

Centre Number						Candidate Number				
Surname										
Other Names										
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For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	



AQA Level 1/2 Certificate
Higher Tier
June 2013

Science: Double Award

8404/C/2H

Chemistry Paper 2H

H

Monday 10 June 2013 1.30 pm to 2.30 pm

For this paper you must have:

- a ruler
- a calculator
- the periodic table (enclosed).

Time allowed

- 1 hour

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 2(a) should be answered in continuous prose. In this question you will be marked on your ability to:
 - use good English
 - organise information clearly
 - use specialist vocabulary where appropriate.

Advice

- In all calculations, show clearly how you work out your answer.



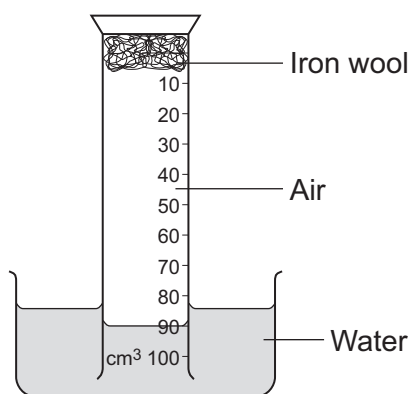
J U N 1 3 8 4 0 4 / C / 2 H 0 1

Answer **all** questions in the spaces provided.

- 1** When iron rusts it reacts with oxygen in the air. This reaction can be used to measure the percentage of oxygen in air.

Some iron wool was put into a 100 cm^3 measuring cylinder and set up in a beaker of water, as shown in **Diagram 1**.

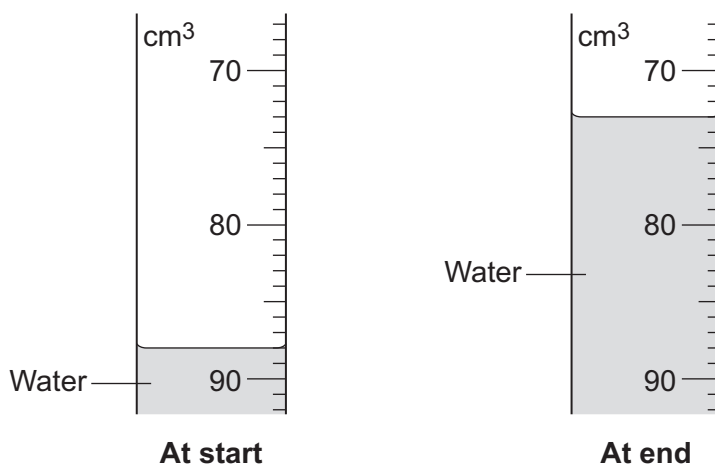
Diagram 1



Over several days, the water moved up the measuring cylinder because oxygen had reacted with the iron wool.

- 1 (a)** **Diagram 2** shows the levels of water in the measuring cylinder at the start and at the end of the experiment.

Diagram 2



Use these diagrams to read and record the volume of air at the start of the experiment and the volume of gas remaining at the end of the experiment.

Volume of air at start = cm³

Volume of gas at end = cm³
(2 marks)

1 (b) Use your readings from part (a) to calculate the percentage of oxygen in the air.

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Percentage of oxygen = %
(2 marks)

1 (c) A student suggested that the mass of iron wool used was too small.

Suggest how this error would affect the volume of gas recorded at the end of the experiment.

Give a reason for your answer.

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(2 marks)

Question 1 continues on the next page

Turn over ►



Turn over for the next question

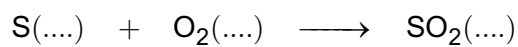
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ANSWER IN THE SPACES PROVIDED**

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2 (b) Sulfur reacts with oxygen to produce sulfur dioxide.

Write the correct state symbols in the equation.



(1 mark)

2 (c) Sulfur dioxide causes an environmental problem.

Name the environmental problem, and give **one** of its effects.

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(2 marks)

9

Turn over for the next question

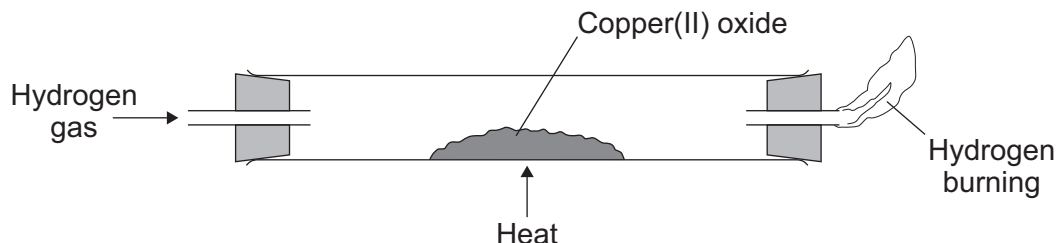
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3 This question is about copper.

3 (a) Copper(II) oxide is converted into copper by heating in a stream of hydrogen.

A teacher did an experiment using the apparatus in the diagram.



3 (a) (i) Why should the hydrogen gas be burned as it leaves the apparatus?

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(1 mark)

3 (a) (ii) Suggest how the teacher could decide from the appearance of the solid in the tube that the copper(II) oxide had been converted into copper.

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(1 mark)

3 (a) (iii) During the reaction, drops of a colourless liquid appear inside the tube.

Name the colourless liquid, and explain how it is produced.

Name

Explanation

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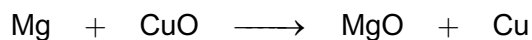
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(3 marks)



- 3 (b)** A different way to convert copper(II) oxide into copper is to use magnesium in the following reaction:



Suggest **one** reason why magnesium can be used to produce copper in this reaction.

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(1 mark)

- 3 (c)** Explain why copper metal conducts electricity.

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(2 marks)

- 3 (d)** Pure copper is too soft for many uses. Copper alloys are made by adding small amounts of other metals to pure copper.

Explain why copper alloys are harder than pure copper.

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(3 marks)

11

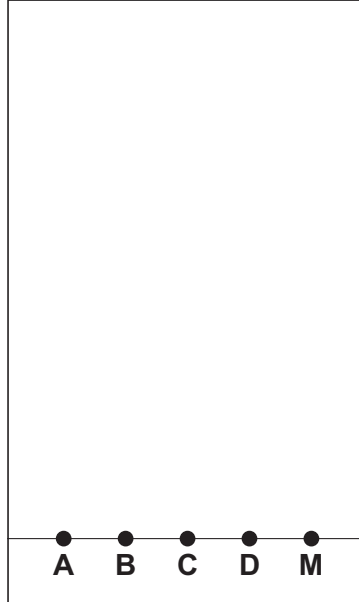
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- 4 A student used paper chromatography to analyse a food colouring.
The student prepared the paper as shown in **Diagram 1**.

Diagram 1



The spots labelled **A**, **B**, **C** and **D** are individual food colourings.

The spot labelled **M** is the food colouring being analysed.

- 4 (a) Describe how the student should use the paper to do the chromatography experiment.

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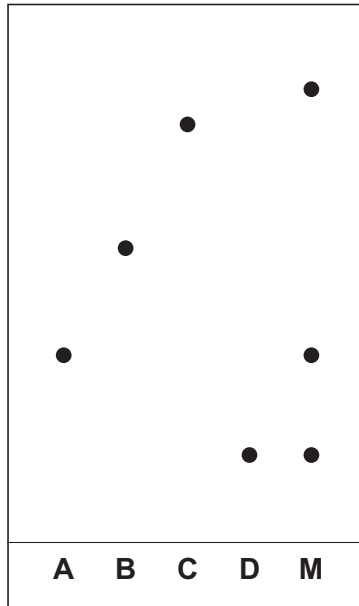
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(4 marks)



4 (b) **Diagram 2** represents the chromatography paper at the end of the experiment.

Diagram 2



What conclusions can you make about food colouring **M**?

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(3 marks)

7

Turn over for the next question

Turn over ►



5 Washing soda is the common name for hydrated sodium carbonate.

Some students wanted to find the mass of water lost when washing soda is heated.

The word equation for this reaction is:

hydrated sodium carbonate \rightleftharpoons anhydrous sodium carbonate + water

5 (a) What does the symbol \rightleftharpoons in the equation tell you about this reaction?

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(1 mark)

5 (b) Some students:

- measured the mass of an empty evaporating basin
- measured the mass of the evaporating basin and some washing soda crystals
- heated the crystals in the evaporating basin
- measured the mass of the evaporating basin and contents after heating.

The table shows the results the students recorded.

Experiment	Mass in grams			
	Evaporating basin	Evaporating basin and washing soda	Washing soda before heating	Contents after heating
1	25.8	32.7	6.9	2.6
2	26.6	33.0	6.4	2.5
3	24.9	32.4	7.5	3.0
4	25.4	32.9	7.5	3.8

What should the students do to check that all the water had been lost?

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(2 marks)



5 (c) Calculate the relative formula mass (M_r) of anhydrous sodium carbonate, Na_2CO_3

Relative atomic masses (A_r): C = 12; O = 16; Na = 23.

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Relative formula mass (M_r) =
(2 marks)

5 (d) (i) The results of Experiment 3 show that 7.5 g of hydrated sodium carbonate produced 3.0 g of anhydrous sodium carbonate.

Calculate the amount of water, in moles, produced in this experiment.

Relative atomic masses (A_r): H = 1; O = 16.

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Amount of water = moles
(3 marks)

5 (d) (ii) The amount of anhydrous sodium carbonate produced in this experiment was 0.028 mol.

The formula of hydrated sodium carbonate can be represented as $\text{Na}_2\text{CO}_3 \cdot x\text{H}_2\text{O}$

Use this information and your answer to part (d)(i) to calculate the value of x. Give your answer to the nearest whole number.

If you could not answer part (d)(i) use a value of 0.16 moles of water. This is **not** the answer to part (d)(i).

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Value of x =
(2 marks)



6 When ammonium chloride dissolves in water, there is a temperature decrease.

A student investigated how the temperature of water changed when different masses of ammonium chloride were added to water.

The student recorded the final temperature of the solution in each experiment.

6 (a) The student waited too long before recording the final temperature in one experiment.

How would this error affect the final temperature recorded in the experiment?
Give a reason for your answer.

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(2 marks)

6 (b) The student wanted to make sure his results were valid.

One of the variables he controlled was the volume of water.

Suggest **one** other control variable. Explain how the final temperature would be affected if this variable was **not** controlled.

Variable

Explanation

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(3 marks)

6 (c) The student used a glass beaker in the investigation.

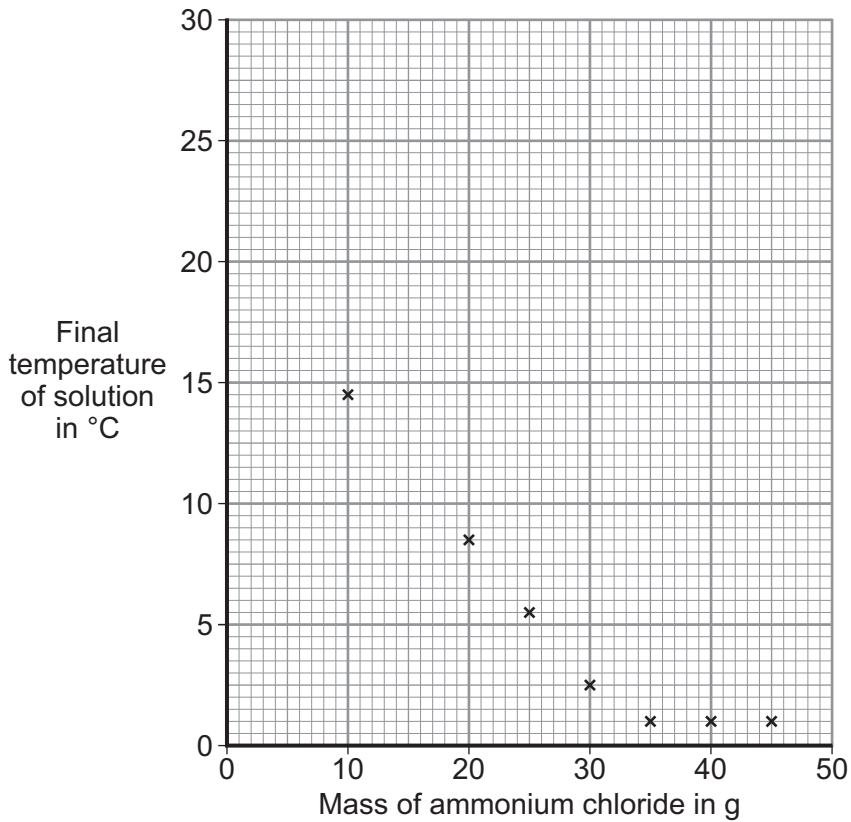
Suggest why using a polystyrene cup might improve the accuracy of the student's results.

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(1 mark)



6 (d) The graph shows the student's results.



6 (d) (i) Explain why the final temperature was the same for all masses of 35 g and greater.

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(2 marks)

6 (d) (ii) Use the graph to estimate the temperature of the room.

Show your working on the graph.

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Temperature of room = °C
(2 marks)

Question 6 continues on the next page

Turn over ►



6 (d) (iii) A second student also did one of the experiments.

This student recorded a final temperature of 14.5 °C.

Both students dissolved 20 g of ammonium chloride in water.

Use the graph to explain the difference in the two final temperatures.

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(2 marks)

12

END OF QUESTIONS

