

Name:

Date:

C8 - Test 3
CHEMISTRY ANALYSIS
Intermediate

GCSE

CHEMISTRY

AQA - Triple Science

Mark

Grade

Materials

For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

Instructions

- Answer all questions
- Answer questions in the space provided
- All working must be shown

Information

- The marks for the questions are shown in brackets

1. Read the article.

Problem food colourings

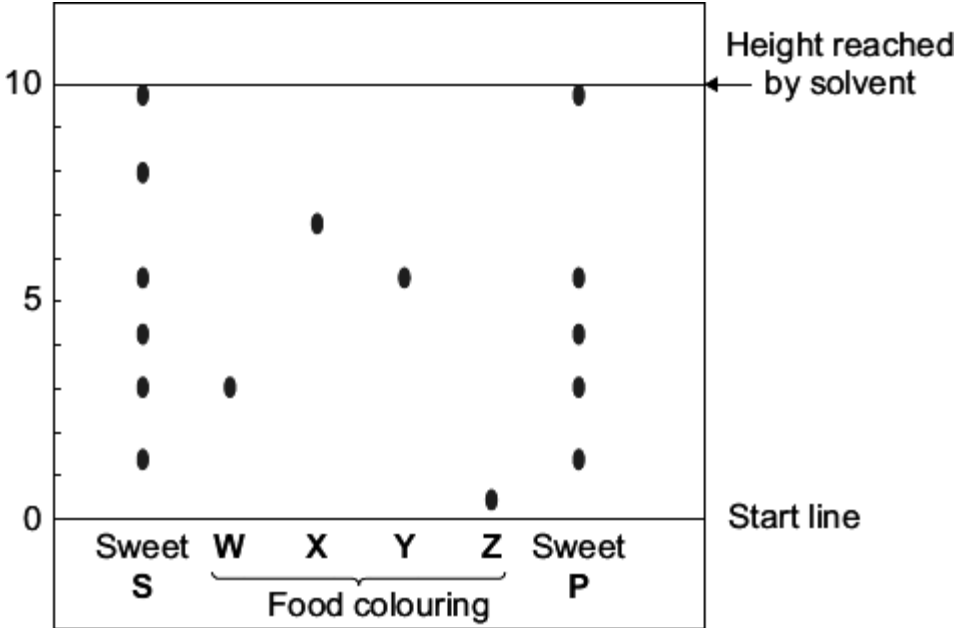
Scientists say they have evidence that some food colourings cause hyperactive behaviour in young children.

These food colourings are added to some sweets.

W, X, Y and Z are food colourings that may cause hyperactive behaviour in young children.

A scientist used chromatography to see if these food colourings were used in two sweets, S and P.

The results are shown on the chromatogram.



(a) Food colourings, such as W, X, Y and Z, are added to some sweets.

Suggest **one** reason why.

(1)

(b) In chromatography, the R_f value = $\frac{\text{distance moved by the colouring}}{\text{distance moved by the solvent}}$

Use the scale on the chromatogram to help you to answer this question.

Which food colouring, **W**, **X**, **Y** or **Z**, has an R_f value of 0.7?

(1)

(c) From the chromatogram, what conclusions can the scientist make about the colourings in sweets **S** and **P**?

(3)

(Total 5 marks)

2.

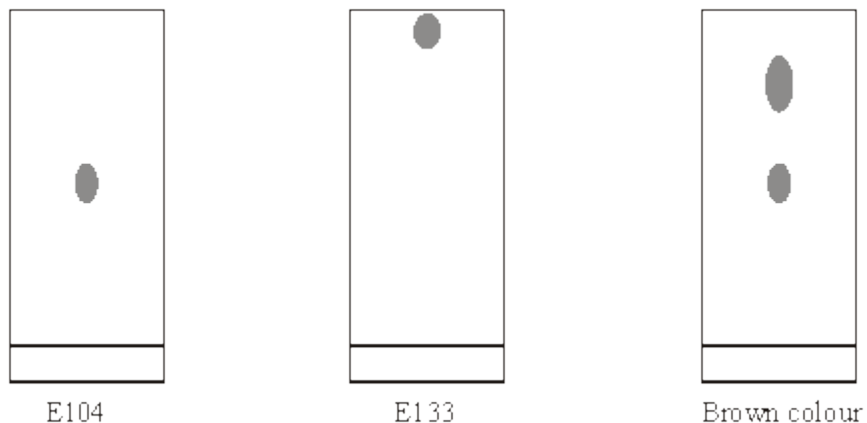
Why blue sweets are turning white

A recent study identified a possible harmful effect on children's nervous systems by some artificial colours. Two of these colours are Brilliant Blue (E133) and Quinoline Yellow (E104). Both are artificial colours because they are made from coal. The company is to stop producing the blue sweets because it is removing all artificial colours and there is no natural blue alternative.

(a) Suggest why it is important to be able to identify the colour additives in food.

(1)

- (b) A brown colour used in sweets was analysed using chromatography. The results were compared with those from E104 and E133.



What do the results tell you about the brown colour and its suitability for use in sweets?

(3)

- (c) Once all the unsuitable colours are removed, the company claims that its sweets are now 'free from artificial colours'.

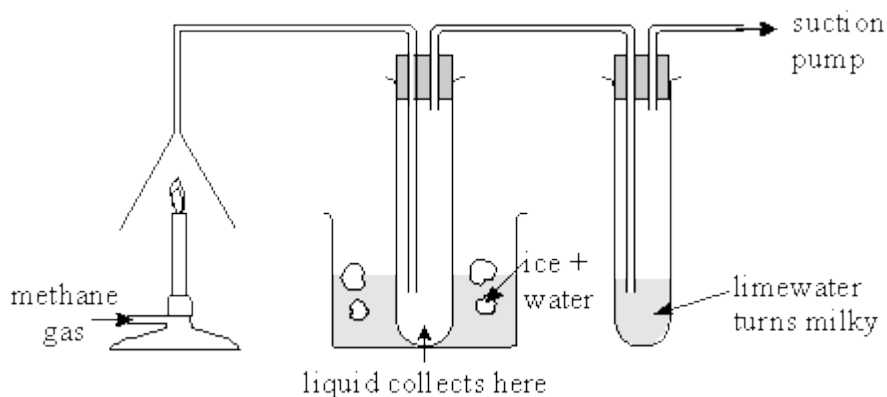
Does this mean that the sweets contain no additives? Explain your answer.

(2)

(Total 6 marks)

3.

Methane CH_4 contains the elements carbon and hydrogen only. A student wanted to find out which new substances are produced when methane is burned. The student set up the apparatus shown below.



(a) Which gas in the air reacts with methane when it burns?

(1)

(b) Name the liquid collected.

(1)

(c) Name the gas which turns limewater milky.

(1)

(d) When methane burns an exothermic reaction takes place. What is meant by an exothermic reaction?

(2)

(Total 5 marks)

4.

Chemical tests can be used to identify compounds.

The table shows the results of some tests carried out on three solutions, **A**, **B** and **C**.

Solution	Flame Test	Hydrochloric acid is added	Sodium hydroxide solution is added	Silver nitrate solution is added
A	Yellow	Carbon dioxide gas produced		
B	Brick-red		White precipitate insoluble in excess sodium hydroxide solution	White precipitate
C			Dark green precipitate	

Use the information in the table to identify solutions **A**, **B** and **C**.

Give the name of:

(a) solution **A**; _____

(2)

(b) solution **B**; _____

(2)

(c) the metal ion in solution **C**. _____

(1)

(Total 5 marks)

5.

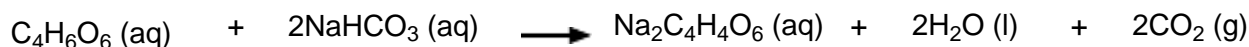
Read the information in the box and then answer the questions.

Seidlitz Powder is the name of a medicine.

Seidlitz Powder comes as two powders. One powder is wrapped in white paper and contains tartaric acid ($C_4H_6O_6$). The other powder is wrapped in blue paper and contains potassium sodium tartrate ($KNaC_4H_4O_6$) and sodium hydrogencarbonate ($NaHCO_3$).

The contents of the blue paper are completely dissolved in water and then the contents of the white paper are added.

The equation which represents this reaction is:



- (a) Describe and give the result of a test to identify the gas produced in this reaction.

(2)

- (b) One of the chemicals in Seidlitz Powder is potassium sodium tartrate ($KNaC_4H_4O_6$).

Suggest why it would be difficult to identify **both** potassium ions and sodium ions in potassium sodium tartrate using a flame test.

(1)

- (c) Some Seidlitz Powder was bought on the Internet. However, when tested, it was found to be only magnesium sulfate.

- (i) Describe and give the result of a chemical test to show that magnesium sulfate contains sulfate ions.

Test _____

Result _____

(2)

(ii) Magnesium sulfate contains magnesium ions.

Describe what you **see** when sodium hydroxide solution is added to a solution of magnesium sulfate.

(1)

(Total 6 marks)

6.

This question is about chemicals in fireworks.

Coloured flames are produced because of the metal ions in the fireworks.

(a) What colour flame would sodium ions produce?

(1)

(b) Name a metal ion that would produce a green flame.

(1)

(c) Some fireworks contain a mixture of metal ions.

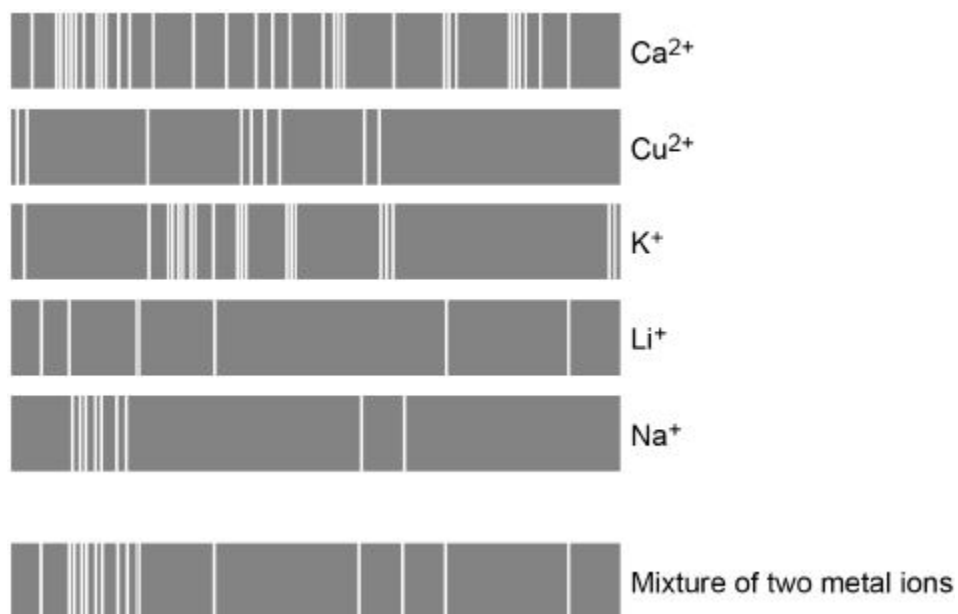
Why is it difficult to identify the metal ions from the colour of the flame?

(1)

(d) Flame emission spectroscopy is used to identify metal ions in a firework.

The diagram below shows:

- the flame emission spectra of five individual metal ions
- a flame emission spectrum for a mixture of two metal ions.



Which **two** metal ions are in the mixture?

Tick **two** boxes.

Ca^{2+}	<input type="checkbox"/>
Cu^{2+}	<input type="checkbox"/>
K^{+}	<input type="checkbox"/>
Li^{+}	<input type="checkbox"/>
Na^{+}	<input type="checkbox"/>

(2)

The compounds in fireworks also contain non-metal ions.

A scientist tests a solution of the chemicals used in a firework.

(e) Silver nitrate solution and dilute nitric acid are added to the solution.

A cream precipitate forms

Which ion is shown to be present by the cream precipitate?

(1)

(f) Describe a test to show the presence of sulfate ions in the solution.

Give the result of the test if there are sulfate ions in the solution.

Test _____

Result _____

(3)

(Total 9 marks)

7.

Water from a lake in the UK is used to produce drinking water.

(a) What are the two main steps used to treat water from lakes?

Give a reason for each step.

Step 1 _____

Reason _____

Step 2 _____

Reason _____

(2)

(b) Explain why it is more difficult to produce drinking water from waste water than from water in lakes.

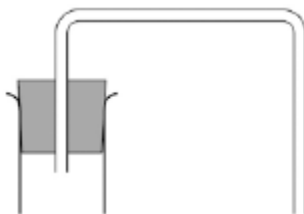
(3)

(c) Some countries make drinking water from sea water.

Complete the figure below to show how you can distil salt solution to produce and collect pure water.

Label the following:

- pure water
- salt solution



(3)

(d) How could the water be tested to show it is pure?

Give the expected result of the test for pure water.

(2)

(e) Why is producing drinking water from sea water expensive?

(1)

(Total 11 marks)

8.

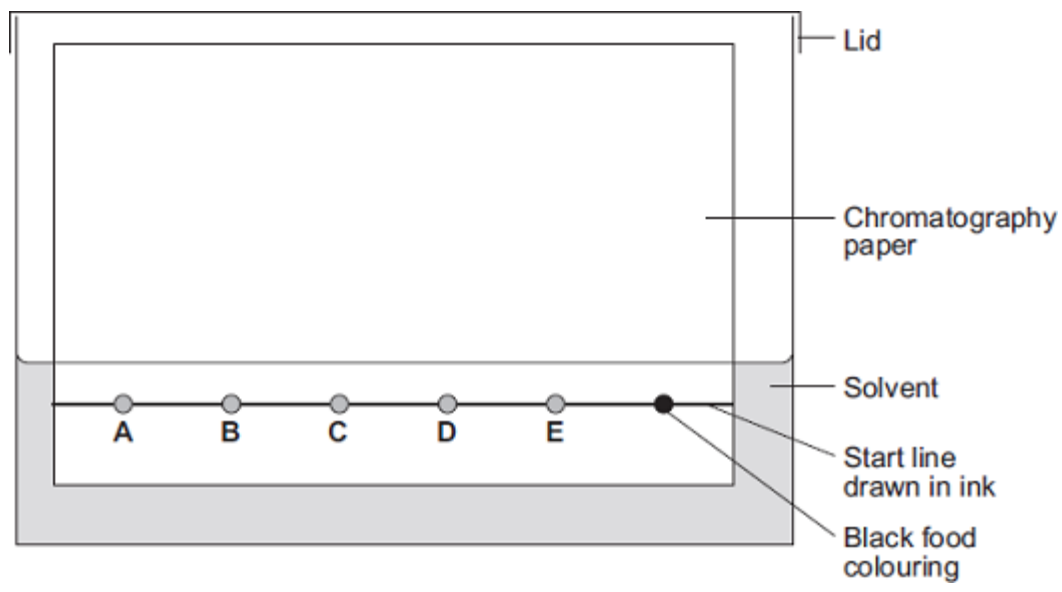
Chromatography can be used to separate components of a mixture.

(a) A student used paper chromatography to analyse a black food colouring.

The student placed spots of known food colours, **A**, **B**, **C**, **D** and **E**, and the black food colouring on a sheet of chromatography paper.

The student set up the apparatus as shown in **Diagram 1**.

Diagram 1



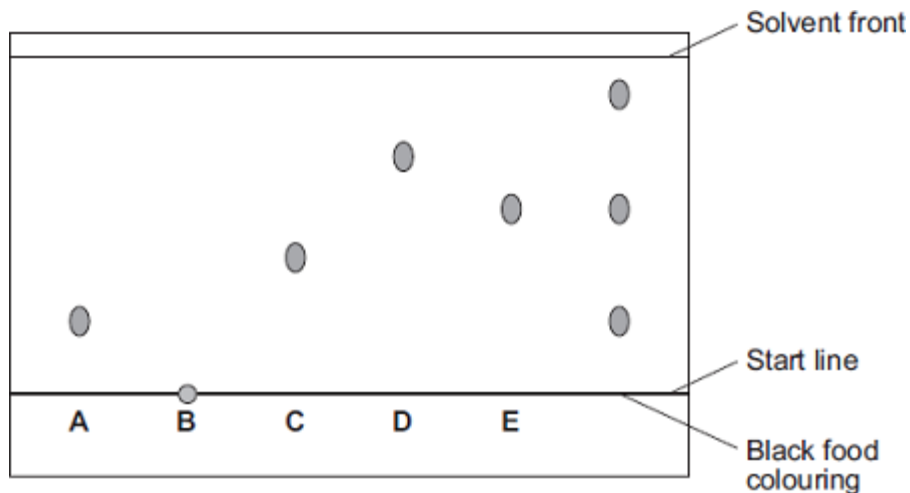
The student made **two** errors in setting up the apparatus. Identify the **two** errors and describe the problem each error would cause.

(4)

(b) A different student set up the apparatus without making any errors.

The chromatogram in **Diagram 2** shows the student's results.

Diagram 2



(i) What do the results tell you about the composition of the black food colouring?

(2)

(ii) Use **Diagram 2** to complete **Table 1**.

Table 1

	Distance in mm
Distance from start line to solvent front	_____
Distance moved by food colour C	_____

(2)

(iii) Use your answers in part **(b) (ii)** to calculate the R_f value for food colour **C**.

R_f value = _____

(1)

- (c) **Table 2** gives the results of chromatography experiments that were carried out on some known food colours, using the same solvent as the students.

Table 2

Name of food colour	Distance from start line to solvent front in mm	Distance moved by food colour in mm	R _f value
Ponceau 4R	62	59	0.95
Carmoisine	74	45	0.61
Fast red	67	27	0.40
Erythrosine	58	17	0.29

Which of the food colours in **Table 2** could be food colour **C** from the chromatogram?

Give the reason for your answer.

(2)

- (d) Two types of chromatography are gas chromatography and paper chromatography.

Give **one** advantage of gas chromatography compared with paper chromatography.

(1)

(Total 12 marks)

9.

Chlorine and bromine are important Group 7 elements.

- (a) Explain why chlorine is added to drinking water.

(1)

- (b) Describe what you would **see** when bromine water is added to an unsaturated organic compound.

(1)

- (c) Bromine can be extracted from seawater. The dissolved bromide ions are reacted with chlorine. Bromine and chloride ions are formed.

- (i) Complete and balance the equation below, which represents the reaction between chlorine and bromide ions.



(1)

- (ii) Describe what you **see** when chlorine is added to a solution containing bromide ions.

(1)

- (d) In terms of electronic structure:

- (i) state why bromine and chlorine are both in Group 7

(1)

- (ii) explain why bromine is less reactive than chlorine.

(3)

(e) What is the result of adding acidified silver nitrate solution to a solution containing:

(i) chloride ions

(1)

(ii) bromide ions?

(1)

(Total 10 marks)