

Chromatography



Chromatography

Chromatography is a method used by scientists for separating mixtures of compounds so that they can be analyzed and studied.

It is often used as a teaching tool to demonstrate separation of coloured inks and dyes.



How it works?

In all chromatography there is a mobile phase and a stationary phase. The **stationary phase** is the phase that **doesn't move** and the **mobile phase** is the phase that **does move**. The mobile phase moves through the stationary phase picking up the compounds to be tested.

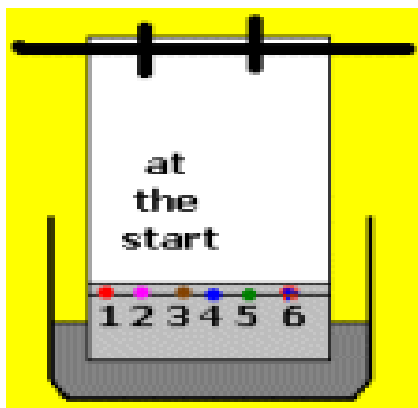
In paper and thin-layer chromatography **the mobile phase is the solvent**. **The stationary phase in paper chromatography is the strip or piece of paper** that is placed in the solvent.

The different components of the mixture travel through the stationary phase **at different speeds**, causing them to **separate from one another**.

<https://www.youtube.com/watch?v=TdJ57SQ6GAQ>

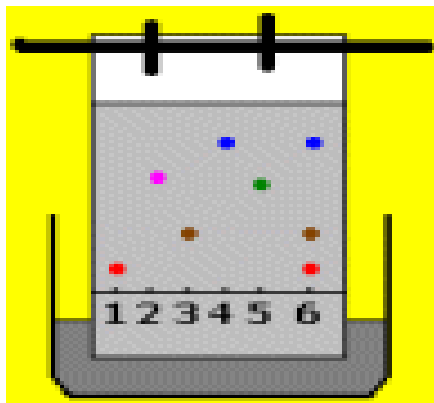
What is the Difference Between Stationary and Mobile Phase?

Stationary vs Mobile Phase	
Stationary phase of a chromatographic technique is the compound used to separate components in a mixture, but it does not move with the components.	Mobile phase in chromatography is a compound used to separate components in a mixture, and it can move along with the components.
Movement	
The stationary phase does not move.	The mobile phase migrates through the stationary phase.

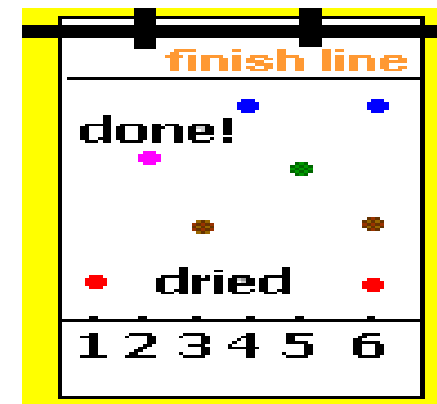


At the start mark a baseline in pencil - mark won't dissolve or run. Make sure it is above the surface of the solvent, so as not to dissolve the spots directly.

You then carefully put spots of the mixtures onto the baseline.



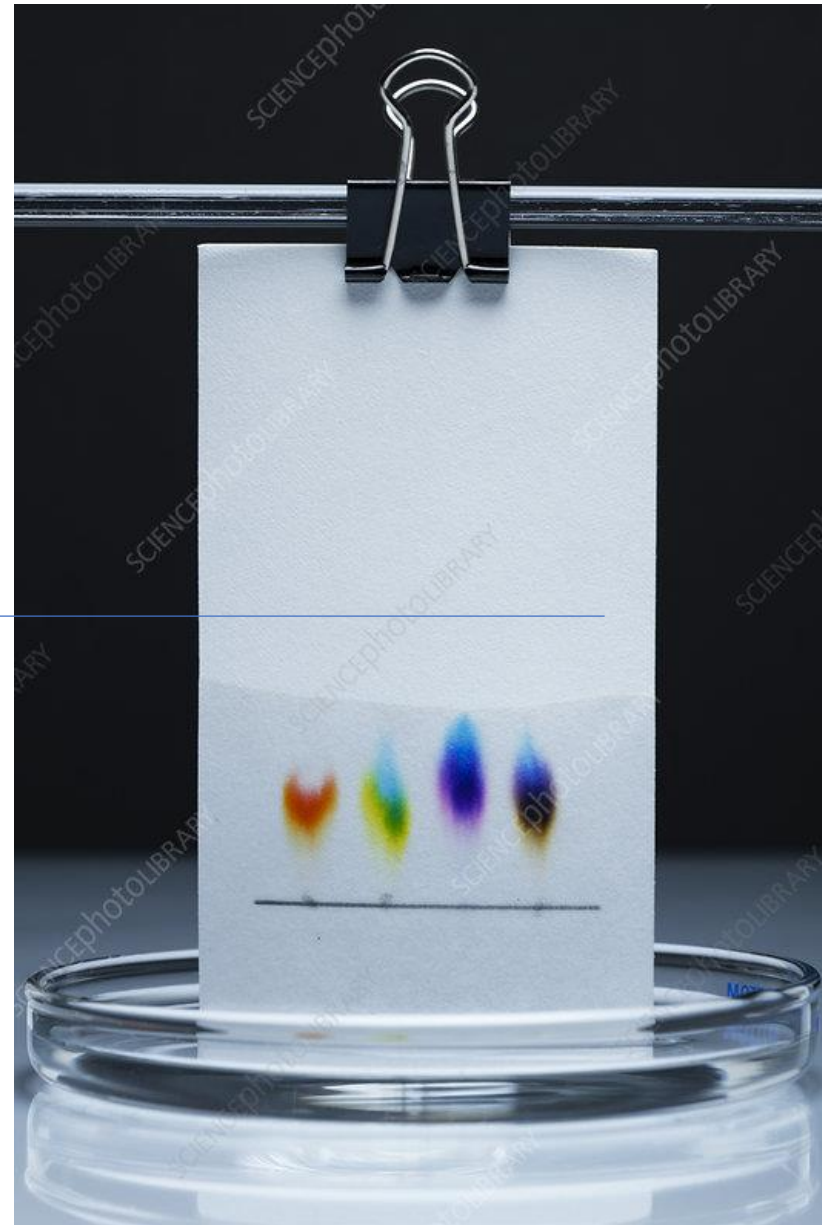
As the solvent seeps into the paper and moves (spreads) up the paper it dissolves the ink spots and the colours begin to separate out.



When the solvent is near the top of the paper, the paper is removed and allowed to dry before examination .
The final result is called the **chromatogram**.

[Very important link](https://www.youtube.com/watch?v=X1DdTOTRa28)

<https://www.youtube.com/watch?v=X1DdTOTRa28>



<https://www.youtube.com/watch?v=GiR7eAj8tH8>

Separating mixtures – chromatography

What is chromatography?

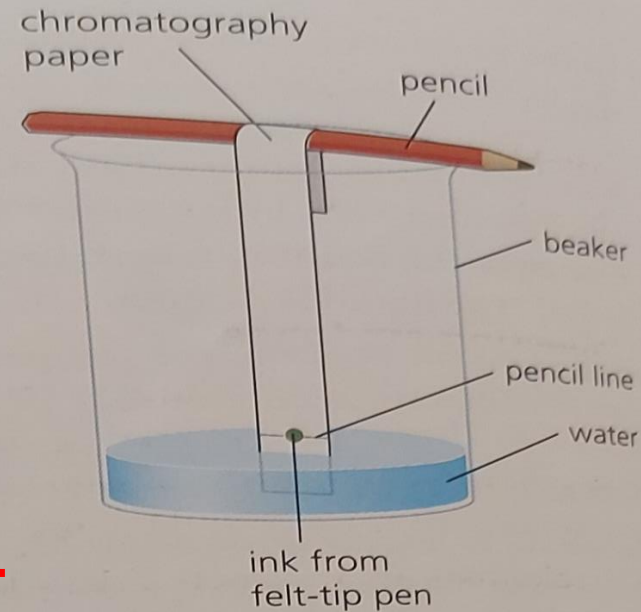
You can use **chromatography** to separate compounds from mixtures of compounds. Chromatography works if all the substances in the mixture dissolve in one solvent.

Chromatography of ink

Mita sets up the apparatus opposite. The water moves up the paper. It takes the dyes in the ink with it. Different dyes move at different speeds, so they separate.

A chromatogram is produced.

In the chromatogram, the blue dye goes further up the paper. This might be because the blue dye dissolves better in the solvent. Or it might be because the yellow dye sticks more strongly to the paper. You cannot tell just by looking at the chromatogram.

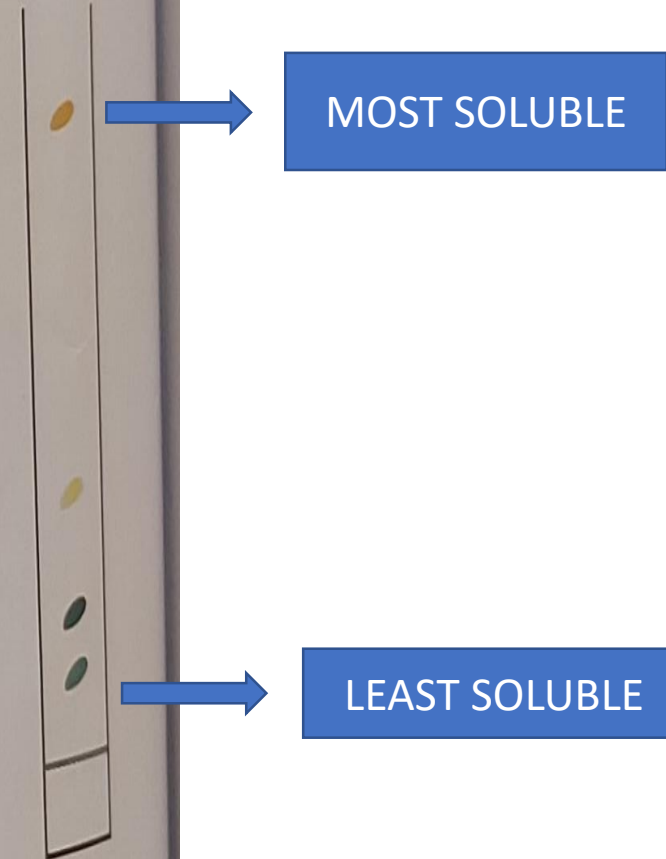


↑ Chromatography apparatus.

yellow dye sticks more strongly to the paper. You can see this in the chromatogram.

Chromatography of spinach

Rashid grinds up a spinach leaf. He puts a spot of spinach juice near the bottom of a piece of chromatography paper. He stands the paper in a solvent. He obtains the chromatogram shown opposite. It shows the pigments (colours) in spinach. Each pigment is a different nutrient.



Workbook/ Page 57

Use words and phrases from the box to complete the sentences below. Use each word or phrase once, more than once, or not at all.

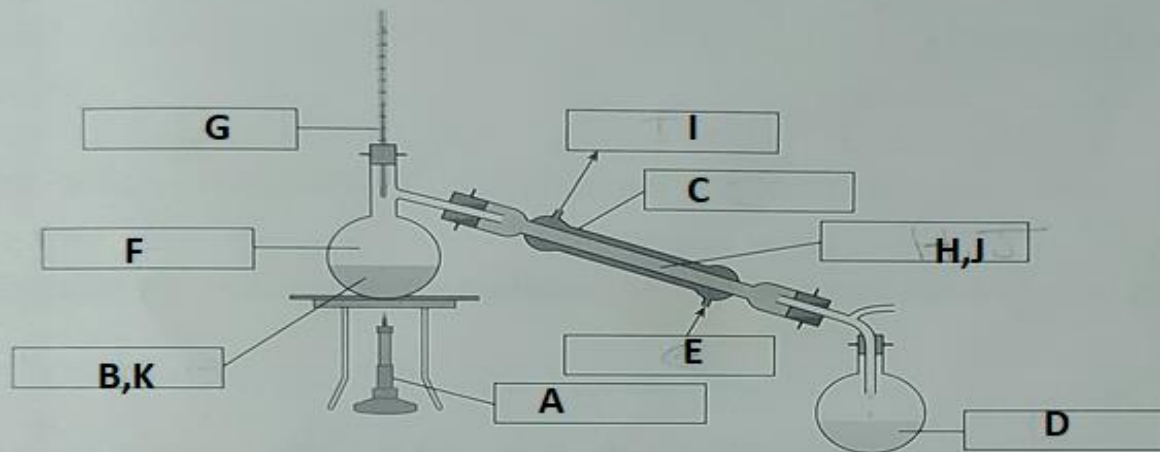
distillation solvent solute solution pure water evaporation salt copper sulfate

Use **evaporation**... to obtain a solute from a solution, for example **salt**..... from seawater

or **copper sulfate** from its solution. The**solvent**.... evaporates. The **solute**..... remains.

Use **distillation**... if you want to obtain a solvent from a ...**solution**...., for example **pure water**.. from seawater.

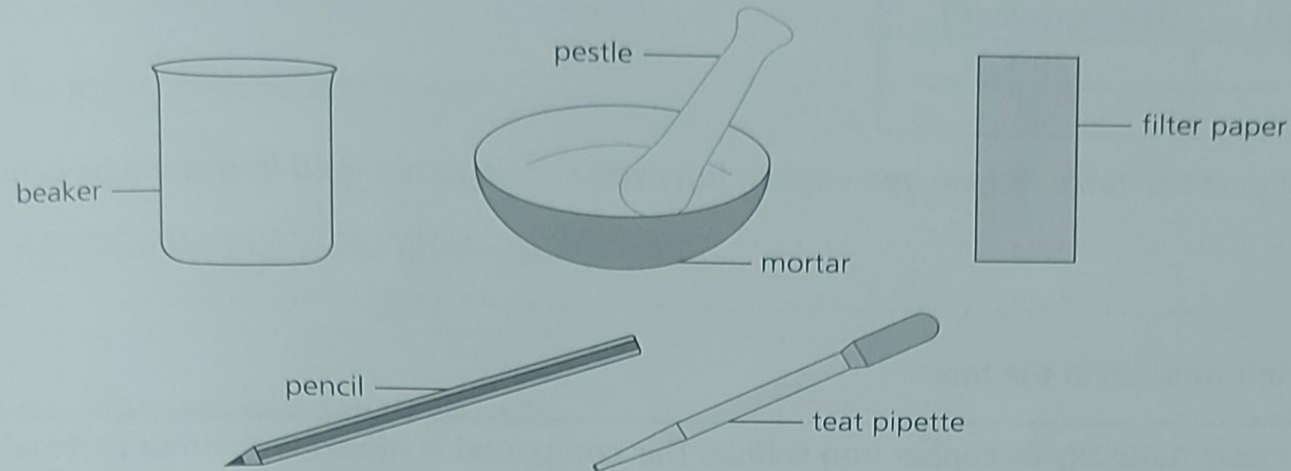
- 2 The diagram shows how to use distillation to obtain pure water from a mixture of ink and water. Write the letters of the words or phrases in the correct boxes on the diagram. Some boxes may need more than one letter.



A	Bunsen burner
B	mixture of ink and water
C	condenser
D	pure water
E	Cold water enters here.
F	steam
G	thermometer
H	steam cools
I	Warmer water comes out here.
J	Steam condenses to liquid water.
K	At 100 °C, water in the mixture boils. It changes state to become a gas – steam. The ink does not boil at this temperature. It remains here as a liquid.

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1 Sarah has a square cut from an unknown leaf. She wants to know if the leaf is from a spinach plant or a cassava plant. She has this apparatus.



The stages below describe what to do. They are in the wrong order. Write the letters in a sensible order.

..... **B D F A C E**

- ~~A~~ Pour solvent into the bottom of the beaker. Stand the paper in the beaker.
- ~~B~~ Use a pestle and mortar to extract liquid from three leaves – the unknown leaf, a spinach leaf, and a cassava leaf.
- ~~C~~ Wait as the solvent moves up the paper.
- ~~D~~ Draw a pencil line on the chromatography paper.
- ~~E~~ Take out the paper. Compare the patterns.
- ~~F~~ Put one spot of liquid from each leaf on the pencil line.



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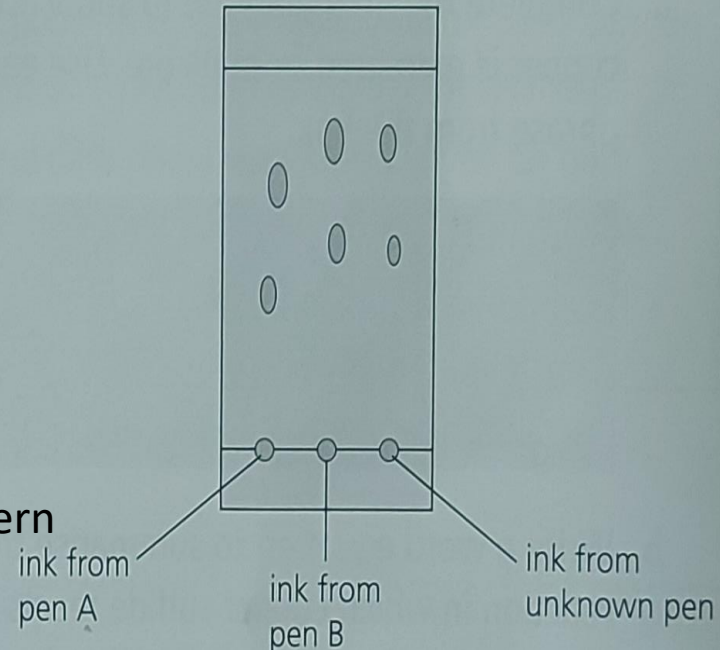
- ~~C~~ Wait as the solvent moves up the paper.
- D Draw a pencil line on the chromatography paper.
- ~~E~~ Take out the paper. Compare the patterns.
- ~~F~~ Put one spot of liquid from each leaf on the pencil line.

2 The chromatogram shows ink from three pens.

Which pen is the unknown sample from?

Explain your choice.

Pen B, because they both show the same pattern



3 List three uses of chromatography.

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E

Use words from the box to complete the sentences below. Use each word once, more than once, or not at all.

blue	chromatography	yellow	red	most
least	chromatogram	three		

This is a **chromatogram** of black ink. It shows that the black ink is a mixture of **three** coloured inks. The **blue** ink has moved furthest. This might be because this ink is **most** soluble in water. Or it might be that this ink sticks **least** strongly to the paper.

