



Centre Number

71

Candidate Number

General Certificate of Secondary Education  
2009–2010

**Science: Single Award (Modular)**  
Chemical Patterns and our Environment  
Module 3  
Higher Tier  
[GSC32]



WEDNESDAY 24 FEBRUARY 2010, MORNING

**TIME**

45 minutes.

**INSTRUCTIONS TO CANDIDATES**

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.  
Answer **all seven** questions.

**INFORMATION FOR CANDIDATES**

The total mark for this paper is 45.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

A Data Leaflet is provided for use with this paper.

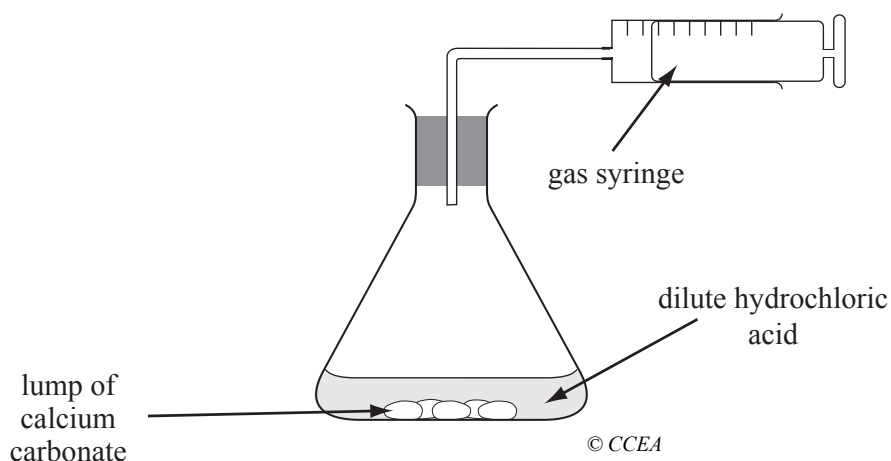
For Examiner's  
use only

Question Number	Marks
1	
2	
3	
4	
5	
6	
7	

Total  
Marks



- 1 The diagram shows the apparatus used to investigate the reaction between a piece of calcium carbonate and dilute hydrochloric acid.



John recorded the total volume of carbon dioxide collected at intervals over 15 minutes.

At the end of the reaction there was some calcium carbonate left in the flask.

John obtained the following results:

<b>Time/minutes</b>	0	1	2	3	5	7	9	11	13	15
<b>Carbon dioxide/cm<sup>3</sup> collected</b>	0	20	38	46	62	72	78	82	82	82

- (a) Complete the graph on the page opposite by plotting the remaining points and join these points to form a smooth curve. [3]

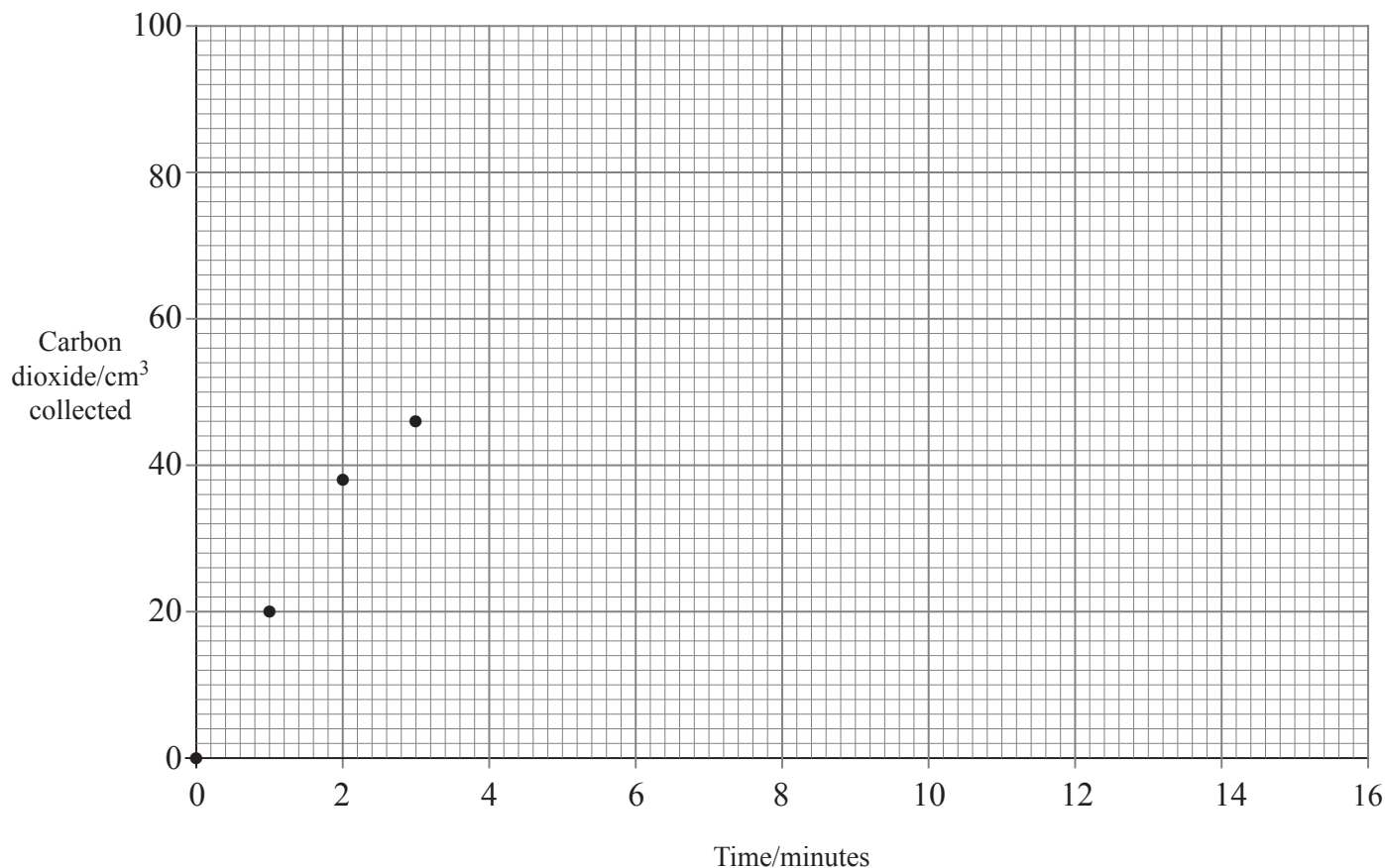
- (b) Describe and explain the shape of the graph over the first two minutes.

\_\_\_\_\_

\_\_\_\_\_ [2]

Examiner Only

Marks Remark



(c) (i) At what time did the reaction finish?

\_\_\_\_\_ [1]

(ii) How do you know that calcium carbonate was in excess?

\_\_\_\_\_ [1]

(d) Which one of the following would give a more accurate result?  
Tick the correct box.

Use a digital clock

Use more acid

Measure the volume of gas every 30 seconds

[1]

Examiner Only	
Marks	Remark

(e) To improve the reliability of the results John should do which of the following?

Tick the correct box.

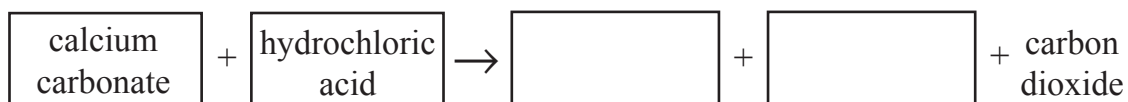
Do the experiment for a longer period

Use stronger acid

Repeat the experiment at least once

[1]

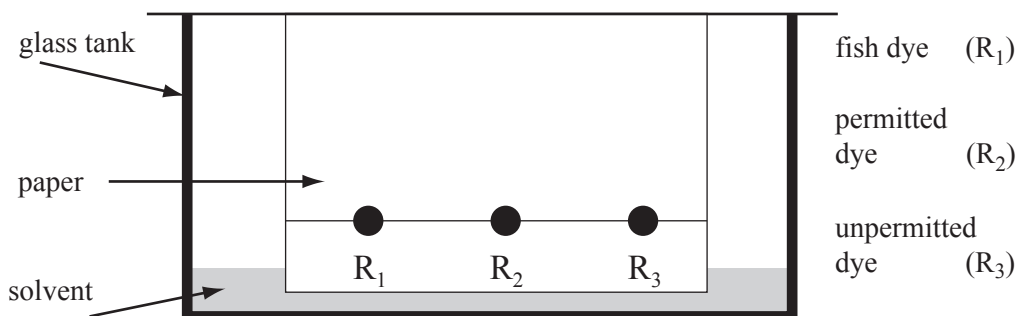
(f) Complete the word equation for this reaction.



[2]

Examiner Only	
Marks	Remark

- 2 Farmed salmon have a red dye added to their food to improve their appearance. Paul was asked to investigate this dye to make sure it was permitted. He was given two other red dyes for comparison and the apparatus below.



- (a) What name is given to this type of separation?

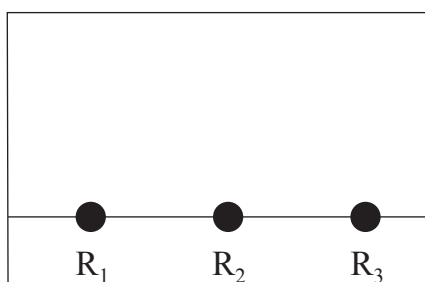
\_\_\_\_\_ [1]

- (b) Describe the steps Paul would take to carry out this separation.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

\_\_\_\_\_ [4]

- (c) Paul found that the fish dye ( $R_1$ ) was the same as the unpermitted dye ( $R_3$ ).  $R_2$  was found to be the least soluble dye and each dye was found to be a single colour. Complete the diagram below to show the relative positions of all three dyes after the experiment.

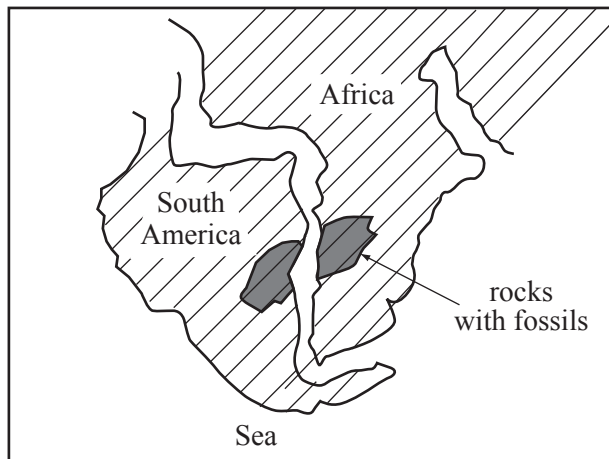


[1]

Examiner Only	
Marks	Remark

3 Ideas on the formation of the continents have been debated since 1597 but a full explanation wasn't developed until 1915 when Alfred Wegener put forward his theory. However, it wasn't until 1960 that scientists accepted his theory as being correct.

Map showing the relative positions of South America and Africa millions of years ago.



(a) Describe Wegener's theory including one piece of evidence that he gave to support it.

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[3]

(b) Some other scientists rejected Wegener's theory. Give **one** reason why it was rejected.

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[1]



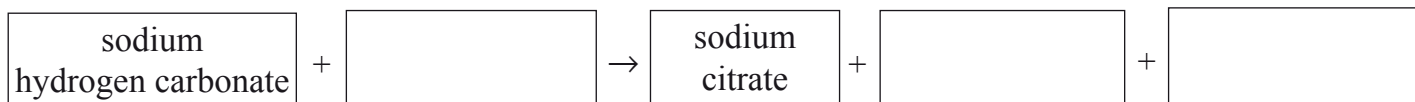
- 5 Sherbet is a mixture of citric acid, sugar and baking soda. When it is eaten it causes a fizzing sensation.



- (a) (i) Name the gas which causes the fizzing sensation.

\_\_\_\_\_ [1]

- (ii) Complete the word equation.



[3]

- (b) Baking soda undergoes thermal decomposition when it is put into the oven.

Explain fully what thermal decomposition means and suggest one advantage of this process when baking cakes.

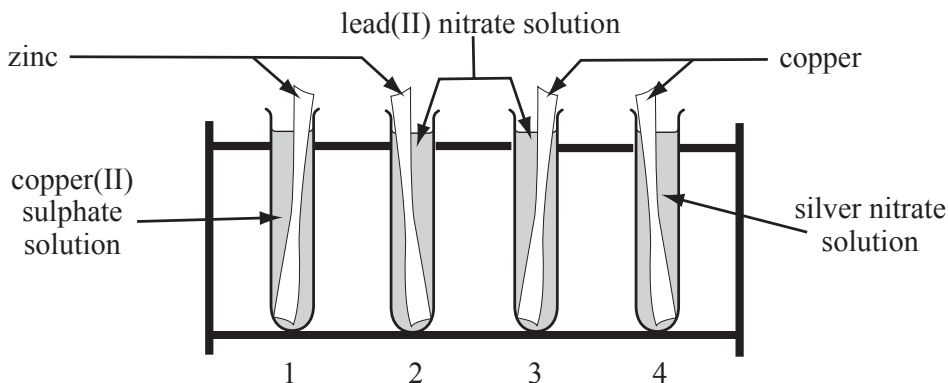
\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ [3]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark



- 6 The diagram below shows four solutions into which strips of metal were placed.



After several hours the following results were obtained.

**Test tube 1:** solution lost its blue colour and a reddish brown deposit was seen on the metal strip.

**Test tube 2:** solution remained colourless and a greyish white deposit was seen on the metal strip.

**Test tube 3:** solution remained colourless and the metal strip remained shiny with no deposit.

**Test tube 4:** solution turned blue and a deposit was seen on the metal strip.

Use this information and your knowledge to answer the following questions.

- (a) In which test tube (1, 2, 3 or 4) was there no chemical reaction?

\_\_\_\_\_ [1]

- (b) Name the blue solution produced in test tube 4.

\_\_\_\_\_ [1]

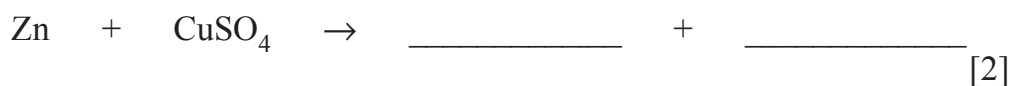
- (c) Name the greyish white deposit that was seen in test tube 2.

\_\_\_\_\_ [1]

- (d) Which of the metals is the most reactive? Circle the correct answer.

**copper**                  **lead**                  **zinc**                  **silver**                  [1]

- (e) Complete the symbol equation for the reaction in test tube 1.



Examiner Only	
Marks	Remark

7 Use your knowledge and the Data Leaflet to answer the following questions.

(a) What name is given to the compound which has the chemical formula  $\text{Na}_2\text{SO}_4$ ?

\_\_\_\_\_ [1]

(b) How many different elements are present in the substance which has the chemical formula  $\text{NH}_4\text{NO}_3$ ?

\_\_\_\_\_ [1]

(c) How many atoms are present in  $\text{Al}_2(\text{SO}_4)_3$ ?

\_\_\_\_\_ [1]

(d) What is the chemical formula for calcium hydrogen carbonate?

\_\_\_\_\_ [1]

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**THIS IS THE END OF THE QUESTION PAPER**

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Marks

Remark



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