

Iron reacts with dilute hydrochloric acid to produce iron chloride solution and one other product.

1.1

Name the other product.

[1 mark]

Fertilisers are formulations.

2.1

What is a formulation?

[1 mark]

3.1

Complete the equation for the reaction.

[2 marks]



4.1

Give the test and result for chlorine gas.

[2 marks]

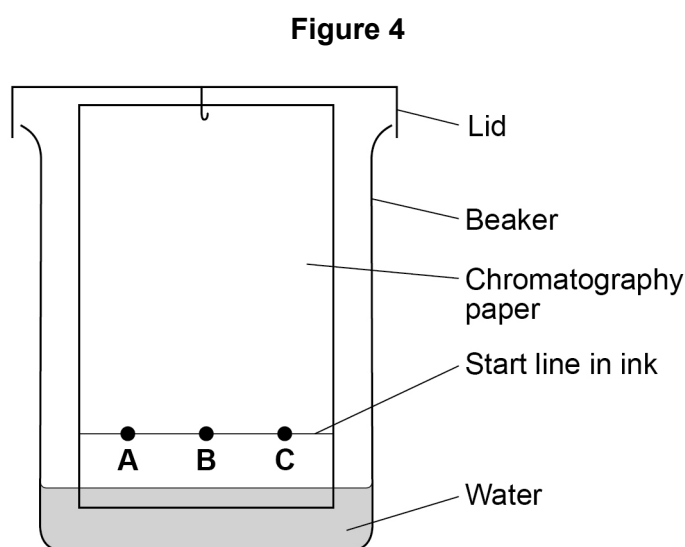
A student investigated the colours in three different flowers, **A**, **B** and **C**.

The colours are soluble in ethanol but are insoluble in water.

This is the method used.

1. Crush flower **A**.
2. Add ethanol to flower **A**.
3. Filter the mixture.
4. Put spots of the coloured filtrate on to the chromatography paper.
5. Repeat steps 1-4 with flowers **B** and **C**.

Figure 4 shows the apparatus used.



5.1

The student made **two** mistakes in setting up the apparatus.

Give **one** problem caused by each mistake.

[4 marks]

Mistake 1 _____

Problem caused _____

Mistake 2 _____

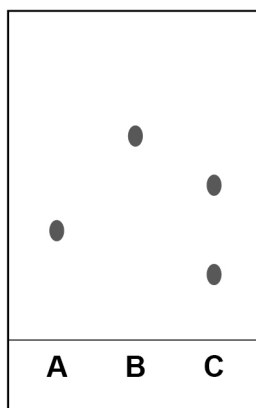
Problem caused _____

5.2

Another student set up the apparatus correctly.

Figure 5 represents the student's results.

Figure 5



Give **two** conclusions you can make from **Figure 5**.

[2 marks]

- 1 _____
- 2 _____

5.3

Colour **A** has an R_f value of 0.65

Colour **A** moves 3.2 cm

Calculate the distance moved by the solvent.

[2 marks]

Distance moved by solvent = _____ cm

6.1

Describe a test for pure water.

Give the result of the test if the water is pure.

[2 marks]

Test

Result

This question is about chromatography of food colouring.

7.1

Food colouring is a formulation.

What is a formulation?

[1 mark]

7.2

Explain how paper chromatography separates the dyes in a food colouring.

Do **not** give details of how to do the experiment.

[2 marks]

7.3

Explain how the student could tell from the chromatogram that the food colouring contained more than one dye.

[2 marks]

7.4

Explain how the student could use chromatography to identify unknown dyes in the food colouring.

[3 marks]

This question is about oxygen (O₂) and sulfur dioxide (SO₂).

8.1

Give the test and result for oxygen gas.

[2 marks]

Test _____

Result _____

9.1

The tablet also contains other substances.

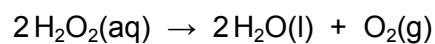
The substances in tablets are present in fixed amounts.

What name is given to mixtures like tablets?

[1 mark]

Some students investigated the rate of decomposition of hydrogen peroxide, H_2O_2

The equation for the reaction is:



The catalyst for the reaction is manganese dioxide.

10.1

Describe a test to identify the gas produced in the reaction.

Give the result of the test.

[2 marks]

Test _____

Result _____

11.1 Describe the test for carbon dioxide.

Give the result of the test.

[2 marks]

Test

Result

11.2 Describe the test for hydrogen.

Give the result of the test.

[2 marks]

Test

Result

This question is about ink.

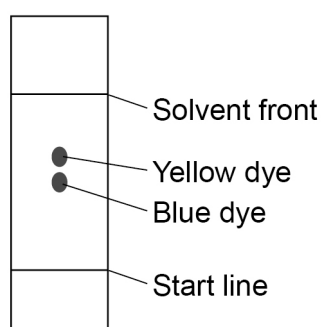
A student investigated green ink using paper chromatography in a beaker.

The student used water as the solvent.

Figure 2 shows the chromatogram obtained.

Figure 2

Diagram not to scale



12.1

The R_f value of the yellow dye = 0.60

The distance moved by the yellow dye = 5.7 cm

Calculate the distance moved by the solvent.

[3 marks]

Distance moved by the solvent = _____ cm

12.2 The green ink contains more than two compounds.

Suggest **one** reason why only two spots are seen on **Figure 2**.

[1 mark]

12.3 On the student's chromatogram, the yellow and blue spots are very close together.

Which **two** ways could increase the distance between the spots?

[2 marks]

Tick (✓) **two** boxes.

Allow the solvent front to travel further.

☐

Dry the chromatogram more slowly.

☐

Use a different solvent.

☐

Use a larger beaker.

☐

Use a larger spot of green ink.

☐

12.4 The manufacturers of the green ink always use the same proportions of yellow dye and blue dye.

Suggest **one** reason why.

[1 mark]

12.5

The R_f value of a dye depends on:

- the solubility of the dye in the solvent
- the attraction of the dye to the paper.

Which will **definitely** produce a smaller R_f value if the solvent and paper are both changed?

[1 mark]

Tick (✓) **one** box.

The dye is less soluble in the new solvent and less attracted to the new paper.

☐

The dye is less soluble in the new solvent and more attracted to the new paper.

☐

The dye is more soluble in the new solvent and less attracted to the new paper.

☐

The dye is more soluble in the new solvent and more attracted to the new paper.

☐

13.1

A student adds a solution of ethanoic acid to zinc carbonate in an open flask on a balance.

Explain what happens to the mass of the flask and its contents during the reaction.

[3 marks]

This question is about algae.

A student:

- placed algae in water containing dissolved carbon dioxide
- shone bright light on the algae.

Gas bubbles were collected as the algae photosynthesised.

14.1

Describe a test that would identify the gas collected.

Give the result of the test.

[2 marks]

Test _____

Result _____

The boiling point is used to check the purity of a sample of water.

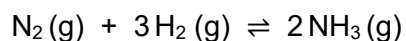
15.1

In chemistry, what is meant by a 'pure substance'?

[1 mark]

Ammonia is produced when a mixture of nitrogen and hydrogen reacts.

The equation for the reaction is:



16.1

Nitrogen is obtained from the air.

The mixture of nitrogen and hydrogen must **not** contain carbon dioxide and oxygen.

Explain how a sample can be tested to show that carbon dioxide is **not** present in the mixture.

[2 marks]

This question is about paper chromatography.

A food colouring contains a dye.

17.1

Plan an investigation to determine the R_f value for the dye in this food colouring.

$$R_f = \frac{\text{distance moved by substance}}{\text{distance moved by solvent}}$$

Your plan should include the use of:

- a beaker
- a solvent
- chromatography paper.

[6 marks]

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins or other markings on the paper.

- 17.2 Two students investigated a dye in a food colouring using paper chromatography.
- Each student did the investigation differently.
- The R_f values they determined for the **same** dye were different.
- How did the students' investigations differ?

[1 mark]

Tick (✓) **one** box.

Different length of paper used

☐

Different period of time used

☐

Different size of beaker used

☐

Different solvent used

☐

- 17.3 Paper chromatography involves a stationary phase.

What is the stationary phase in paper chromatography?

[1 mark]

Tick (✓) **one** box.

Beaker

☐

Dye

☐

Paper

☐

Solvent

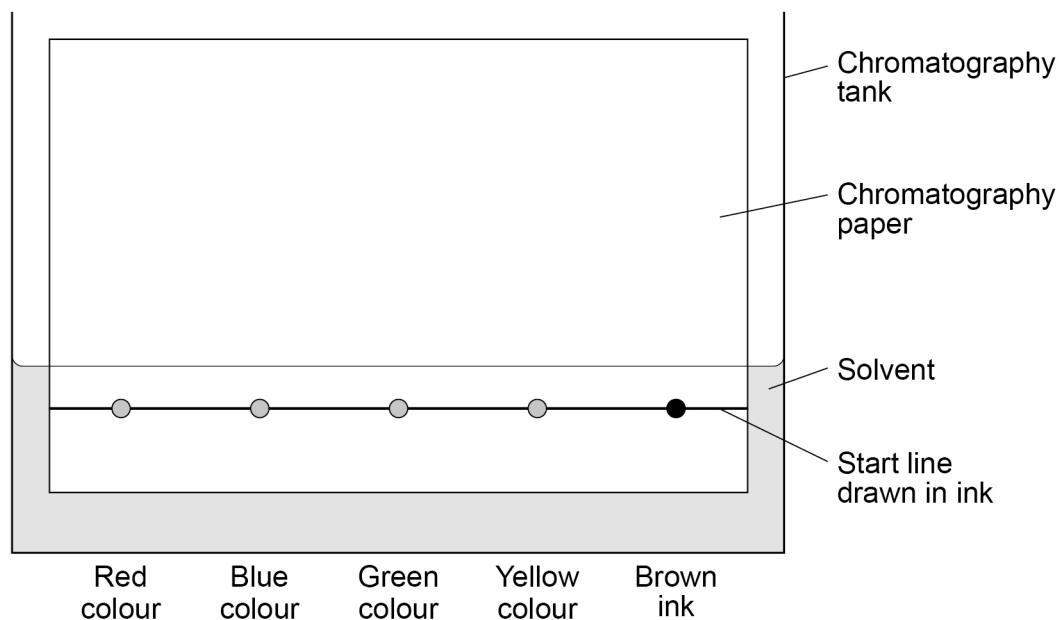
☐

A student investigated the colours in a brown ink using chromatography.

18.1

Figure 1 shows the apparatus used.

Figure 1



Give **two** errors made by the student.

Describe the problem each error would cause.

[4 marks]

Error 1 _____

Problem 1 _____

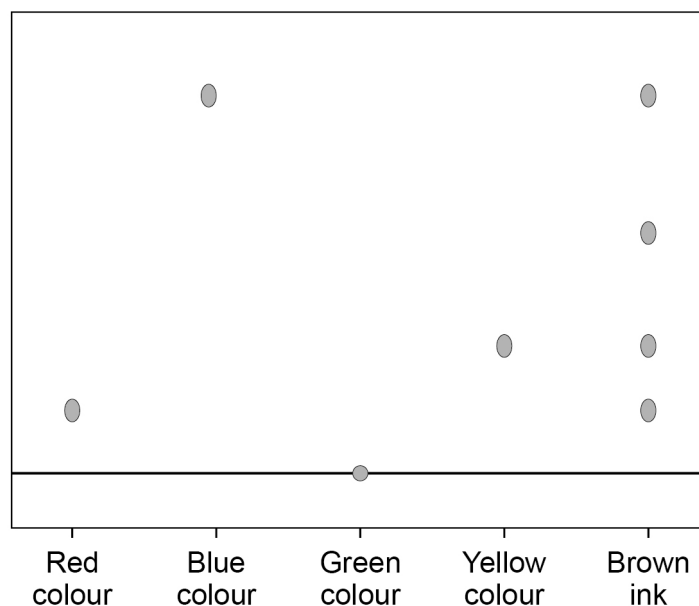
Error 2 _____

Problem 2 _____

A different student set up the apparatus correctly.

Figure 2 shows the results.

Figure 2



18.2

Give **two** conclusions the student can make from **Figure 2** about the four colours in the brown ink.

[2 marks]

1 _____

2 _____

18.3 Why was the green colour still on the start line at the end of the experiment?

[1 mark]

Tick (✓) **one** box.

The experiment was left for too long.

☐

The green colour was insoluble in the solvent.

☐

The green spot contained too many colours.

☐

The green spot was too small.

☐

18.4 A student calculated the R_f value of a colour to be 0.24

The colour moved 1.8 cm from the start line.

Calculate the distance the solvent moved.

Use the equation:

$$R_f = \frac{\text{distance moved by colour}}{\text{distance moved by solvent}}$$

[3 marks]

Distance moved by solvent = _____ cm

19.1 Chlorine is also used to treat some ground water.

Describe the test for chlorine gas.

Give the result of the test.

[2 marks]

Test _____

Result _____

Chromatography is used to separate mixtures.

Chromatography involves a mobile phase and one other phase.

20.1 What is the other phase in chromatography?

[1 mark]

Tick (✓) **one** box.

Moving phase

☐

Recycled phase

☐

Stationary phase

☐

Viscous phase

☐

20.2 Why do the substances in the mixture separate in the mobile phase?

[1 mark]

20.3 How many spots will be produced on the chromatogram of a pure compound?

[1 mark]

Number of spots = _____

20.4

In a chromatography experiment, a blue colour moved 4.77 cm.

The solvent moved 5.30 cm.

Calculate the R_f value for the blue colour.

[2 marks]

R_f value = _____

20.5

Black ink is a mixture of several colours.

Plan an experiment using paper chromatography to:

- separate the colours in black ink
- identify the colours from their R_f values.

[6 marks]

Crude oil is a mixture of many different compounds.

21.1

Give **two** reasons why crude oil is **not** a formulation.

[2 marks]

1 _____

2 _____

22.1

The student concludes that distilled water is pure.

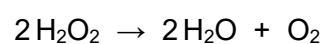
Describe a test to confirm that distilled water is pure.

[2 marks]

Test _____

Result _____

23.1 The equation for the decomposition of hydrogen peroxide is:



Describe a test to identify the gas produced in the reaction.

[2 marks]

Test _____

Result _____

24.1 Hydrogen gas is produced during this reaction.

Describe the test for hydrogen gas.

Give the result of the test.

[2 marks]

Test _____

Result _____

25.1

Give the result of the test when carbon dioxide is bubbled through limewater.

[1 mark]

This question is about chromatography.

A student investigated an orange food colouring using two different types of chromatography paper.

The food colouring:

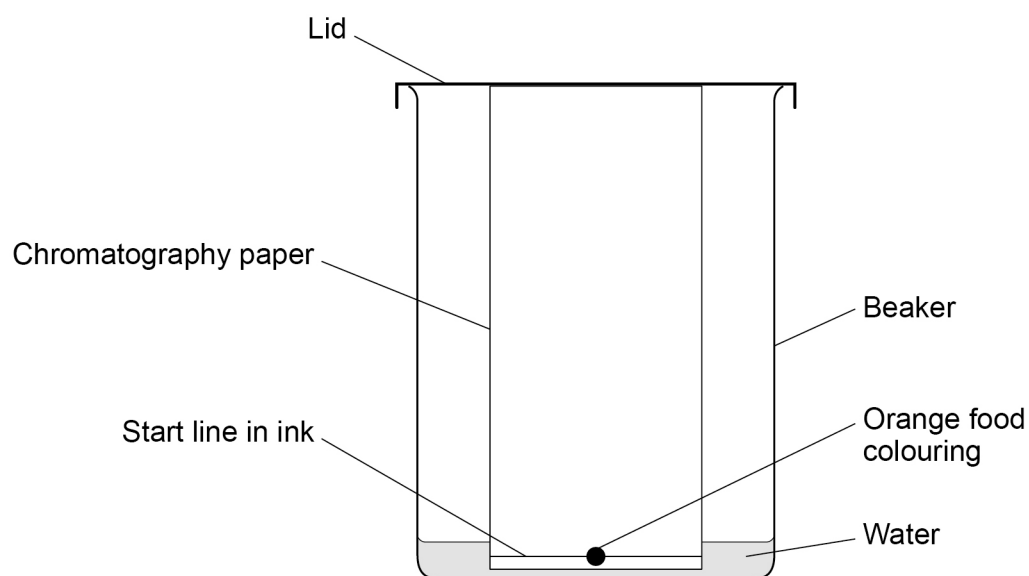
- contained a mixture of red and yellow dyes
- was soluble in water.

This is the method used.

1. Draw a start line on a piece of type **A** chromatography paper.
2. Put a spot of orange food colouring on the line.
3. Put the paper into a beaker containing water as a solvent.
4. Wait for the water to travel up the paper.
5. Measure the distance above the start line moved by the red and yellow dyes and the water.
6. Repeat steps 1 to 5 using type **B** chromatography paper.

Figure 3 shows how the student set up the apparatus.

Figure 3



26.1

The student made **two** mistakes when setting up the apparatus.

Give **two** mistakes the student made.

[2 marks]

- 1 _____
- 2 _____

Another student set up the apparatus correctly.

Table 3 shows the results.

Table 3

	Type A chromatography paper		Type B chromatography paper	
	Red dye	Yellow dye	Red dye	Yellow dye
Distance moved by dye in cm	4.8	6.6	5.4	X
Distance moved by water in cm	12.0	12.0	12.0	12.0
R_f value	0.40	0.55	0.45	0.60

26.2

Determine value **X** in **Table 3**.

[3 marks]

X = _____ cm

Changing the type of chromatography paper resulted in different R_f values for the red dye.

26.3

Explain why the R_f values for the red dye are different using the two types of chromatography paper.

Use **Table 3**.

[3 marks]

26.4

What other change to the investigation could result in a different R_f value for the red dye?

[1 mark]
