PURITY: CHROMATOGRAPHY AND MEDICINE 2

- Understand how chromatography separates compounds
- Use R_f values to interpret chromatography

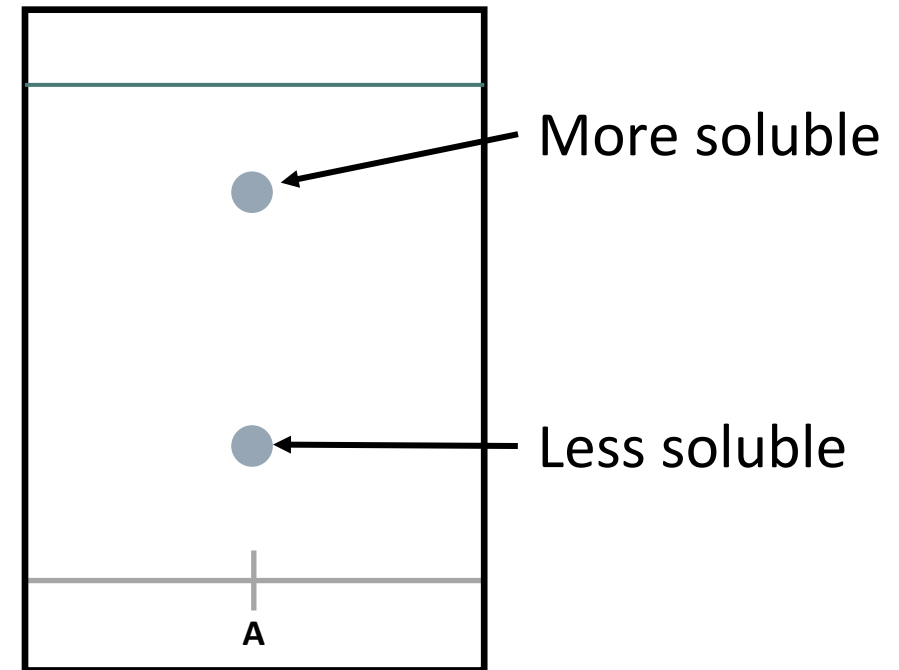# WHY DO THE SPOTS SEPARATE?

WHY DO THE SPOTS SEPARATE?

More soluble compounds **move further** up the stationary phase.

Less soluble compounds move a **shorter distance** up the stationary phase.
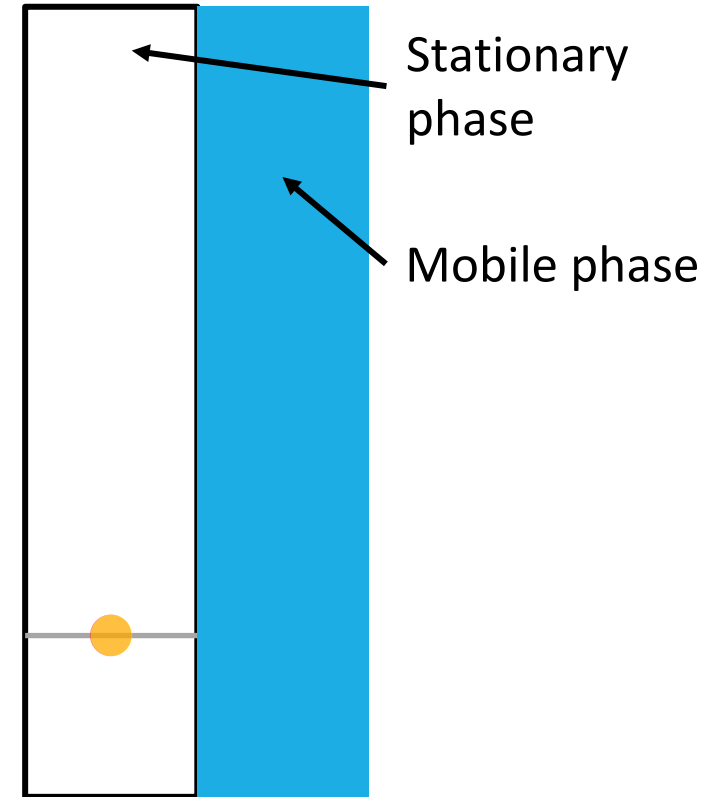
More soluble

Less soluble

A

WHY DO THE SPOTS SEPARATE?

More soluble compounds spend **longer being pulled along** in the **mobile phase**.

Less soluble compounds spend **longer stuck to the stationary phase**.

How far a spot moves depends on the **solvent (mobile phase)** you use.

Stationary phase

Mobile phase

IDENTIFYING A MIXTURE: CHROMATOGRAPHY

Chromatography is useful to test if a substance is **pure** or a **mixture**.

Even more useful is that it can also be used to **identify parts of a mixture.**
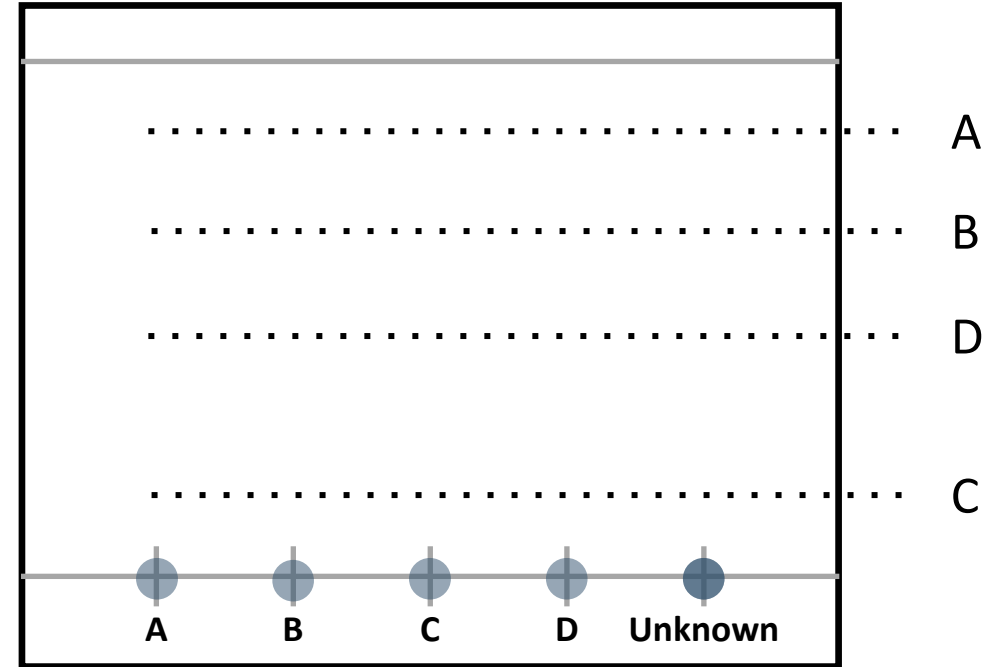
IDENTIFYING A MIXTURE: CHROMATOGRAPHY

Step 1: Make spots of **known compounds**. Make sure you label them!

Step 2: Make a spot of your **unknown mixture (make sure it's labelled!)**.

Step 3: Run the experiment.

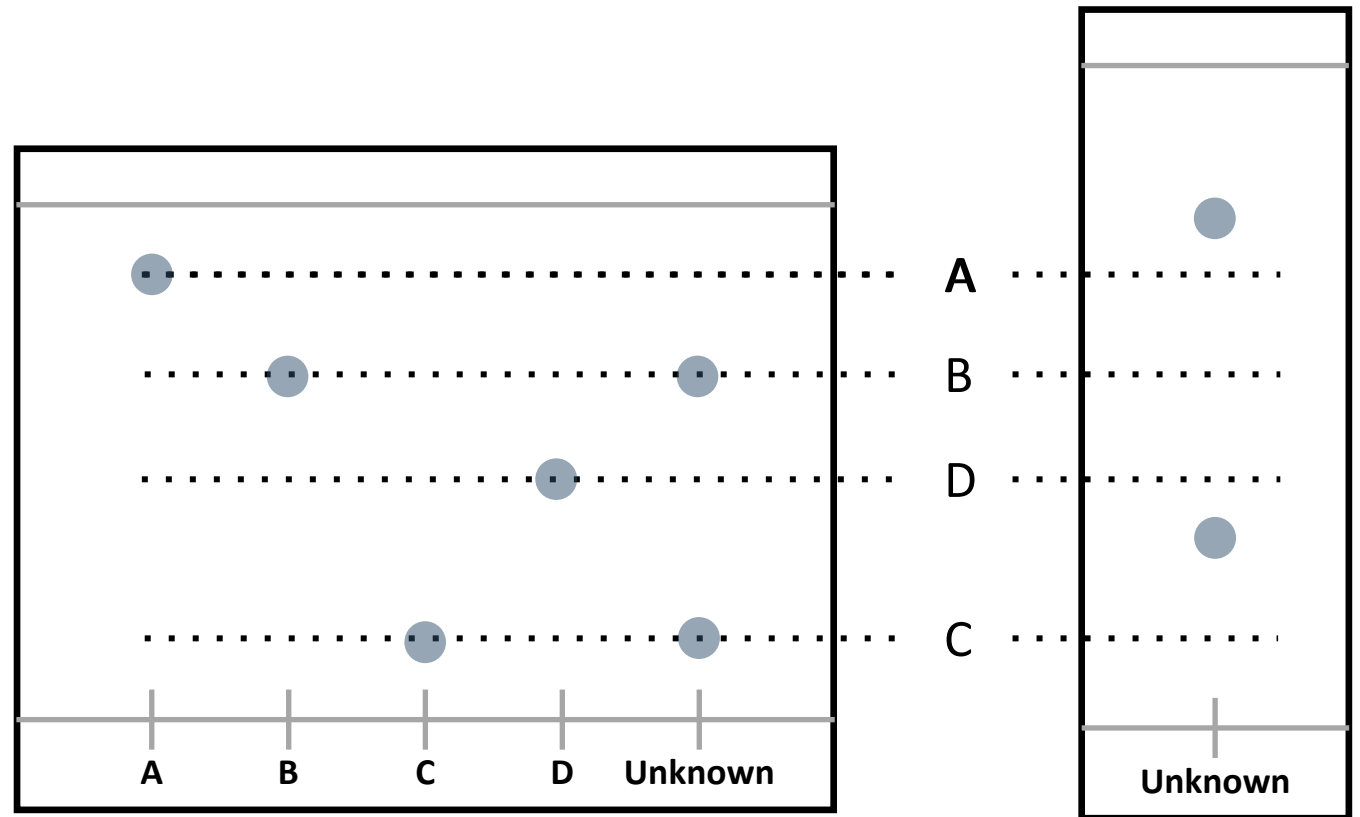**Step 4:** Look for spots at the **same level**.

IDENTIFYING A MIXTURE: R_f VALUES

These two chromatograms look unrelated.

In reality, both samples are the same!

R_f values let us identify spots on a different length chromatogram
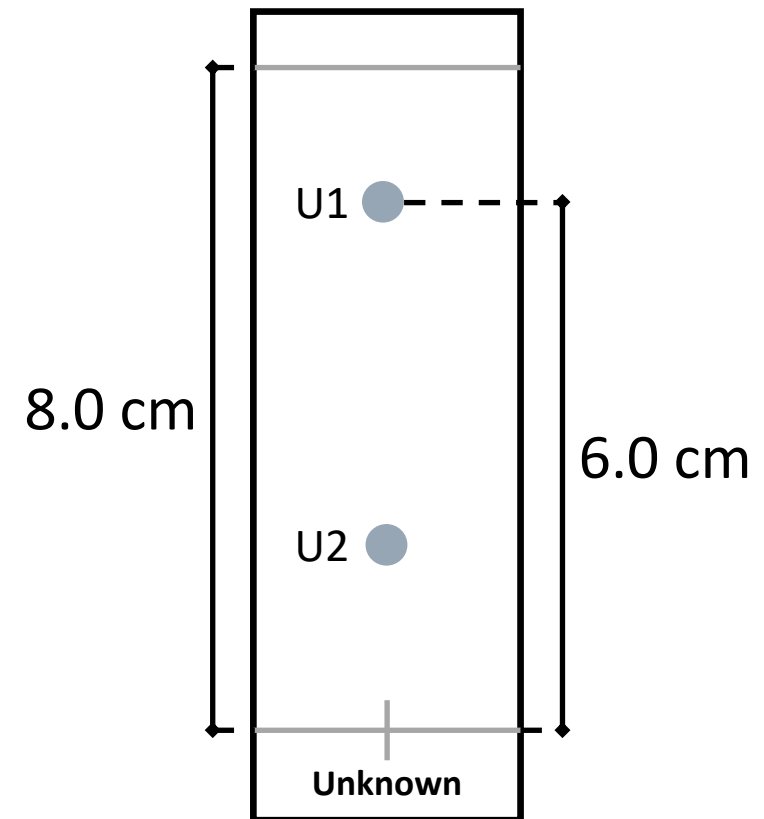
IDENTIFYING A MIXTURE: R_f VALUES

We calculate R_f values like this:

$$R_f \text{ value} = \frac{\text{distance moved by a spot}}{\text{distance moved by the solvent}}$$

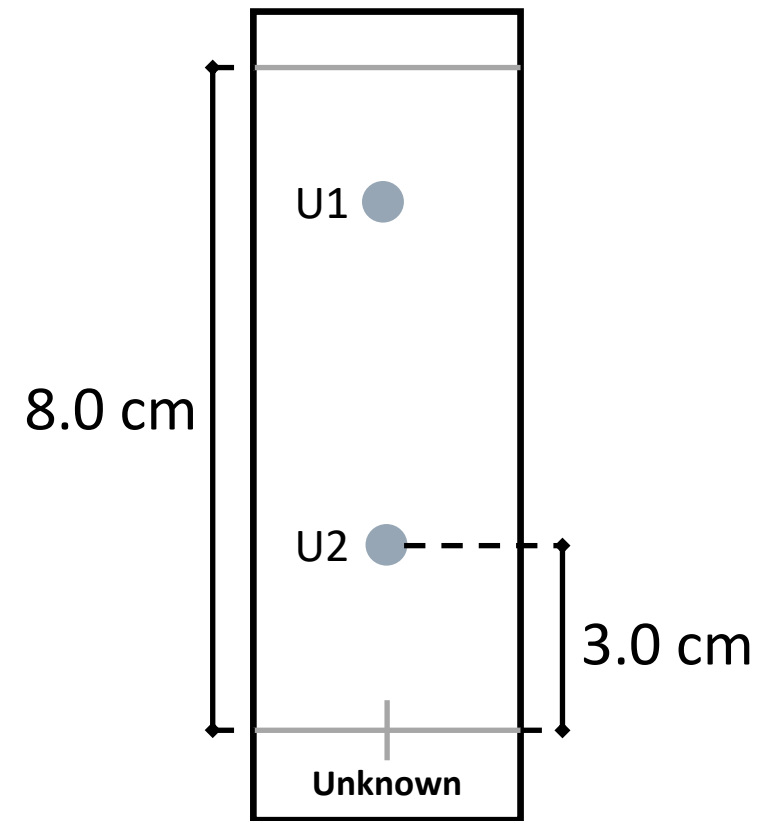$$R_f \text{ value (Spot U1)} = \frac{6.0}{8.0} = 0.75$$

IDENTIFYING A MIXTURE: R_f VALUES

We calculate R_f values like this:

$$R_f \text{ value} = \frac{\text{distance moved by a spot}}{\text{distance moved by the solvent}}$$
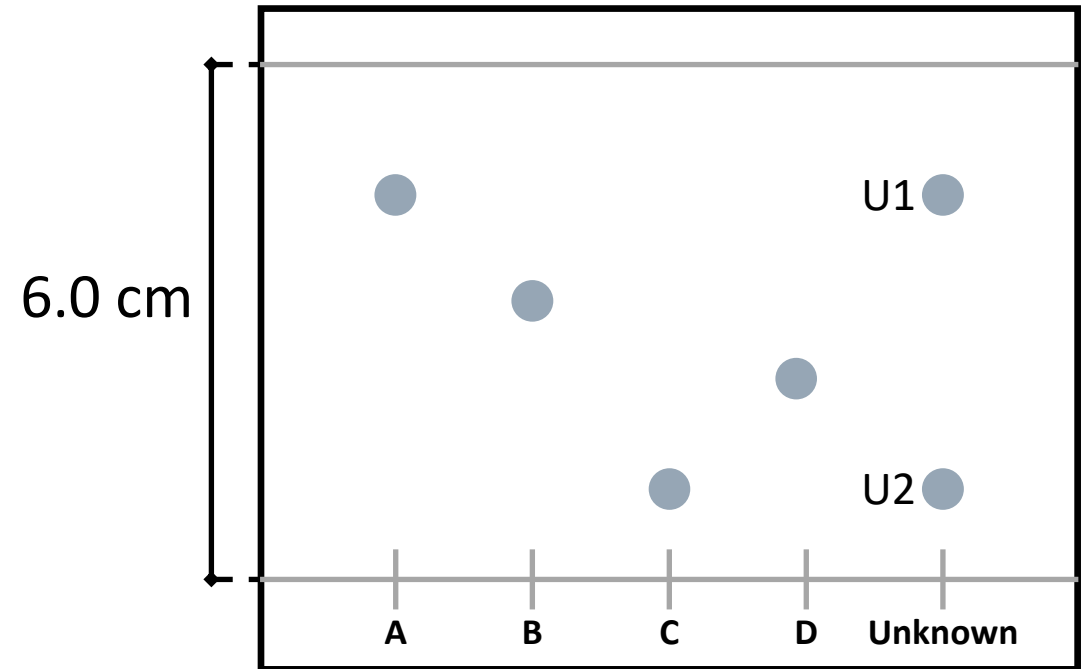
$$R_f \text{ value (Spot U2)} = \frac{3.0}{8.0} = 0.38$$

IDENTIFYING A MIXTURE: R_f VALUES

$$R_f \text{ value} = \frac{\text{distance moved by a spot}}{\text{distance moved by the solvent}}$$

Spot	Distance Moved	R_f Value
A	4.0	
B	3.5	
C	2.3	
D	3.0	
U1	4.0	
U2	2.3	

IDENTIFYING A MIXTURE: R_f VALUES

Spot	R_f Value
A	0.75
B	0.58
C	0.38
D	0.5
U1	0.75
U2	0.38

Spot	R_f Value
U1	0.75
U2	0.38

R_f values are the same, so these are the same spots!

EXAM QUESTION

The figure below shows a paper chromatogram of five different inks.

Analyse the chromatogram. Describe and explain the result for black ink.

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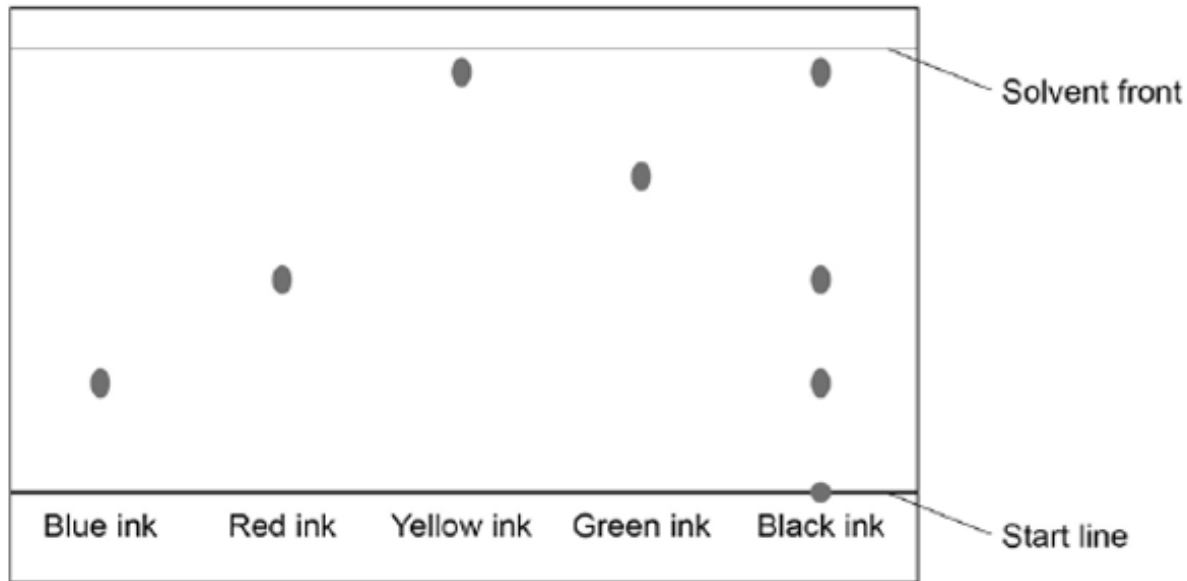
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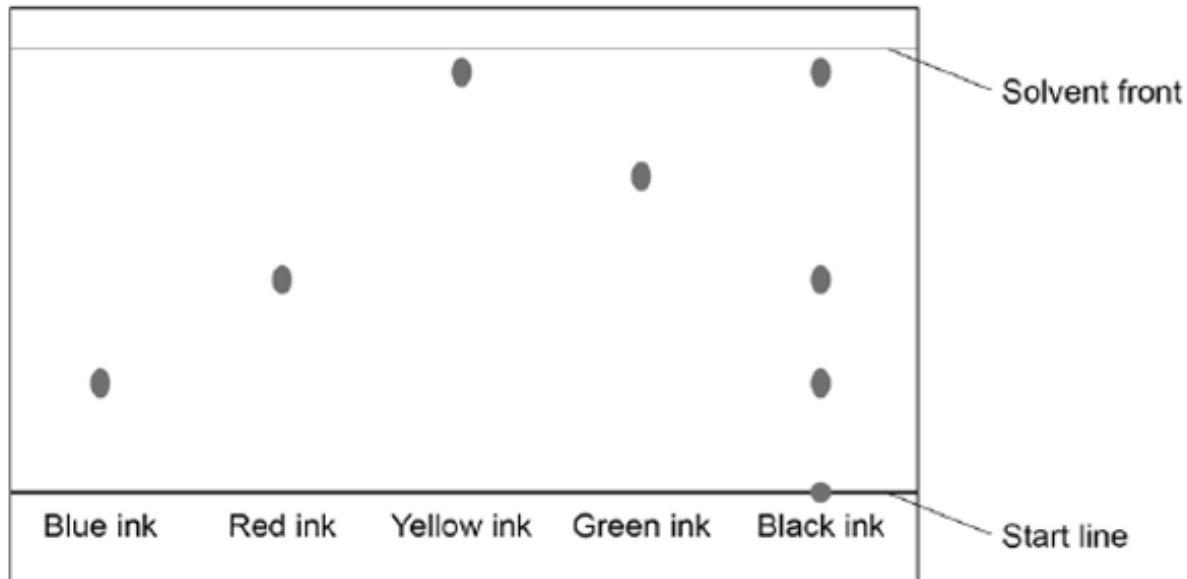
(4 marks)

EXAM QUESTION

The figure below shows a paper chromatogram of five different inks.

Analyse the chromatogram. Describe and explain the result for black ink.

- black ink is a mixture
- because more than one spot
- contains blue, red and yellow
- because R_f values / positions match
- does not contain green
- contains an unknown (which is insoluble)
- yellow is most soluble or has highest R_f value, blue is least

(4 marks)