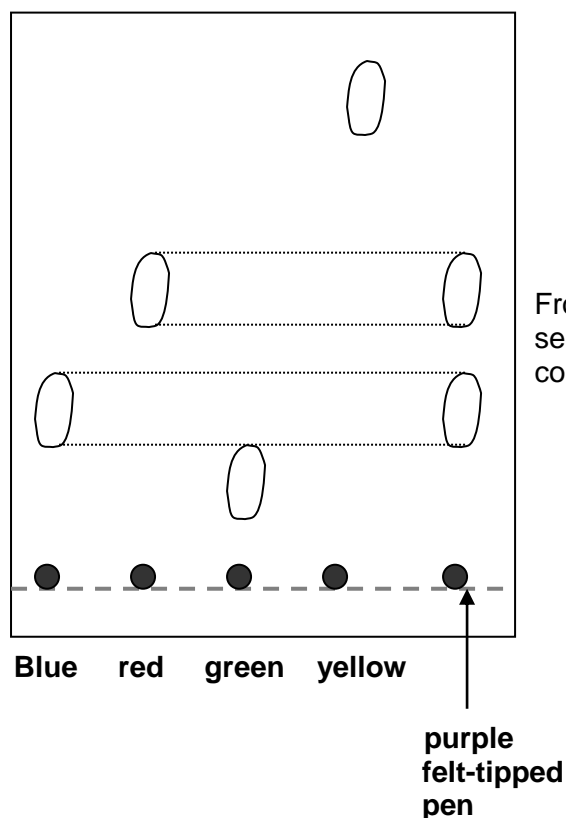
Describe a use for chromatography in industry?

CONCLUSION

Ink from a purple felt-tipped pen was found to contain pure red and blue inks.

SOLUTIONS TO DISCUSSION QUESTIONS

1.



From the chromatogram it can be seen that the purple felt-tipped pen contains pure red and blue inks.

2. Yes it would, provided that the R_f values of pure blue, red, green and yellow inks calculated from a different experiment were available. These R_f values would only be valid if the experiment was performed using the same type of paper and the same solvent with the same concentration.
3. R_f values are calculated by dividing the distance a component has moved up the chromatography paper by the distance moved by the solvent. A component can only move up the paper while it is desorbed into the moving solvent. Therefore it is impossible for a component to move further than the solvent, resulting in components always having R_f Values less than 1.
4. No. The components on a chromatogram separate according to their rates of adsorption onto the stationary phase and desorption into the mobile phase. The solubility of the components will vary in different solvents so the upward rate of movement of a component will be different in different solvents.
5. In industry, chromatography can be used for:
 - Checking the colouring agents in foods.
 - Identifying the components of drugs and fruit juices.
 - Identifying the components present in dyes and inks.