C8bD Chromatography and Instrumental Analysis: Exam Drill

Total Marks

AQA 8464 · Calculator allowed · about 30 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Paper chromatography separates dyes using a solvent moving up a strip of chromatography paper.

(a) Define Rf value. **(1)**

(b) Give the equation used to calculate Rf. **(1)**

(Total for Question 1 is 2 marks)

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2 A student runs paper chromatography. The solvent front moved 84 mm from the origin. A blue spot moved 42 mm from the origin.

(a) Calculate the Rf value for the blue spot. **(2)**

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(Total for Question 2 is 2 marks)

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3 In paper chromatography, the solvent sometimes passes the origin line and dissolves the spots, causing streaking.

(a) Give two practical changes to reduce streaking. **(2)**

(Total for Question 3 is 2 marks)

4 Thin layer chromatography (TLC) is similar to paper chromatography but uses a thin coated plate and can separate more small organic molecules.

(a) State one advantage of TLC over paper chromatography and explain why. **(3)**

(Total for Question 4 is 3 marks)

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5 A required practical asks students to identify components in a mixture using paper chromatography of inks. The origin is 10 mm from the bottom. The solvent front reached 70 mm. A red spot from the mixture is at 40 mm and a red spot from a known dye is at 42 mm.

(a) Decide whether the known dye is present and justify, including Rf values. **(3)**

(Total for Question 5 is 3 marks)

Mark scheme · C8bD Chromatography and Instrumental Analysis: Exam Drill

Question 1

- (a) **B1** ratio that compares how far a substance has moved relative to the solvent front in chromatography, oe
- **(a) Answer: Rf is the ratio comparing how far a substance moves relative to the solvent front on the chromatography paper.**
- (b) **B1** Rf = distance moved by substance / distance moved by solvent front cao
- **(b) Answer: Rf = distance moved by substance / distance moved by solvent front**

Question 2

- (a) **M1** substitutes: Rf = 42 / 84
- (a) **A1** 0.50 cao
- **(a) Answer: 0.50**

Question 3

- (a) **B1** use smaller or more concentrated spots so less sample is applied, oe
- (a) **B1** allow the spots to dry between applications or use a weaker solvent to reduce over-wetting, oe
- **(a) Answer: Any two of: apply smaller or more concentrated spots; allow spots to dry between applications; use a less aggressive solvent; place origin above solvent level.**

Question 4

- (a) **B1** states an advantage, e.g. better resolution/separation, faster run time, or can be used with smaller sample sizes
- (a) **B1** explains the reason, e.g. finer particle coating on plate gives more uniform capillary action and sharper spots, oe
- (a) **B1** links to outcome, e.g. so similar compounds can be separated or results are obtained more quickly, oe
- **(a) Answer: TLC gives better resolution because the uniform thin coating causes sharper, more uniform movement of compounds, so similar compounds are separated more clearly.**

Question 5

- (a) **M1** calculates Rf for unknown: (40 - 10) / (70 - 10) = 30 / 60 shown or equivalent
- (a) **M1** calculates Rf for known: (42 - 10) / (70 - 10) = 32 / 60 shown or equivalent
- (a) **A1** concludes that the dye is unlikely to be the same because Rf values differ (0.50 vs 0.53) and are not identical, oe
- **(a) Answer: Rf unknown = (40 - 10) / (70 - 10) = 30 / 60 = 0.50; Rf known = (42 - 10) / (70 - 10) = 32 / 60 = 0.53. The values differ (0.50 vs 0.53) so the known dye is unlikely to be present; the Rf values are not identical.**