Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature		Date	

General Certificate of Secondary Education
June 2008 / June 2009

ADDITIONAL SCIENCE / CHEMISTRY   **ASCC/CHYC/C2.1**
ISA C2.1   Controlling Reactions

AQA
ASSESSMENT and
QUALIFICATIONS
ALLIANCE

To be conducted before 4 May 2009
For submission in May 2008 or May 2009 or May 2010

For this paper you must have:
- results tables and charts or graphs from your own investigation
- a ruler.

You may use a calculator.

For Teacher's Use	
Section	Mark
1	
2	
Total (max 34)	

Time allowed: 45 minutes

Instructions

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in **Section 1** and **Section 2**.
- Answer the questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The maximum mark for this paper is 34.
- The marks for questions are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

| Did this candidate take part in the practical activity? | **YES / NO** |

Signature of teacher marking this ISA .... Date ....

ASCC/CHYC/C2.1

SECTION 1

These questions are about the investigation that **you** did.

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

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1 What were you trying to find out in your investigation?

  ....

  ....

  ....

  ....
(2 marks)

2 In your investigation:

  (a)   state **two** variables that it was important to keep the same to make it a fair test;

    Variable 1 .... Variable 2 ....
(2 marks)

  (b)   explain why it was important to keep these variables the same.

      ....

      ....
(1 mark)

3 Suggest **one** change to your apparatus that would improve the **precision** of your results.

  ....

  ....
(1 mark)

  Explain your answer.

  ....

  ....
(1 mark)

4 In your investigation, what was the **independent** variable (the one that you deliberately changed)?

....
(1 mark)

5 Suggest **one** possible cause of error in your investigation.

....

....
(1 mark)

6 You may have repeated your results in order to calculate a mean.

What feature of a calculated mean is improved by carrying out more repeats?

Put a tick (✓) in the box next to your choice.

Precision ☐

Reliability ☐

Validity ☐
(1 mark)

7 What did you find out from your investigation?

I found out that ....

....

....

....
(2 marks)

8 Make sure that **your** results tables and charts or graphs are handed in with this paper.
You will be awarded up to 6 marks for these. *(6 marks)*

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SECTION 2

These questions are about an investigation that may be similar to the one that you did.

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

You have to protect some limestone statues from acid rain. You ask a company that waterproofs the walls of buildings to help.

The company investigates the rate of reaction of hydrochloric acid on untreated limestone and then repeats the test on treated limestone.

To do this, the company's scientists add dilute hydrochloric acid to limestone cubes which have sides of exactly 1 cm × 1 cm × 1 cm. The scientists measure the volume of gas produced in one minute. For each test, the same number of limestone cubes is used. The cubes are also tested with distilled water.

Look at the results and then answer the questions that follow.

Table 1   Untreated limestone cubes

Concentration of hydrochloric acid in mol/dm^3	Volume of gas produced in one minute in cm^3			
	Test 1	Test 2	Test 3	Mean
2.5	95	100	96	97
2.0	79	77	78	78
1.5	59	61	90	70
1.0	39	36	39	38
0.5	19	18	20	19
Distilled water	0	0	0	0

9   What interval did the company use for the concentration of hydrochloric acid?

.... mol/dm^3
(1 mark)

10 Which concentration of acid gave the biggest range of results? .... mol/dm^3
(1 mark)

11 The mean volume of gas produced in one minute for **one** of the concentrations of hydrochloric acid has been incorrectly calculated in **Table 1**.

For which concentration has the mean volume been incorrectly calculated?

.... mol/dm^3

Explain how the mean volume of gas produced has been incorrectly calculated.

....

....

....

....
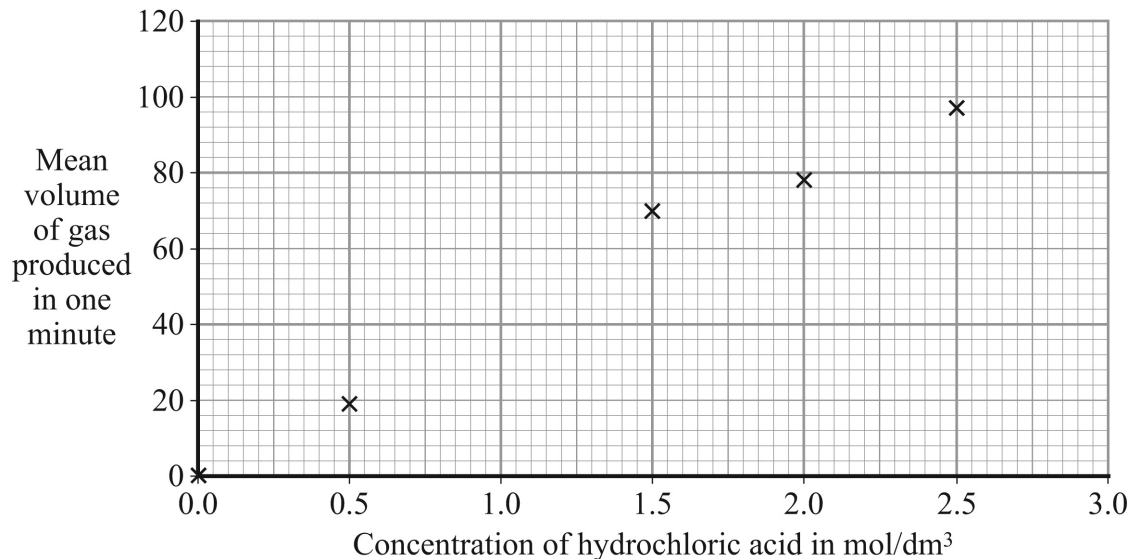
(2 marks)

12 (a) The graph shows the results that the company's scientists obtained. One point is missing.

Plot the missing point on the graph.

(1 mark)

(b) Draw a line of best fit on the graph. *(1 mark)*

Turn over ▶

13 The company's scientists tested the effect of distilled water as well as hydrochloric acid.

Suggest why they did this.

....

....

(1 mark)

14 (a) How does the volume of gas produced in one minute change as the concentration of the hydrochloric acid is increased?

....

....

(1 mark)

(b) How could you calculate the rate of the reaction between the limestone and the hydrochloric acid from the volume of gas produced?

....

....

(1 mark)

15 Acid rain is a dilute solution. It contains sulfuric acid and nitric acid.

(a) Suggest **one** reason why the company's scientists did **not** use samples of acid rain to carry out their tests on the limestone cubes.

....

....

(1 mark)

(b) The company's scientists tested the limestone using hydrochloric acid.
They claim that all acids will give the same results.

Do you think that the company was justified in its claim?

Draw a ring around your answer.   **Yes / No**

Explain your answer.

....

....

(1 mark)

16 The company's scientists used limestone cubes with sides of exactly 1 cm × 1 cm × 1 cm instead of using irregular pieces of limestone.

Explain why they did this.

....

....

....

....

(2 marks)

17 The company's scientists repeated their tests using limestone cubes that had been treated with their company's waterproofing solution.

Table 2   Treated limestone cubes

Concentration of hydrochloric acid in mol/dm^3	Mean volume of gas produced in 1 minute in cm^3
2.5	0
2.0	0
1.5	0
1.0	0
0.5	0

The company suggests that using its waterproofing solution would protect the statues from acid rain for at least 50 years and would not harm the statues.

Write a short report that includes **one** point that supports the company's claim and **one** point that does not support the company's claim.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

....

....

....

....

....

....

(3 marks)

END OF QUESTIONS

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There are no questions printed on this page