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**kickstart
tutors**

Student number

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Name _____

Date _____

Attempt/Time taken _____

GCSE CHEMISTRY

Topic Paper: 4.2 Reactions of acids
Part 1

Time allowed: 40 minutes

Materials

For this paper you must have:

- the Periodic Table/Data Sheet, provided as an insert (enclosed)
- a ruler with millimetre measurements
- a calculator, which you are expected to use where appropriate.

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.
- All working must be shown.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The Periodic Table/Data Sheet is provided as in insert.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering questions you need to make sure that your answer:
 - is clear, logical, sensibly structured
 - fully meets the requirements of the question
 - shows that each separate point or step supports the overall answer.



35 Marks



Q1. The picture shows a lump of phosphate rock.



Rob Lavinsky, iRocks.com – CC-BY-SA-3.0 [CC-BY-SA-3.0], via Wikimedia Commons

Phosphoric acid is made by adding sulfuric acid to phosphate rock.

- (a) The rate of reaction between sulfuric acid and phosphate rock can be increased if the mixture is heated to a higher temperature.

Explain, in terms of particles, why an increase in temperature increases the rate of reaction.

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.....
.....
.....
.....

(2)

- (b) State **one** other way in which the rate of reaction between sulfuric acid and phosphate rock can be increased.

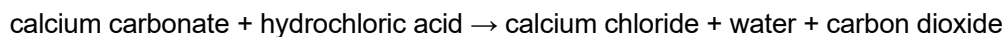
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(1)

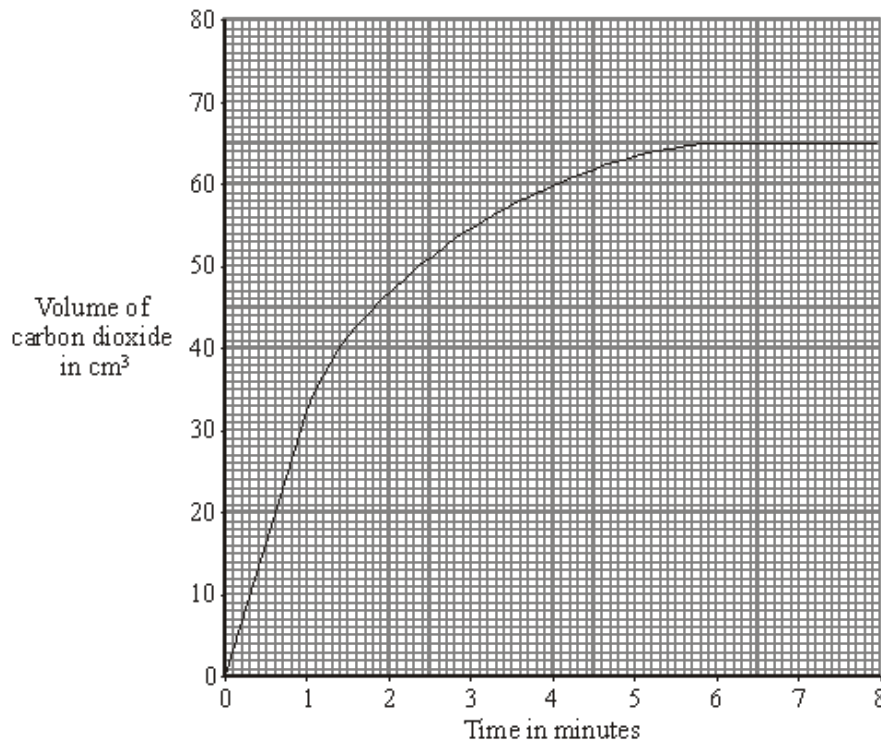
(Total 3 marks)



Q2. A student studied the reaction between dilute hydrochloric acid and an **excess** of calcium carbonate.



The student measured the volume of carbon dioxide produced in the experiment. The results are shown on the graph.



(a) After how many minutes had all the acid been used up?

..... minutes

(1)

(b) The student wrote this conclusion for the experiment:

'The reaction gets slower and slower as the time increases.'

Explain why the reaction gets slower. Your answer should be in terms of particles.

.....

.....

.....

.....

(2)



- (c) A second experiment was carried out at a higher temperature. All other factors were the same.

Draw a line on the graph above to show the results that you would expect.

(2)

(Total 5 marks)

Q3. Hydrogen peroxide, H_2O_2 , is often used as a bleach. It decomposes forming water and oxygen.

- (a) (i) Write the balanced chemical equation for the decomposition of hydrogen peroxide.

.....

(3)

- (ii) Give a test for oxygen.

Test

Result of test

.....

(2)

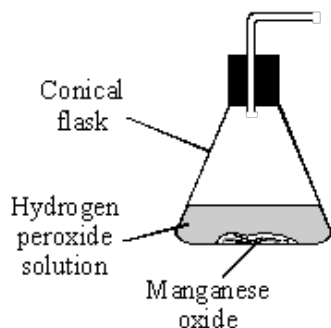
- (b) The rate of decomposition of hydrogen peroxide at room temperature is very slow. Manganese oxide is a catalyst which can be used to speed up the decomposition. Complete the sentence.

A catalyst is a substance which speeds up a chemical reaction. At the end of the reaction, the catalyst is

(1)

- (c) Two experiments were carried out to test if the amount of manganese oxide, MnO_2 affected the rate at which the hydrogen peroxide decomposed.

- (i) Complete the diagram to show how you could measure the volume of oxygen formed during the decomposition.



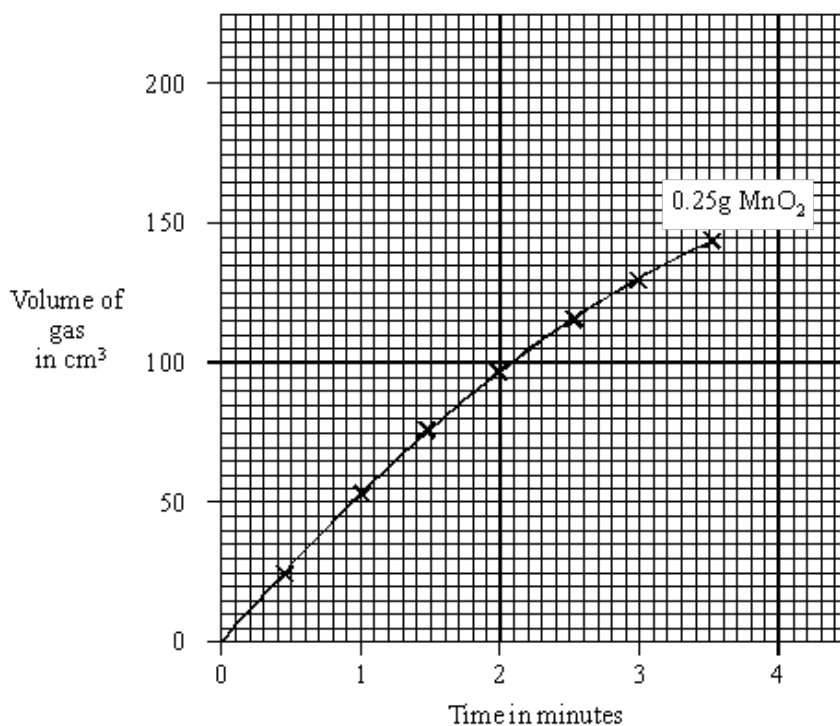
(2)



(ii) The results are shown in the table.

Time in minutes	0	0.5	1	1.5	2	2.5	3	3.5
Volume of gas in cm³ using 0.25 g MnO₂	0	29	55	77	98	116	132	144
Volume of gas in cm³ using 2.5 g MnO₂	0	45	84	118	145	162	174	182

Draw a graph of these results. The graph for 0.25 g MnO₂ has been drawn for you.



(3)

(iii) Explain why the slopes of the graphs become less steep during the reaction.

.....

.....

.....

(2)



(iv) The same volume and concentration of hydrogen peroxide solution was used for both experiments. What **two** other factors must be kept the same to make it a fair test?

1

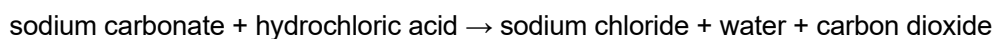
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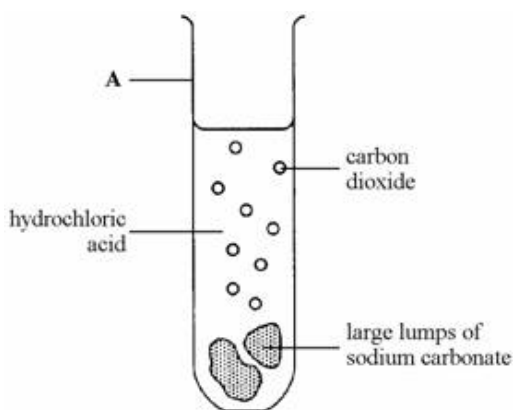
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(2)
(Total 15 marks)

Q4. Dilute hydrochloric acid reacts with sodium carbonate. The word equation for this reaction is:



(a) The diagram shows apparatus used by student X to investigate this reaction.



(i) Name the piece of apparatus labelled A.

.....

(1)

(ii) NaCO_3 NaCl Na_2CO_3 Na_2Cl

Use the Data Sheet to help you choose the correct formula from the list for:

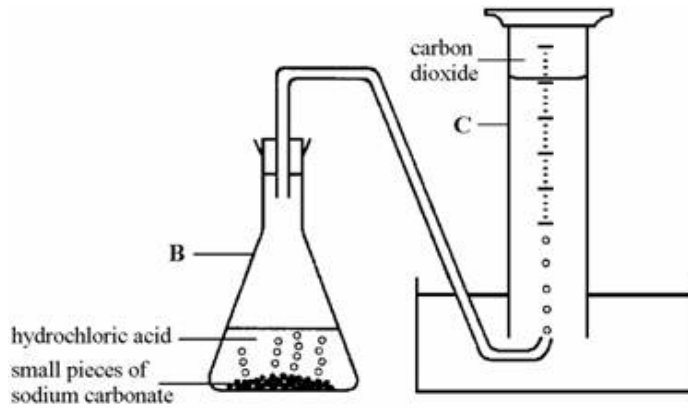
sodium carbonate,

sodium chloride.

(2)



- (b) The diagram below shows a different apparatus used by student Y to investigate the same reaction.



- (i) Name the pieces of apparatus labelled **B** and **C**.

B

C

(2)

- (ii) Both students X and Y used the same
- volume of acid
 - concentration of acid
 - temperature
 - mass of sodium carbonate

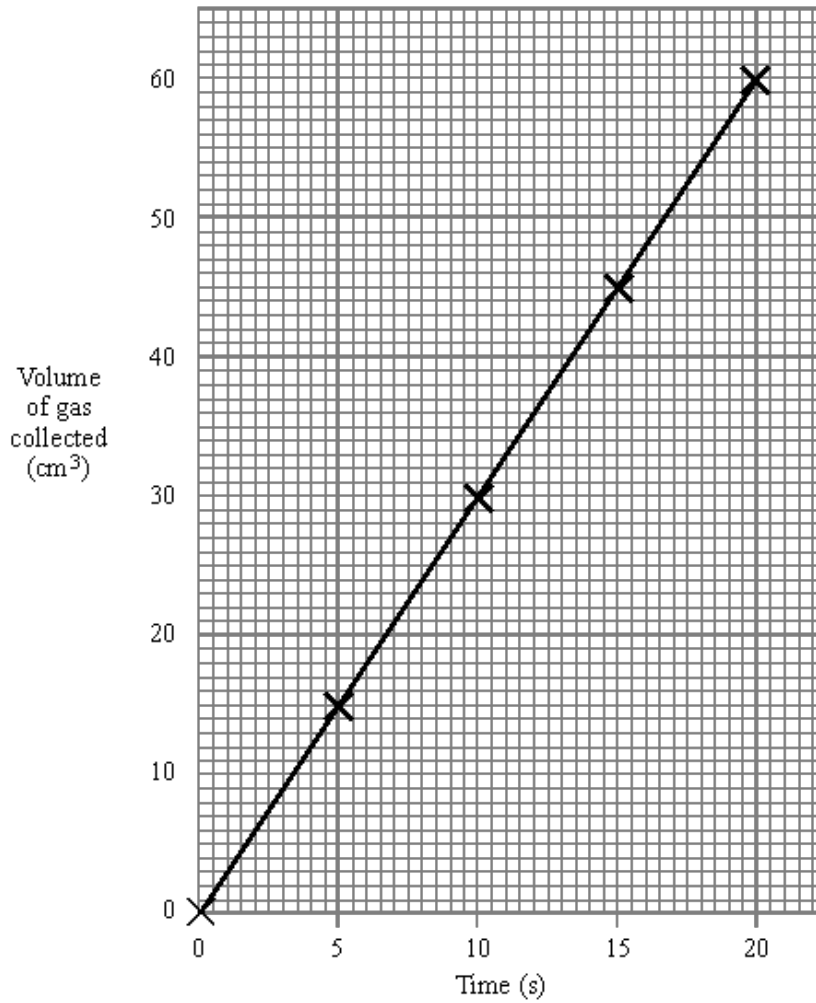
Use information from the diagrams to explain why the reaction that student Y carried out was faster.

.....
.....
.....

(2)



(c) The results obtained by student Y were plotted as shown below.



(i) Student Y repeated the experiment exactly as before but used warmer acid. This made the reaction faster. On the graph draw a line for this faster reaction.

(2)

(ii) Explain, in terms of particles, why the rate of the reaction is faster when warmer acid is used.

.....

.....

.....

(3)

(Total 12 marks)