Chromatography

OCR A H432 · A level

Show your working where needed.

Name _____ Date _____

1. Calculate a retention factor

From the pencil baseline, a spot moves 3.2 cm and the solvent front moves 8.0 cm. Calculate the Rf value and state whether it has units.

2. Check a TLC setup

A student draws the starting line on a TLC plate with a pen, adds the samples and stands the plate in solvent. The solvent initially covers the spots. Explain two changes to the setup that would improve the chromatogram.

3. Explain different retention factors

Substances A and B have Rf values 0.33 and 0.75 on the same TLC plate. A student claims B interacts more strongly with the stationary phase relative to the solvent. Use the results to assess the claim.

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4. Compare with a standard

An unknown mixture gives spots at Rf 0.28 and 0.59. A pure standard run on the same plate under the same conditions gives Rf 0.59. State the strongest conclusion supported by this evidence.

5. Read a gas chromatogram

An unknown gives peaks at 2.3, 4.7 and 6.2 min. In the same conditions standards X and Y give retention times of 2.3 and 6.2 min respectively. Identify any possible matches and explain why the two matching peaks have different retention times.

6. Read peak areas in the right way

A gas chromatogram has peaks A and B with integrated areas 140 and 70 units. A and B give the same detector response per mole under these conditions. Find the amount ratio and the mole percentage of A.

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7. Choose a suitable calibration range

The highest calibration standard gives a peak area of 410. Measured under the same conditions, the unknown gives an area of 690. Explain how to obtain a more reliable concentration and how to calculate the original value.

8. Apply a GC calibration

A calibration gives peak area = 96 × c + 12, with c in mg dm^{-3}. A sample diluted fivefold gives an area of 252. Calculate the concentration before dilution.

9. Extra challenge · Compare two calibrated concentrations

A sample is diluted fourfold before GC. For a standard in mg dm^{-3}, peak area P = 50c + 20 and area Q = 90c + 10. The diluted sample gives P area 220 and Q area 280.

Calculate the concentrations before dilution and the mass proportion of P among these two components. Explain why comparing the raw areas directly gives the wrong order.

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