Chromatography and gas tests

AQA GCSE Chemistry (8462) · Foundation and Higher

Show your working where needed. Check the worked answers when you finish.

Name _____ Date _____

1. Evidence from melting points

A sample melts sharply at 62 °C. A different sample softens and melts over 53-60 °C. Which result is more consistent with a pure substance? Explain.

2. Setting up chromatography

A pupil draws the start line in ink and allows the solvent to cover the sample spots. Explain a problem with each decision.

3. Why the dyes separate

Two dissolved dyes start in the same spot on chromatography paper. One finishes closer to the solvent front. Use what happens in the solvent and on the paper to explain why the dyes move different distances.

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4. Work out an Rf value

The centre of a spot is 24 mm from the start line. The solvent front is 60 mm from the same line. Calculate the Rf value.

5. Three samples of gas

Gas X relights a glowing splint. Gas Y burns with a squeaky pop when tested with a lit splint. Gas Z makes limewater cloudy. Identify X, Y and Z.

6. Interpreting a litmus result

A pupil reports that a gas turned damp blue litmus paper red. They conclude the gas was chlorine. State the further change they would need to observe to support that conclusion.

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7. Matching dyes in an ink

An ink and reference dyes P, Q and R are run together. The solvent front travels 70 mm. The two ink spots travel 21 mm and 42 mm. The references have Rf values 0.30, 0.46 and 0.60, respectively. Which dyes could be in the ink? Show how you used the measurements.

8. Check what one spot proves

An ink gives one spot when run in solvent A and two clearly separated spots when run in solvent B. What does the second result show? Explain why the first result could look different.

9. Extra challenge · Test a proposed dye match

An unknown and reference S were run on different papers. The unknown moved 39 mm with a 65 mm solvent front. S moved 48 mm with an 80 mm front.

Calculate both Rf values. The solvents were different. Design a check and give a result that would rule out the match.

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Worked answers

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1. Evidence from melting points

The sample with a sharp melting point at 62 °C. Pure substances melt at a fixed temperature under given conditions, whereas a mixture often melts over a range.

2. Setting up chromatography

Ink used for the line may dissolve and produce extra spots, so use pencil. The sample spots can dissolve directly into the solvent if submerged. The solvent level should start below the spots.

3. Why the dyes separate

Each dye alternates between dissolving in the moving solvent and being held by the stationary phase on the paper. The dye that spends more time in the moving solvent travels further.

4. Work out an Rf value

Rf = distance moved by spot ÷ distance moved by solvent front = 24 ÷ 60 = 0.40. The ratio has no unit.

5. Three samples of gas

X is oxygen, Y is hydrogen and Z is carbon dioxide.

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Worked answers

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6. Interpreting a litmus result

The damp litmus paper should also be bleached white. Turning red shows an acidic effect, so the red colour alone does not identify chlorine.

7. Matching dyes in an ink

The ink spots have Rf values 21 ÷ 70 = 0.30 and 42 ÷ 70 = 0.60. These match P and R under the same conditions. The comparison supports those identities.

8. Check what one spot proves

There are at least two substances in the ink. They may have travelled the same distance in solvent A and separated in solvent B. A single spot in one solvent is insufficient to establish purity.

9. Extra challenge · Test a proposed dye match

Unknown: 39 ÷ 65 = 0.60. S: 48 ÷ 80 = 0.60. Matching Rf values across different solvents do not establish the identity.

Run the unknown and S side by side on the same paper in the same solvent. If their spots finish at different heights from the same start line, the proposed match is ruled out under those conditions. Running in a second common solvent gives another comparison.

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