

Identifying substances with chemical tests

Chemistry grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · Lab

Name: _____ Date: _____ Class: _____

Chromatography separates substances that dissolve differently. In this lab you separate the dyes in felt-tip inks, calculate R_f values for every spot, and use them to decide which pen inks were mixed to make an unknown ink. You also evaluate how reliable the evidence is.

Level: Chemistry grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** GCSE C8

Aim

To use paper chromatography and R_f values to find which felt-tip pen inks are present in an unknown ink U.

Equipment

- chromatography paper strips, pencil and ruler
- felt-tip pens P, Q, R and a sample of unknown ink U
- 250 cm³ beaker, water as solvent, a pencil to hang the strips, tape
- safety goggles

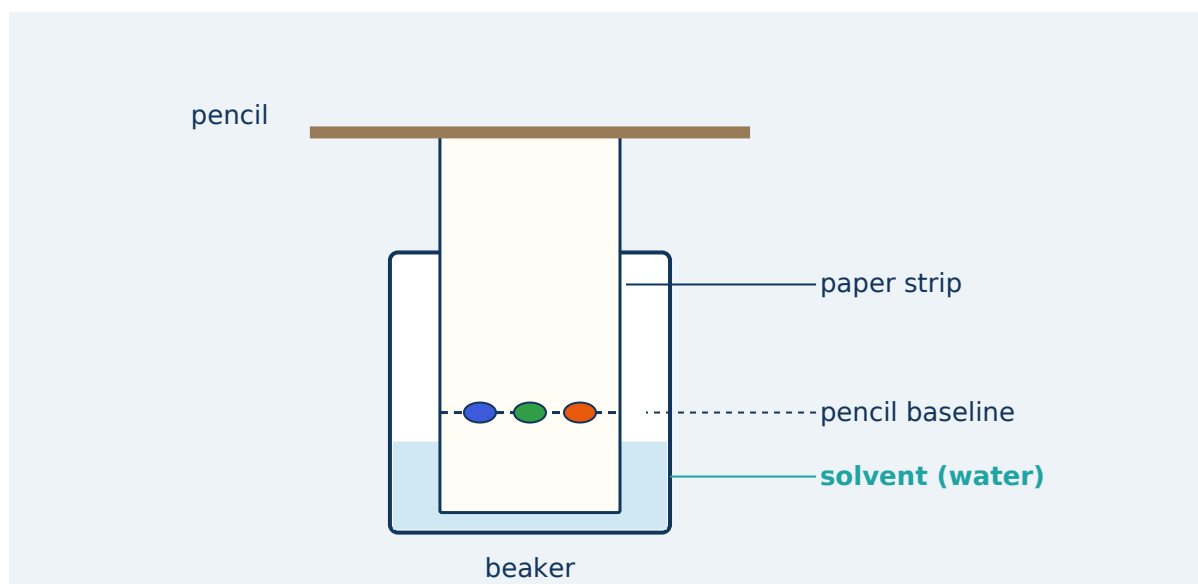
Safety

Safety

Wear goggles and clean up spills at once. Water is the only solvent in this lab; if a teacher provides ethanol as a solvent, keep it away from flames and use a lid. Do not taste any ink.

Method

1. Draw a pencil baseline 1.5 cm from the bottom of each strip.
2. Place a small, single dot of each ink on the baseline of its own strip, and let it dry.
3. Pour water into the beaker to a depth of about 1 cm.
4. Tape the strip to the pencil so that the bottom edge just touches the water, with the baseline above the water.
5. Leave the strip until the solvent front is near the top. Remove it, mark the solvent front immediately and let the paper dry.
6. Measure the distances from the baseline to the centre of each spot and to the solvent front.



Set-up for paper chromatography of inks.

Results

Measured distances from the baseline:

Strip	Solvent front (cm)	Spot distances (cm)
P	8.0	2.4 and 4.8
Q	8.0	2.4 and 6.4
R	7.5	3.75
U	8.0	2.4, 4.8 and 6.4

Analysis questions

Question 1 Calculate all R_f values

Calculate the R_f value of every spot in the table.

Question 2 Which pens are in U

Decide which pen inks are present in U and justify your decision.

Question 3 Shared dye

Which spot is shared by P, Q and U? What does this suggest?

Question 4 Is R pure

R gives one spot. Does that prove R is a pure dye? Suggest one further test.

Question 5 Pencil baseline

Explain why the baseline is drawn in pencil and must be above the water level.

Question 6 Marking the front

Why is the solvent front marked as soon as the strip is removed?

Question 7 Effect of a different solvent

Predict what would happen to the R_f values if the solvent were changed, and say whether the conclusion would change.

Question 8 Improve reliability

Suggest two ways of improving the reliability of the results.