Answer all the questions below as fully as you can then check your answers

1. In paper chromatography, what is the mobile phase?

a) The chromatography paper
b) The solvent
c) The ink
d) The pencil line

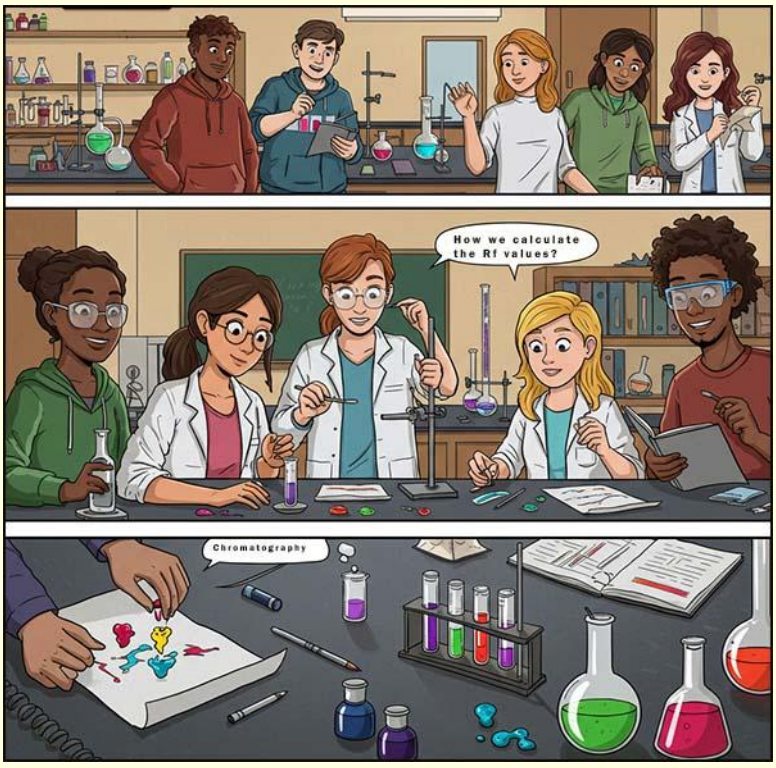
2. What is the purpose of using a pencil, rather than a pen, to draw the baseline?

a) Pencil is easier to see
b) Pencil is cheaper
c) Pen ink would also dissolve and move up the paper
d) Pencil marks the paper better

3. What does the Rf value represent?

a) The distance the solvent travelled
b) The distance the ink travelled
c) The ratio of the distance the substance travelled to the distance the solvent travelled
d) The number of different colours in the ink

4. Explain why different components of an ink mixture travel different distances up the chromatography paper.



5. What two factors determine how far a substance travels up the chromatography paper?

6. Why is it important that the solvent level is below the baseline when setting up a chromatography experiment?

7. What can you conclude if two different substances have the same R_f value?

8. Why do R_f values change if you change the solvent?

9. You are given a mixture of unknown dyes. How would you use paper chromatography to identify the dyes present in the mixture?

10. A student performs paper chromatography on a green ink and obtains two distinct spots on the chromatogram. What can the student conclude about the green ink?

11. Describe the steps involved in setting up and carrying out a paper chromatography experiment. (4 marks)

12. Explain how paper chromatography can be used to determine whether a substance is pure or a mixture. (2 marks)

13. In a chromatography experiment, the solvent front moved 10 cm, and a particular dye moved 6 cm. Calculate the R_f value for the dye.

b. Another dye has an Rf value of 0.8. If the solvent front moved 8 cm, how far did the dye travel?

True or False:

14. The more soluble a substance is in the solvent, the further it will travel up the chromatography paper.

b. If two substances have different R_f values, they are likely to be the same substance.

Answers

1. In paper chromatography, what is the mobile phase?

a) The chromatography paper

b) The solvent <-- Answer

c) The ink

d) The pencil line

Answer: b) The solvent

2. What is the purpose of using a pencil, rather than a pen, to draw the baseline?

a) Pencil is easier to see

b) Pencil is cheaper

c) Pen ink would also dissolve and move up the paper

d) Pencil marks the paper better

Answer: c) Pen ink would also dissolve and move up the paper

3. What does the Rf value represent?

a) The distance the solvent travelled

b) The distance the ink travelled

c) The ratio of the distance the substance travelled to the distance the solvent travelled

d) The number of different colours in the ink

Answer: c) The ratio of the distance the substance travelled to the distance the solvent travelled

4. Explain why different components of an ink mixture travel different distances up the chromatography paper.

Answer: Different components have different solubilities in the solvent and different attractions to the stationary phase.

5. What two factors determine how far a substance travels up the chromatography paper?

Answer: Solubility in the solvent (mobile phase) and attraction to the chromatography paper (stationary phase).

6. Why is it important that the solvent level is below the baseline when setting up a chromatography experiment?

Answer: If the solvent is above the baseline, the ink spots will dissolve directly into the solvent before the chromatography can occur.

7. What can you conclude if two different substances have the same R_f value?

Answer: They are likely to be the same substance if the same conditions are used.

8. Why do R_f values change if you change the solvent?

Answer: The solvent is the mobile phase. Changing the solvent changes the interactions with the substances being separated, thus affecting how far they travel.

9. You are given a mixture of unknown dyes. How would you use paper chromatography to identify the dyes present in the mixture?

Answer: Run chromatography on the unknown mixture and on known dyes separately. Compare the Rf values and the positions of the spots on the chromatograms. Matching Rf values and spot positions indicate the presence of those dyes in the unknown mixture.

10. A student performs paper chromatography on a green ink and obtains two distinct spots on the chromatogram. What can the student conclude about the green ink?

Answer: The green ink is a mixture of at least two different dyes.

11. Describe the steps involved in setting up and carrying out a paper chromatography experiment. (4 marks)

Answer:

(1) Draw a pencil baseline near the bottom of the chromatography paper. (2) Spot the ink samples on the baseline using capillary tubes. (3) Place the paper in the chromatography tank, ensuring the solvent is below the baseline. (4) Allow the solvent to rise up the paper, then remove and dry the chromatogram.

12. Explain how paper chromatography can be used to determine whether a substance is pure or a mixture. (2 marks)

Answer: A pure substance will produce a single spot on the chromatogram. A mixture will produce two or more spots.

Calculation Questions:

13. In a chromatography experiment, the solvent front moved 10 cm, and a particular dye moved 6 cm. Calculate the R_f value for the dye.

Answer: R_f = 6 cm / 10 cm = 0.6

b. Another dye has an Rf value of 0.8. If the solvent front moved 8 cm, how far did the dye travel?

Answer:

Distance = R_f * Solvent front distance = 0.8 * 8 cm = 6.4 cm

True or False:

14. The more soluble a substance is in the solvent, the further it will travel up the chromatography paper.

Answer: True

b. If two substances have different R_f values, they are likely to be the same substance.

Answer:

False. If they have the same R_f value under the same conditions, they are likely to be identical. If they have different R_f values, they are definitely not the same.