

Purity and Formulations

- 1 Copper can be made extremely pure. The melting point of two samples of copper were measured. Sample **A** had a melting point of 1085°C and sample **B** melted over the range $900 - 940^{\circ}\text{C}$.



- 1.1 How is a pure substance defined in chemistry? Tick **one** box.

A single element not mixed with any other substance.

☐

A single compound not mixed with any other substance.

☐

A single element or compound not mixed with any other substance.

☐

An element that has not been reacted with anything.

☐

[1]

- 1.2 Suggest which of the samples was the most pure? Explain your answer.

.....

.....

[2]

- 1.3 The boiling point of copper is $2,562^{\circ}\text{C}$. Which of the samples is likely to have a boiling point closer to that of pure copper?

.....

[1]

[Total 4 marks]

- 2 A paint was composed of 20% pigment, 35% binder, 25% solvent, and 20% additives.



- 2.1 Explain why the paint is a formulation.

.....

.....

.....

[3]

- 2.2 How would a manufacturer of the paint ensure that each batch had exactly the same properties?

.....

[1]

- 2.3 Other than paint, name **one** other example of a formulation.

.....

[1]

[Total 5 marks]

Exam Practice Tip

A formulation is a mixture but a mixture isn't always a formulation. For the exam, you may need to identify formulations based on information about their ingredients and how they've been designed to make the product fit for purpose.


☐

☐

☐

PRACTICAL**Paper Chromatography****Warm-Up**

Complete the diagram by correctly labelling the different parts of the chromatography apparatus using the labels on the left, below.

Watch glass

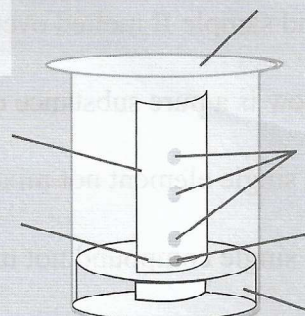
Sample

Filter paper

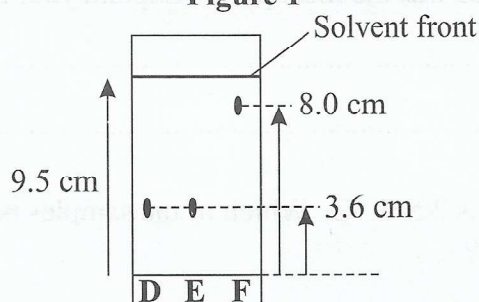
Baseline

Solvent

Spots of chemicals



- 1 Paper chromatograms were produced for three dyes, **D**, **E** and **F**, using a variety of solvents. The chromatogram produced using ethanol as a solvent is shown in **Figure 1**.

**Figure 1**

- 1.1 Calculate the R_f values for **E** and **F** in ethanol, using the chromatogram shown in **Figure 1**.

R_f of **E** = ...

R_f of **F** = ... [4]

- 1.2 Why do the substances travel different distances?

.....
 [1]

- 1.3 In all solvents, each dye only has one spot.
 What does this imply about the composition of the dyes?

..... [1]

- 1.4 State which of the dyes could be the same.

..... [1]

[Total 7 marks]

- 2 A paper chromatography experiment was used to identify the compounds in a mixture, **W**, as shown in **Figure 2**. Three known compounds, **A**, **B** and **C** were spotted alongside **W**. Water was used as the solvent.



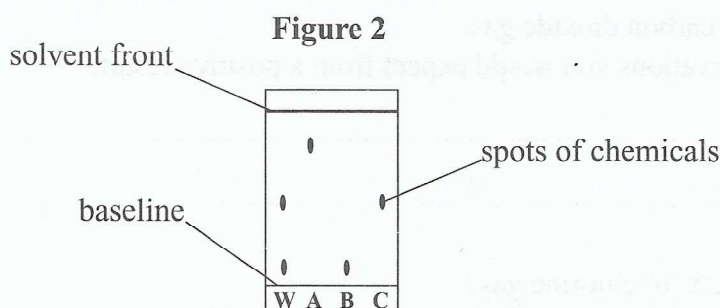
- 2.1 The experiment was conducted in a beaker with a watch glass functioning as a lid. Why is it necessary to have a lid while conducting a paper chromatography experiment?

[1]

- 2.2 The R_f values of **A** and **B** were found to be 0.9 and 0.1 respectively. With reference to the mobile phase and stationary phase, suggest why **A** has a much larger R_f value than **B**.

[1]

- 2.3 A diagram of the chromatogram from the experiment can be seen in **Figure 2**. State which of the known compounds could be found in **W**.



[1]

- 2.4 A student suggested that if the solvent was changed, the R_f value of compounds **A**, **B** and **C** would stay the same. Explain whether the student was correct.

[2]

- 2.5 The experiment was repeated again using a different solvent. The mixture **W** had three spots on the resultant chromatogram. What does this suggest about the mixture **W**?

[1]

- 2.6 Suggest why only two spots were shown on the chromatogram shown in **Figure 2**.

[1]

[Total 7 marks]

Exam Practice Tip

There are lots of different type of chromatography, but paper chromatography is the only one you need to know how to carry out. It's not just about knowing how to set up the apparatus — you also need to know how to analyse the results.



PRACTICAL**Tests for Gases and Anions**

1 This question is about common tests for gases.



1.1 What is the test for hydrogen? Tick **one** box.

☐ A burning splint
which results in a
popping noise.

☐ A glowing splint
which results in a
popping noise.

☐ A burning splint
which is extinguished.

[1]

1.2 The gas produced in a reaction was collected in a test tube.

A glowing splint relit when inserted into the tube. Identify the gas given off.

..... [1]

1.3 Outline a test for carbon dioxide gas.

Include any observations you would expect from a positive result.

..... [2]

1.4 How could you test for chlorine gas?

Include any observations you would expect from a positive result.

..... [2]

[Total 6 marks]

2 Certain positive ions can be identified using flame tests.



2.1 A flame test was conducted on a sample containing an unknown cation.

The sample burned with a lilac flame. Identify the unknown cation. Tick **one** box.

☐ Lithium, Li^+

☐ Potassium, K^+

☐ Copper, Cu^{2+}

☐ Calcium, Ca^{2+}

[1]

2.2 Describe how to conduct a flame test.

..... [4]

2.3 A solution containing sodium ions was tested using a flame test.

What colour flame would you expect to see?

..... [1]

[Total 6 marks]