



Paper chromatography

Practical video

Supporting resources

Contents

Teacher notes	1
How to use this video	1
Notes on running the practical experiment	1
Key terms	2
Prior knowledge	2
Common misconceptions	3
Real-world contexts	3
Cross-curriculum links and skills	3
How to use the additional resources	3
Intended outcomes	4
Additional resources	5
Pause-and-think questions	5
Follow-up worksheet	8
Support	8
Core	9
Follow-up worksheet answers (support and core)	11
Structure strip: suggested answer	13

Also available:

- Technician notes
- Integrated instructions
- Frayer models
- Johnstone's triangle

Download the PDF and editable PowerPoint slides at rsc.li/3MSQltm.

Teacher notes

This resource supports the practical video Paper chromatography, available here: rsc.li/3MSQltn.

The value of experiencing live practical work cannot be overstated. Numerous studies provide evidence of its value in terms of learner engagement, understanding, results and the likelihood of continuing to study chemistry or work in a related field.

Use this video to complement live practical work, or to help learners understand the methods, equipment and skills when they cannot access the lab.

How to use this video

The video and additional resources are designed for you to use flexibly but read on for suggestions of how to use them with your learners.

Flipped learning

Show learners the video before the live practical lesson to help it run more smoothly and keep objectives in focus. This will build learners' confidence and improve their outcomes in the lesson. Use questions from the set provided as part of the preparation task (for more on flipped learning, see rsc.li/3On7DQF).

Consolidation and revision

Show learners the video after the practical – either directly after the lesson or return to it as part of learners' exam revision.

Revisiting the practical with a different focus

Practical experiments support many learning outcomes. Focussing on just one or two of those in a lesson will ensure you achieve the lesson's aims. Use the video to revisit the experiment with a different focus.

Home learning

Whether it is remote teaching, homework, or individual learner absence, give learners an opportunity to engage with a practical experiment and the associated skills when they are not in the lab.

Other tips

Provide your own commentary

Mute the voice over and provide your own commentary. This will allow you to better engage with learners and adapt the video to the needs and objectives of your lesson.

Use questions

A set of pause-and-think questions are provided in two formats, one for teacher-led questions and discussion and a student worksheet to be used independently by learners. Select from these or create your own questions to engage learners and target specific aims.

Notes on running the practical experiment

This experiment is designed to cover most of the questions asked in a variety of syllabuses. You or your school's technician will have to do some trial and error to get the ink composition correct to get the desired results. The suggestion is that one ink is not soluble in the water (solvent) and so doesn't move, one colour moves to the top of the paper (learners can identify this as the most soluble) and there is a colour in common between two of the samples. Although the video and worksheets refer to particular colours seen in the video, the actual colours don't matter and it is their characteristics that are key to the success of the practical.

You may want to demonstrate the experiment using a different solvent, such as ethanol (student safety sheet 60 from CLEAPSS: bit.ly/3T9fcwP). Use a lid and wear eye protection (safety glasses to EN166 F) when using the alcohol. To show a different stationary phase, use a TLC plate.

Technician notes including the equipment list, safety notes and tips are available here: rsc.li/3MSQltn. Read our standard health and safety guidance (available from: rsc.li/3IAmFAQ) and carry out a risk assessment before running any live practical.

Procedure for paper chromatography of inks

1. Cut a piece of filter paper to fit inside a beaker (size of the beaker is not relevant) so that it does not curve and lies flat, not touching the edges of the beaker.
2. Using a pencil, draw an origin line on the paper and label 1, 2 and 3 at equal distances below the line.
3. Using a separate capillary tube for each ink, transfer a small spot onto the correct labelled position on the origin line.
4. Add a small amount of the solvent to just cover the bottom of the beaker.
5. Check the paper is the right length by lining it up on the outside of the beaker so that the water is below the origin line. Roll the paper round a splint and hold it with a paper clip.
6. Place the paper inside the beaker. Make sure it just touches the water and it is vertical.
7. Remove the filter paper from the beaker when the solvent has nearly reached the top of the filter paper.
8. Leave the filter paper to dry or use a hairdryer.
9. Measure the distances from the origin line to the middle of the colours and from the origin line to the solvent front to find the R_f values.

Integrated instructions

Integrated instructions use clear numbering, arrows and simple pictograms, like an eye to show when to make observations. They were developed using cognitive load theory and remove unnecessary information. Therefore, the instructions reduce extraneous load on learners, increasing the capacity of their working memory to think about what they are doing and why. Download the integrated instructions for this experiment at rsc.li/3MSQltn.

Key terms

- Chromatography – a technique for separating mixtures of soluble substances.
- Chromatogram – the results of separating mixtures by chromatography.
- Mixture – two or more different substances, not chemically joined together.
- Solvent – the substance a solute dissolves in to form a solution.
- Solute – a substance that will dissolve in a solvent.
- Dissolve – when a solute mixes completely with a solvent to produce a solution.
- Solution – a mixture formed by a solute and a solvent.
- Soluble – a substance that will dissolve.
- Insoluble – a substance that will not dissolve.
- Pure – a substance made of only one element or compound.
- Impure – a substance made of more than one element or compound.
- R_f value – the ratio of the solute's distance travelled to the solvent's distance travelled.
- Stationary phase – the substance that does not move, eg paper.
- Mobile phase – the solvent that moves up the stationary phase, eg water.
- Origin line – the mark you add the samples to at the start of chromatography.
- Solvent front – the distance travelled by the solvent.
- Volatile – evaporates easily.

You will find template and example Frayer models for the terms: 'chromatography', 'mobile phase', 'stationary phase', 'origin line' and 'solvent front' on the PowerPoint slides, available from: rsc.li/3MSQltn.

Prior knowledge

- Mixtures and pure substances, including how to identify them.
- Solubility: dissolving, solutes, solvents and solution.
- Rate: solubility and attraction of the substance to the mobile or stationary phase changes the speed at which it moves up the stationary phase.
- Techniques for separating mixtures.
- Evaporation to understand why you use a lid during paper chromatography.

Common misconceptions

Using pen to draw the origin line. Bring attention to using pencil and encourage learners to think why pens might interfere with the separation.

Putting too much solvent so learners submerge the origin line. Ensure the solvent is below the origin line and learners understand why.

Allowing the solvent to travel too far up the paper. The solvent front will be lost meaning the R_f value cannot be calculated.

All mixtures are separated using only one separating technique. Practise a range of techniques with learners and highlight that chromatography is a method of separation for analysing a mixture but does not achieve separation of the entire test mixture. Carry out further methods once purity has been determined and/or the impurities identified.

The solvent/mobile phase can only be water. Use different solvents, such as sodium chloride solution and ethanol.

The stationary phase in chromatography can only be paper. Introduce alternatives, such as thin layer chromatography using silica on a plastic backing or aluminium oxide coated plates.

Dyes have a preference or 'like' to be in the stationary or the mobile phase. Avoid anthropomorphising as analogies like this can be a barrier to deep learning. Use 'is attracted to' or 'hydrophobic/philic' instead.

Real-world contexts

- Highlight real-world uses of chromatography with the article Poisoned by milk: rsc.li/30I0Hli.
- Complete this project on the chemistry of food in a sequence of timetabled chemistry lessons, STEM clubs or during an activity day to provide context to analytical techniques: rsc.li/46RTPVj.
- Engage younger learners with this investigation to solve who stole a famous painting: rsc.li/3rDY9Yo.
- Watch the video to see how senior science manager Paul (rsc.li/3lpJleT) uses liquid chromatography in his job at British Sugar.

Cross-curriculum links and skills

Learners will use key maths skills in the practical including measuring a distance accurately, ratios and giving answers to a specified decimal place.

How to use the additional resources

Pause-and-think questions

Pause-and-think questions are supplied in two formats: a teacher version for 'live' questioning and a learner version that can be used during independent study. The timestamps allow you to pause the video when presenting it to your class, or learners to use the video for active revision.

Teacher version

The questions are in a table. You can use as many as are appropriate for your class and the learning objectives. Some questions have two timestamps to allow you to adapt the questions for different classes or scenarios. Pause the videos at the earlier timestamp to ask a question before you hear/see the answer, useful for revision or to challenge learners. Pause at the later timestamp to ask a question reflectively and assess whether learners have understood what they have just heard or seen. This would be useful when introducing a topic, for flipped learning or to provide additional support and encouragement.

Think about how you will ask for responses. Variation in how you ask for responses may help increase engagement. Learners could write and hold up short answers or they could discuss questions in groups. Not all answers are in the video. Some of the questions will extend learners' thinking beyond its content or draw on prior learning.

Learner version

Provide the worksheet with the same questions in situations where there is not a teacher present to guide discussion during the video, eg homework, revision or remote learning.

Using the structure strip

Writing about chemistry encourages learners to reflect on their understanding, formulate new ideas and make links in new ways. Learners also need to practise for long-answer questions in exams. They can stick the structure strip in the margin and use the prompts to overcome 'fear of the blank page'. Use it to consolidate learning after the practical and/or for revision. Read more at rsc.li/2POJDIW.

Using the follow-up worksheet

There are two versions of the follow-up worksheet – support and core – that you can use to reinforce learning. The first questions asks learners to sketch the results from the video's chromatogram and add the values, in centimetres, given to calculate the R_f for one colour. This diagram does not have to be accurate and is only a sketch. You can also remove this question or ask learners to stick their dried chromatograms onto the worksheet or in their books to measure their distances and calculate the R_f values.

Both versions of the student worksheet then take learners through questions asking why a colour has not moved, why one colour has moved to the top of the paper, how many colours have separated and how the learner knows that there is a colour in common between two of the samples.

The support student sheet briefly mentions the mobile and stationary phase. The core student sheet delves into the understanding of the mobile and stationary phase and how this affects the movement of the ink and the R_f value. There are challenge questions and a research task about thin layer chromatography (TLC) and amino acids on the core worksheet.

The answers to both versions of the student sheet are at the end of this document.

Use the Johnstone's triangle, available to download as a PowerPoint from rsc.li/3MSQltm, to help learners link their observations to what's going on at the submicroscopic level.

Intended outcomes

It's important that the purpose of each practical is clear from the outset. Defining the intended learning outcomes consolidates this. Outcomes can be categorised as 'hands on' – what learners are going to do with objects – and 'minds on' – what learners are going to do with ideas to show their understanding. We have offered some differentiated suggestions for this practical. You can focus on just one or two, or make amendments based your learners' needs (read more at rsc.li/2JMvKa5).

Consider how you will share outcomes and evaluation with learners to empower them to direct their own learning.

	Hands on	Minds on
Effective at a lower level	Learners correctly: <ul style="list-style-type: none">Set up paper chromatography so that several separated spots from a sample can be observed.	Learners correctly: <ul style="list-style-type: none">Talk about how different substances move at different speeds up the paper and that different spots indicate different substances.Discuss how the pattern on the chromatogram of an unknown sample may be compared to a known sample to help identify the unknown one.
Effective at a higher level	Learners correctly: <ul style="list-style-type: none">Measure the distance travelled of the spots and solvent front to calculate R_f values.	Learners correctly: <ul style="list-style-type: none">Discuss what will happen to the R_f value, and why, if the mobile or stationary phase are changed.

Additional resources

Pause-and-think questions

Teacher version

Timestamp(s)		Question	Answer/discussion points
00:16	00:33	What is a real-world use for chromatography?	There are many answers to this. The video mentions: to identify fraudulent documents by looking at the colours present in inks, to test unknown or toxic substances in food and drink and to look at the purity and, therefore, safety of drugs.
00:44		Something that is not pure contains a mixture. What is the definition of a mixture?	Two or more different substances, not chemically joined together.
01:04	01:09	Why should we draw the origin line in pencil?	The pencil is not soluble in water so will not affect the experiment.
01:16	01:30	Why does the presenter use a capillary tube to transfer the liquids?	We need to use a very small amount of each ink.
02:13	02:22	The solvent moves up the paper. What phase is the paper?	The stationary phase.
03:09	03:17	What would happen if the water level was higher than the ink samples?	The ink samples would dissolve in the water and there would be no samples left on the filter paper.
03:50		Why do I need to make a note of where the solvent got to at the end of the experiment?	When it dries you will not be able to tell how far the solvent travelled.
04:11	04:19	Sample 2 didn't move off the origin line, so it didn't separate any colours in the mixture. Why?	This black ink is not soluble in water.
04:19	04:26	How can you tell that Sample 3 is pure?	It only contains one spot of colour.
04:33	05:49	Explain why the inks have separated and travelled different distances up the paper.	It depends on how soluble the inks are in the water. The video describes in more detail that the different chemicals in the mixture travel different distances, depending upon whether they have a stronger attraction for the mobile phase, the solvent, or for the stationary phase, the paper.
04:50	05:00	On the animation, which colour has the strongest attraction for the stationary phase, (the filter paper)? Why do you think that?	The video gives an answer: it is the Sample 2 ink because it doesn't move up the filter paper.
05:01	05:09	On the animation, which colour has the strongest attraction for the mobile phase, (the solvent)?	It is the blue in Sample 1 because this is the quickest to move up the filter paper and is the most soluble.
05:13	05:19	What variable can you change to see if you can separate the colours in Sample 2?	Repeat the experiment with a different solvent/mobile phase.
05:41	05:49	What does TLC stand for?	Thin-layer chromatography.
06:33		Why do we take our line to the middle of the spot and not to the bottom or top?	We need to measure the line to the same point in each colour otherwise the R_f value would be different each time we measured it for a particular dye. It will also be different from the data book value if you measure it from different places.

Pause-and-think questions

Learner version

Pause the video at the time stated to test or revise your knowledge of these practical experiments.

Time	Question
------	----------

00:33	What is a real-world use for chromatography?
-------	--

	<hr/> <hr/> <hr/> <hr/> <hr/>
--	-------------------------------

00:44	What is the definition of a mixture?
-------	--------------------------------------

	<hr/> <hr/>
--	-------------

01:09	Why should we draw the origin line in pencil?
-------	---

	<hr/> <hr/>
--	-------------

01:30	Why does the presenter use a capillary tube to transfer the liquids?
-------	--

	<hr/> <hr/>
--	-------------

02:22	The solvent moves up the paper. What phase is the paper?
-------	--

	<hr/>
--	-------

03:17	What would happen if the water level was higher than the ink samples?
-------	---

	<hr/> <hr/>
--	-------------

03:50	Why do I need to make a note of where the solvent got to at the end of the experiment?
-------	--

	<hr/> <hr/>
--	-------------

04:19	Sample 2 didn't move off the origin line, so it didn't separate any colours in the mixture. Why?
-------	--

	<hr/> <hr/>
--	-------------

04:26	How can you tell that Sample 3 is pure?
-------	---

	<hr/> <hr/>
--	-------------

05:49	Explain why the inks have separated and travelled different distances up the paper.
-------	---

	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
--	---

05:00 On the animation, which colour has the strongest attraction for the stationary phase, (the filter paper)? Why do you think that?

05:09 On the animation, which colour has the strongest attraction for the mobile phase, (the solvent)?

05:19 What variable can you change to see if you can separate the colours in Sample 2?

05:49 What does TLC stand for?

06:33 Why do we take our line to the middle of the spot and not to the bottom or top?

Follow-up worksheet

This worksheet accompanies the Paper chromatography video, available at [rsc.li/3MSQltm](https://www.rsc.li/3MSQltm).

Support

- Using the video or your class experiment, sketch the results from the paper chromatography practical. Label the origin line and the solvent front. Draw on the diagram approximately where the ink spots have moved to. You do not have to measure this exactly on the diagram.

2.

- On your chromatogram, or the diagram you drew using the video, list the colours in Sample 1.
- Pick a colour from Sample 1 and draw a vertical line from the origin line to the middle of the coloured spot.
- Draw another vertical line from the origin line to the solvent front.
- Use the values from your experiment or the video and write the length in centimetres of line 1 (**distance moved by the coloured spot**) and line 2 (**distance moved by the solvent**) on the diagram above. If you have done this experiment in the lesson, then use the actual values from your chromatogram.

- Work out the R_f value for the coloured spot to two decimal places using the formula:

$$R_f = \frac{\text{distance moved by the coloured spot (line 1)}}{\text{distance moved by the solvent (line 2)}}$$

Show your working.

- Which solvent (mobile phase/liquid) is used for this experiment?

- Why is the origin line drawn in pencil?

- Why did the presenter on the video make sure that the water was below the origin line at the start?
The chromatogram is the dried filter paper with the separated colours. If your chromatogram is very different from the one on the video, use our results to answer the following questions:

- How many colours separated out in Sample 1? Explain how you knew this.

- Why did Sample 2 not move up the filter paper (stationary phase)?

9. Which colour in Sample 1 is the same as Sample 3? Explain how you know this.

10. Circle the most soluble colour in water on the chromatogram – why did you choose this?

11. Name one real life use of chromatography.

12. Identify the mobile phase in this experiment.

13. Identify the stationary phase in this experiment.

Core

1. Sketch a chromatogram using the results from either the video or your own class practical.

2. Identify the colours in Sample 1.

3. Work out the R_f value for one of the colours in Sample 1 to two decimal places; using either the values from the video or the values measured on your own chromatogram. Show your working.

4. Which solvent did you use for this experiment?

5. Why did you draw the origin line in pencil?

6. Why did you make sure that the water was added below the origin line at the start?

The chromatogram is the dried filter paper with the final results. If your chromatogram is very different from the one on the video, use our results to answer the following questions:

7. How many colours separated out in Sample 1? Explain how you knew this.

8. Why did Sample 2 not move up the filter paper?

9. Which colour in Sample 1 is the same as Sample 3? Explain how you know this by looking at the chromatogram.

10. Circle the most soluble colour in water on the chromatogram – why did you choose this?

11. Name one real life use of chromatography.

12. Identify the mobile phase in this experiment.

13. Identify the stationary phase in this experiment.

Challenge questions

a) Refer to your answer in Q3. How else could you confirm which colour in Sample 1 is the same as Sample 3?

b) What could you change to try and separate the inks in sample 2? Explain why you think this would work.

c) If you repeated the experiment but with a longer piece of filter paper, would the R_f of the orange spot in question a) change? Explain your answer.

d) If you stopped the chromatography after half the time that the demonstrator on the video used, would the R_f of the orange spot in question a) change? Explain your answer.

e) If you changed the mobile phase, would the R_f of the orange spot in question a) change? Explain your answer.

f) If you changed the stationary phase, would the R_f of the orange spot in question a) change? Explain your answer.

g) Why is there not just one R_f value for a particular chemical? Use the words stationary phase, mobile phase and movement of the chemical to explain.

Research question

Research how scientists use chromatography to separate and identify amino acids in medical research. Find out what stationary and mobile phases they use.

Follow-up worksheet answers (support and core)

1. Sketch or stuck in dried chromatogram



2. Colours identified (blue, orange and pink if using the video). Solute and solvent distances measured (support only).

3. Work out the R_f value for the coloured spot to two decimal places using the formula:

$$R_f = \frac{\text{distance moved by the coloured spot (line 1)}}{\text{distance moved by the solvent (line 2)}} = \frac{5.0}{5.3} = 0.94$$

4. Water.
5. Pencil does not dissolve in the water and therefore will not affect the results.
6. So that the inks do not leave the filter paper and dissolve in the water.
7. Three colours separated out because there were three spots (video: blue, orange and pink).
8. It was not soluble in the solvent/water.
9. The orange colour is the same as they have both travelled the same distance up the paper. Learner could also say that the R_f value is the same.
10. This is the colour that travelled the furthest up the filter paper.
11. Any reasonable answer – the video mentions some, such as to detect false documents in forensic science, testing unknown substances in food and drink and checking the purity and safety of drugs.
12. Water.
13. Filter paper.

Challenge questions

- a) Find the R_f value for the spots in both samples. The R_f value should be the same. You can use a reference table to identify the actual chemical.
- b) Change the mobile phase, ie solvent. The ink needs to be soluble in the mobile phase.
- c) No, the R_f value is a ratio so it will still be the same.
- d) No, the R_f value is a ratio so it will still be the same, but the results may not be as accurate because the colours will be closer together and might overlap more.
- e) Yes, the orange ink may have a different solubility and attraction to the new mobile phase and therefore move more slowly or quickly. This will affect the R_f value.
- f) Yes, the orange ink may have a different attractive force to the new stationary phase and therefore move more slowly or quickly. This will affect the R_f value.
- g) If the coloured ink has a strong attractive force to the stationary phase (filter paper) then it will move more slowly. If the coloured ink has a stronger attraction to the mobile phase, it will move more quickly. Therefore, the chemical will have a unique R_f number for every different combination of mobile and stationary phase.

Research question

Learners should be able to identify that medical researchers use thin layer chromatography with a silica plate as the stationary phase and a volatile solvents as the mobile phase. They need a locating agent to see the separated amino acids, such as ninhydrin spray or UV light, and the researchers can measure the R_f values and compare to a reference table to identify the amino acids.

Structure strip: suggested answer

Writing about chemistry encourages learners to reflect on their understanding, formulate new ideas and make links between ideas in new ways. Learners also need to practice for long-answer questions in examinations. The structure strip can be stuck in the margin of a page to provide prompts and overcome 'fear of the blank page'. Use it to consolidate learning after the practical and/or for revision. Read more at rsc.li/2P0JDIW and see structure strips for other practical videos at: rsc.li/47fDhGS.

Question: A forensic scientist needs to investigate which colours are present in a black pen that has been used in a fraud. She has found a small black pen at the crime scene which contains ink that is insoluble in water. Describe how she should use paper chromatography to identify if the colours in the small black pen match the colours in the pen used for the fraud.

Paper chromatography Structure strip	Example answer
Describe or draw how the equipment is set up for paper chromatography with a volatile solvent.	A diagram would be a good way to show this. Diagram shows filter paper, solvent with level below origin line, two samples added on origin line, beaker and lid. Sample F (fraud) and B (black pen) or other suitable labels.
Identify which solvent she should not use in the chromatography and suggest an alternative with a reason.	The solvent that should not be used is water as the pen ink is insoluble in water. She should try ethanol or acetone (or another reasonable solvent). She needs to make sure that the ink is soluble in the solvent she decides to use.
Mention what she should draw the start or origin line with and explain why.	Draw the origin line in pencil as this is not soluble in the solvent and will not affect the experiment.
Mention why she needs to be careful when adding the solvent to the beaker.	She must add the solvent below the origin line otherwise all the ink will dissolve in the solvent instead of moving up the paper.
Explain how she will make sure she only adds a small spot of ink at the start.	She will use a capillary tube to add a tiny spot of sample to the origin line.
Explain what she will see at the end of the experiment and how she will know if any of the separated colours in either sample is the same ink.	If the colours are the same, they will have travelled the same distance up the paper. You can check this by finding the R_f values and seeing if they are the same.

Paper chromatography Structure strip	Paper chromatography Structure strip	Paper chromatography Structure strip	Paper chromatography Structure strip	Paper chromatography Structure strip
Describe or draw how the equipment is set up for paper chromatography with a volatile solvent.	Describe or draw how the equipment is set up for paper chromatography with a volatile solvent.	Describe or draw how the equipment is set up for paper chromatography with a volatile solvent.	Describe or draw how the equipment is set up for paper chromatography with a volatile solvent.	Describe or draw how the equipment is set up for paper chromatography with a volatile solvent.
Identify which solvent she should not use in the chromatography and suggest an alternative with a reason.	Identify which solvent she should not use in the chromatography and suggest an alternative with a reason.	Identify which solvent she should not use in the chromatography and suggest an alternative with a reason.	Identify which solvent she should not use in the chromatography and suggest an alternative with a reason.	Identify which solvent she should not use in the chromatography and suggest an alternative with a reason.
Mention what she should draw the start or origin line with and explain why.	Mention what she should draw the start or origin line with and explain why.	Mention what she should draw the start or origin line with and explain why.	Mention what she should draw the start or origin line with and explain why.	Mention what she should draw the start or origin line with and explain why.
Mention why she needs to be careful when adding the solvent to the beaker.	Mention why she needs to be careful when adding the solvent to the beaker.	Mention why she needs to be careful when adding the solvent to the beaker.	Mention why she needs to be careful when adding the solvent to the beaker.	Mention why she needs to be careful when adding the solvent to the beaker.
Explain how she will make sure she only adds a small spot of ink at the start.	Explain how she will make sure she only adds a small spot of ink at the start.	Explain how she will make sure she only adds a small spot of ink at the start.	Explain how she will make sure she only adds a small spot of ink at the start.	Explain how she will make sure she only adds a small spot of ink at the start.
Explain what she will see at the end of the experiment and how she will know if any of the separated colours in either sample is the same ink.	Explain what she will see at the end of the experiment and how she will know if any of the separated colours in either sample is the same ink.	Explain what she will see at the end of the experiment and how she will know if any of the separated colours in either sample is the same ink.	Explain what she will see at the end of the experiment and how she will know if any of the separated colours in either sample is the same ink.	Explain what she will see at the end of the experiment and how she will know if any of the separated colours in either sample is the same ink.