2.27 Chromatography and Instrumental Analysis: Test Pack

Total Marks

AQA 8464 · Calculator allowed · about 15 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)

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)**

(Total for Question 2 is 2 marks)

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)

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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)

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Mark scheme · 2.27 Chromatography and Instrumental Analysis: Test Pack

Question 1

(a) ratio that compares how far a substance has moved relative to the solvent front in chromatography, oe **B1**

(a) Answer: Rf is the ratio comparing how far a substance moves relative to the solvent front on the chromatography paper.

(b) Rf = distance moved by substance / distance moved by solvent front cao **B1**

(b) Answer: Rf = distance moved by substance / distance moved by solvent front

Question 2

(a) substitutes: Rf = 42 / 84 **M1**

(a) 0.50 cao **A1**

(a) Answer: 0.50

Question 3

(a) use smaller or more concentrated spots so less sample is applied, oe **B1**

(a) allow the spots to dry between applications, or use a weaker solvent to reduce over-wetting, or keep the origin line above the solvent level, oe **B1**

(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) states an advantage, e.g. better resolution/separation, faster run time, or can be used with smaller sample sizes **B1**

(a) explains the reason, e.g. finer particle coating on plate gives more uniform capillary action and sharper spots, oe **B1**

(a) links to outcome, e.g. so similar compounds can be separated or results are obtained more quickly, oe **B1**

(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) calculates Rf for unknown: (40 - 10) / (70 - 10) = 30 / 60 shown or equivalent **M1**

(a) calculates Rf for known: (42 - 10) / (70 - 10) = 32 / 60 shown or equivalent **M1**

(a) concludes that the dye is unlikely to be the same because Rf values differ (0.50 vs 0.53) and are not identical, oe **A1**

(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.

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