

Purity Formulations + Chromatography

Question Paper

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Chemistry
Exam Board	AQA
Topic	5.8 Chemical Analysis
Sub-Topic	Purity Formulations + Chromatography
Difficulty Level	Bronze Level
Booklet	Question Paper

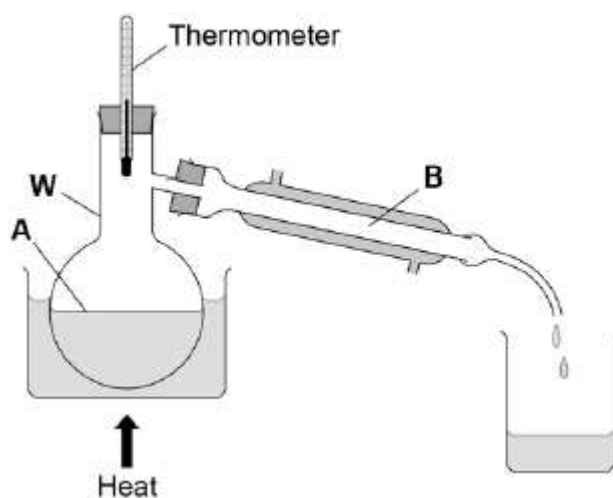
Time Allowed: 44 minutes

Score: /43

Percentage: /100

Grade Boundaries:

Q1. The apparatus in the figure below is used to separate a mixture of liquids in a fuel.



(a) What is apparatus **W** on above the figure above?

Tick **one** box.

Beaker

☐

Boiling Tube

☐

Flask

☐

Jug

☐

(1)

(b) What is the name of this method of separation?

Tick **one** box.

Crystallisation

☐

Electrolysis

☐

Filtration

☐

Distillation



(1)

- (c) Name the changes of state taking place at **A** and **B** in the figure above.

Use words from the box.

boiling	condensing	freezing	melting
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Change of state at **A**:

Change of state at **B**:

(2)

- (d) **Table 1** shows the boiling points of the hydrocarbons in the fuel.

Table 1

Hydrocarbon	Boiling point in °C
Pentane	36
Hexane	69
Heptane	98
Octane	125

Which hydrocarbon will be the last to collect in the beaker?

Tick **one** box.

Pentane

☐

Hexane

☐

Heptane

☐

Octane

☐

(1)

- (e) The fuel is a mixture of liquids that has been designed as a useful product.

What name is given to this type of mixture?

Tick **one** box.

Catalyst

☐

Formulation

☐

Polymer

☐

Solvent

☐

(1)

- (f) Describe how this fuel is different from crude oil.

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(2)

- (g) A student measured the melting point of a solid hydrocarbon four times.

The student's results are in **Table 2**.

Table 2

	Trial 1	Trial 2	Trial 3	Trial 4
Melting	35	48	37	37

point in °C				
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Calculate the mean melting point of the hydrocarbon, leaving out any anomalous result.

Give your answer to two significant figures.

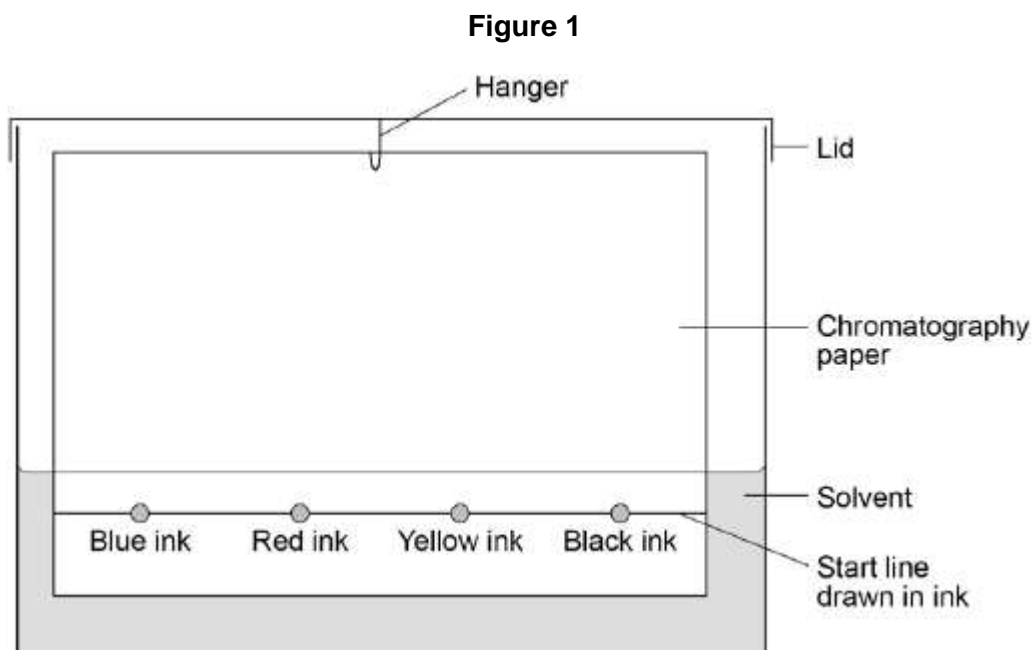
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Mean melting point = °C

(2)
 (Total 10 marks)

Q2. A student used paper chromatography to investigate the colours in different inks.

Figure 1 shows the apparatus the student used.



- (a) The student made **two** mistakes in setting up the apparatus.

Identify the **two** mistakes.

Describe the problem each mistake would cause.

Mistake 1

Problem

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Mistake 2

Problem

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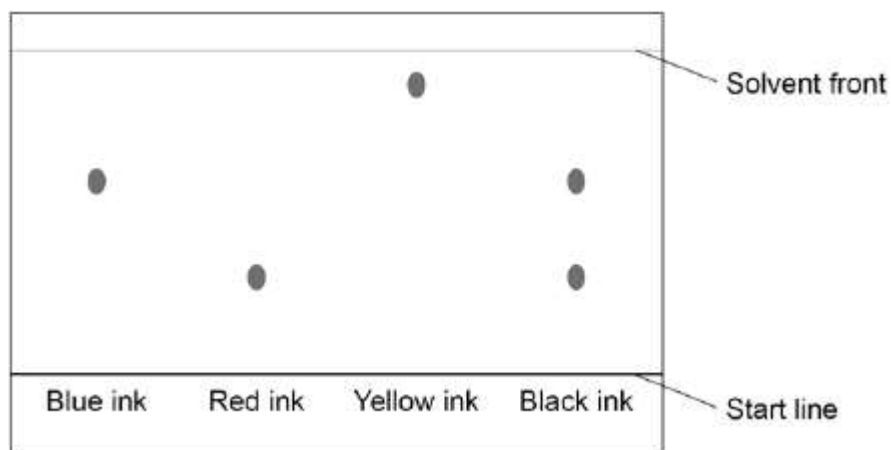
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(4)

- (b) The student then set up the apparatus without making any mistakes.

Figure 2 shows his results.

Figure 2



What colours are in the black ink?

.....

.....

(1)

- (c) Which of the inks is the most soluble in the solvent?

Give a reason for your answer.

Ink

Reason

.....

(2)

- (d) Use **Figure 2** to complete the table below, then calculate the R_f value for red ink.

	Distance in mm
Distance moved by red ink
Distance from start line to solvent front

The R_f value for red ink is calculated using the equation.

$$R_f = \frac{\text{distance moved by red ink from the start line}}{\text{distance moved by solvent from the start line}}$$

Give your answer to two significant figures.

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R_f value =

(5)

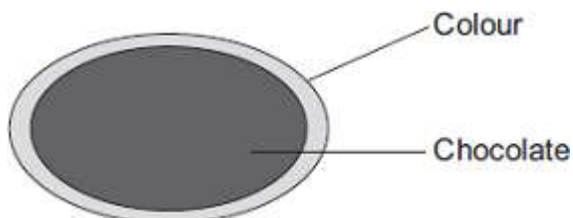
- (e) How can you tell from **Figure 2** that the R_f value for the blue ink is greater than the R_f value for the red ink?

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(1)
 (Total 13 marks)

Q3. Colours are used to coat some chocolate sweets.

Some of these colours are given E-numbers.



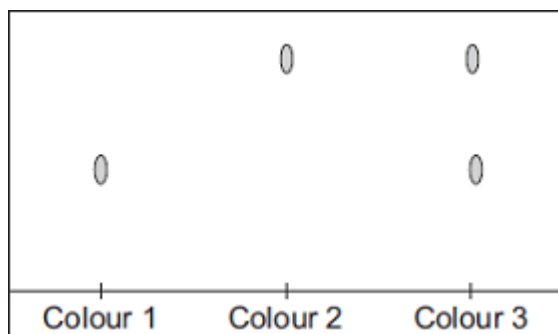
Use the correct word from the box to complete the sentence.

additive	element	fuel
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An E-number is used to identify a permitted food

(1)

- (b) Chromatography was used to compare three of the colours used to coat the chocolate sweets.



What do these results tell you about these three colours?

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(3)

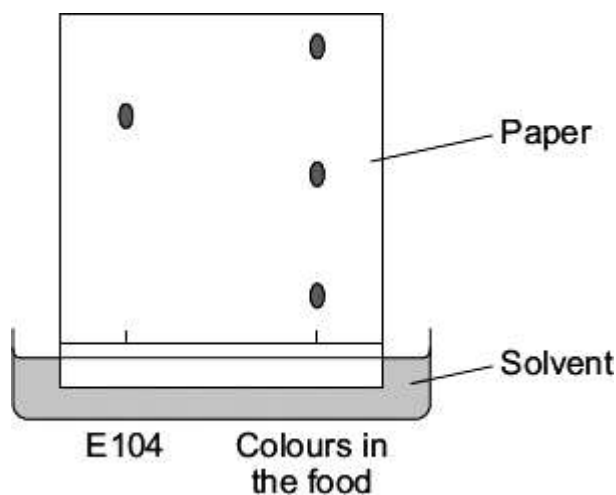
(Total 4 marks)

Q4. An article began:

Ban yellow additives

Quinoline yellow (E104) is suspected of causing hyperactivity, asthma and rashes in children.

- (a) A student tested a food to find out if it contained quinoline yellow (E104). The student's results are shown below.



- (i) Draw a ring around the correct answer to complete the sentence.

This method of detecting and identifying colours is called

chromatography
distillation.
electrolysis.

(1)

- (ii) Using the student's results, how many different colours are in the food?

(1)

- (iii) Using the student's results, how can you tell that the food does **not** contain quinoline yellow (E104)?

.....
.....

(1)

- (b) Quinoline yellow (E104) is used in foods such as sweets, drinks and ice cream.

- (i) Give **one** reason why quinoline yellow (E104) is added to foods.

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.....

(1)

- (ii) Suggest what should be done to decide if quinoline yellow (E104) should be banned.

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(1)
(Total 5 marks)

Q5. This is part of an article about food additives.

THE PERIL OF FOOD ADDITIVES

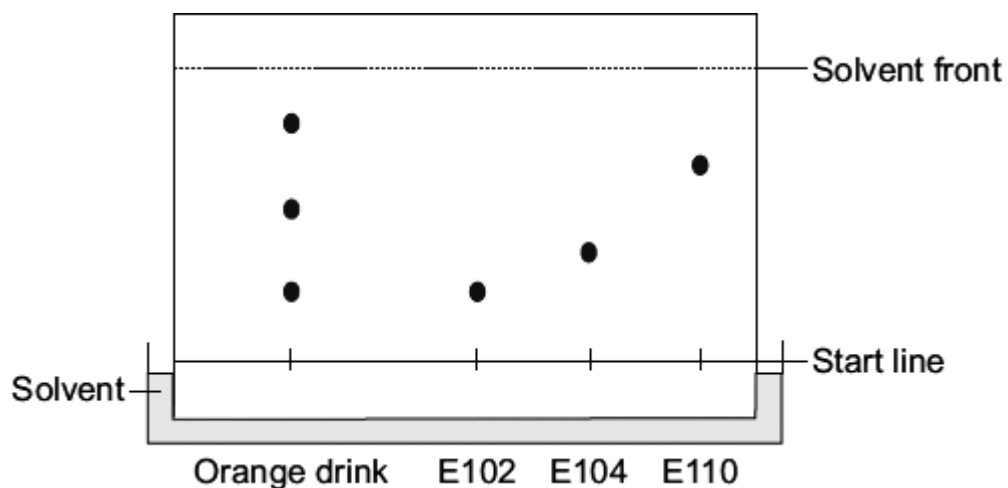
Some orange drinks contain the additives E102 (Tartrazine), E104 (Quinoline Yellow) and E110 (Sunset Yellow). These three additives are thought to cause hyperactivity in children.

- (a) Tick (✓) **two** reasons why a manufacturer of orange drinks uses these additives.

Reason	Tick (✓)
to make the drink healthier	
to improve the appearance of the drink	
because they are permitted colours	
because they are expensive	

(2)

- (b) A scientist tested an orange drink to find out if it contained these additives. The result of the test is shown.



- (i) Draw a ring around the correct answer to complete the sentence.

The test that the scientist did is called

chromatography.
cracking.
distillation.

(1)

- (ii) How many coloured additives are there in the orange drink?

(1)

- (iii) The scientist concluded that the orange drink contained only **one** of the additives E102, E104 and E110.

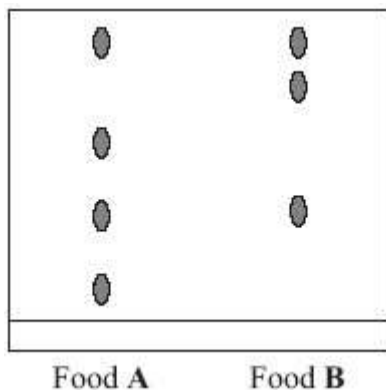
Explain why.

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(2)

(Total 6 marks)

- Q6.** The result of a process used to detect and identify the colours in two foods, **A** and **B**, is shown.



- (i) Describe the differences between the colours used in food **A** and food **B**.

.....

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.....

(2)

- (ii) Tick (✓) the name of the process used to detect and identify colours in food.

Process	(✓)
chromatography	
extraction	
hardening	

(1)
(Total 3 marks)

- Q7.** Chromatography was carried out on a sample of soft drinks to check that they contained only colours that were safe. This is the result.



What conclusions about the safety of the colours in the soft drinks **A**, **B**, **C** and **D** can be made from the results shown by chromatography?

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(Total 2 marks)