PEARSON EDEXCEL GCSE COMBINED SCIENCE (HIGHER) · 1SC0

CHEMISTRY



EXAM QUESTION PACK

TOPIC 7: RATES OF REACTION AND ENERGY CHANGES: RATES OF REACTION (PAPER 2)

SCORE	PERCENTAGE
/121	%

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Q1.

A student used the equipment in Figure 6 to investigate the rate of reaction between zinc and excess dilute hydrochloric acid.

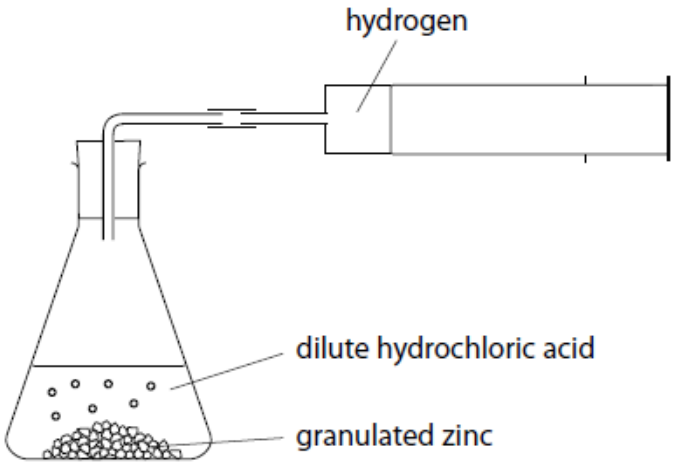


Figure 6

The student uses the following method:

- place a known mass of granulated zinc into the conical flask
- pour 25 cm^3 of dilute hydrochloric acid (an excess) into the conical flask and fit the bung quickly into the neck of the flask
- measure the volume of gas produced every 20 seconds until after the reaction finishes.

Figure 7 shows the results.

time / s	volume of hydrogen / cm^3
0	0
20	42
40	66
60	75
80	80
100	82
120	82
140	82

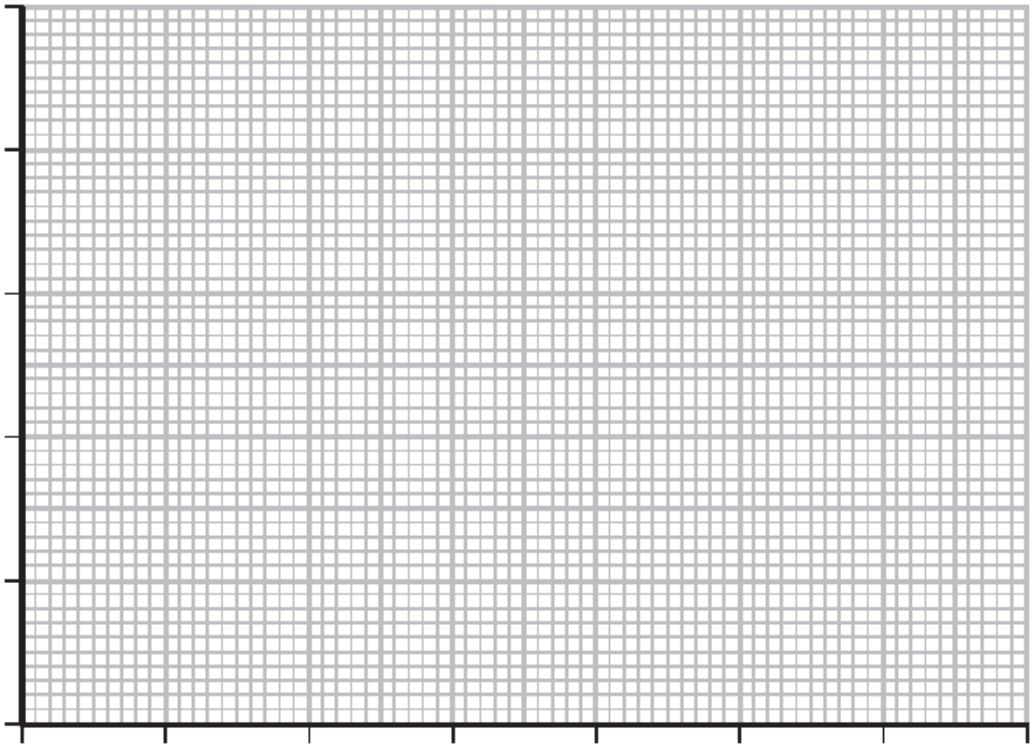
Figure 7

(a) Give the name of a piece of equipment that can be used to measure 25 cm^3 of dilute hydrochloric acid accurately.

(1)

(b) Draw a graph of the volume of hydrogen gas produced against time using the grid.

(3)



(c) The average rate of reaction in the first 20 seconds in cm^3 of hydrogen produced per second is

(1)

☒ **A** 2.1

☒ **B** 8.4

☒ **C** 21

☒ **D** 84

(d) The student repeated the experiment keeping all conditions the same but using the same mass of powdered zinc instead of granulated zinc.

On the grid above sketch the graph you would expect when the experiment is repeated using powdered zinc.

Label your line **A**.

(2)

(Total for question = 7 marks)

(**Q04abcd 1SC0/2CF, SAM 2016**)

Q2.

Hydrogen peroxide decomposes to form water and oxygen.

The rate of this reaction can be found by measuring the volume of oxygen formed after different time intervals.

Hydrogen peroxide solution is placed in a conical flask.
The apparatus is set up as shown in Figure 5.

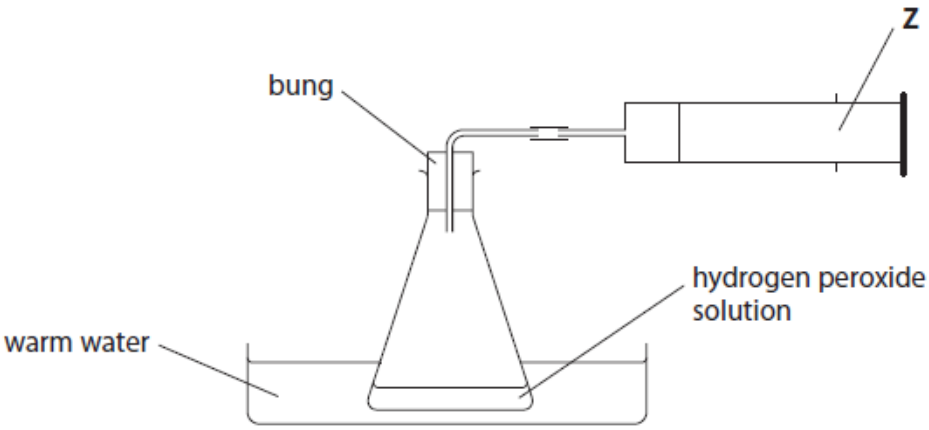


Figure 5

Complete the balanced equation for the reaction and fill in the two missing state symbols.

(2)

.....H_2O_2(aq) → 2H_2O(.....) + O_2(.....)

(Total for question = 2 marks)

(**Q09 1SC0/2CF, June 2018**)

Q3.

Two substances, **A** and **B**, each form a colourless solution.

If the solutions are mixed in a beaker, **A** and **B** react to form a coloured product.
The rate of the reaction between **A** and **B** can be investigated by placing the beaker containing the mixture on a cross on a piece of paper and timing how long it takes for enough coloured product to be produced to make the cross invisible when viewed from above, through the solution.

	experiment 1	experiment 2	experiment 3
concentration of **A in solution** in g dm^{-3}	10	10	40
temperature in °C	20	40	40
time for cross to become invisible in s	320	80	20

Figure 13

Use the results of these experiments to explain, in terms of the behaviour of particles, the effect of changing temperature and the effect of changing the concentration of **A** in solution on the rate of this reaction.

(Total for question = 6 marks)

(**Q22 1SC0/2CH, June 2018**)

Q4.

Calcium carbonate reacts with dilute hydrochloric acid to produce carbon dioxide gas.

The word equation for the reaction is

$$\text{calcium carbonate} + \text{hydrochloric acid} \rightarrow \text{calcium chloride} + \text{carbon dioxide} + \text{water}$$

Two samples of calcium carbonate are provided.
One sample is in the form of large marble chips and the other sample is in the form of small marble chips.

Describe, in detail, an investigation to find the effect of using small marble chips rather than large marble chips on the rate of this reaction.

(6)

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(Total for question = 6 marks)

(**Q06b 1SC0/2CF/S2, SAM**)

Q5.

Dilute hydrochloric acid reacts with calcium carbonate to produce carbon dioxide gas.

Three different experiments were carried out using large pieces of calcium carbonate, small pieces of calcium carbonate and powdered calcium carbonate.
The size of the calcium carbonate pieces was the only factor that was changed.

In each experiment the volume of carbon dioxide released in five minutes was measured.

The results are

size of calcium carbonate pieces used	volume of carbon dioxide released in five minutes / cm^3
large	3
small	7
powdered	50

Describe what this shows about the effect of the surface area of calcium carbonate on the rate of this reaction.

(2)

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(**Q24 1SC0/2CF, June 2013**)

Q6.

Magnesium reacts with dilute sulfuric acid to form magnesium sulfate and hydrogen gas.

A student wants to find out the effect of temperature on the rate of this reaction.

The student used the following method.

step 1 pour 25 cm^3 of dilute sulfuric acid into a conical flask
step 2 warm the acid until its temperature is 30 °C
step 3 add a piece of magnesium to the acid
step 4 start a stopwatch
step 5 wait until the reaction has finished
step 6 stop the stopwatch
step 7 repeat steps 1–6 but at 50 °C.

At 50 °C, 15.0 cm^3 of gas was produced during the first 60 seconds of the reaction.

Calculate the average rate of reaction, in $cm^3\ s^{-1}$, for the first 60 seconds of the reaction.

(2)

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average rate of reaction = ... $cm^3\ s^{-1}$

(Total for question = 2 marks)

(**Q01e 1SC0/2CF, Nov 2021**)

Q7.

The calcium carbonate powder produced 90 cm^3 of carbon dioxide in five minutes.

Calculate the average rate of reaction in cm^3s^{-1}.

(3)

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.....

average rate of reaction = ... cm^3s^{-1}

(Total for question = 3 marks)

(**Q02b 1SC0/2CH, Nov 2020**)

Q8.

A student used the apparatus shown in Figure 10 to investigate the reaction between marble chips and
dilute hydrochloric acid.

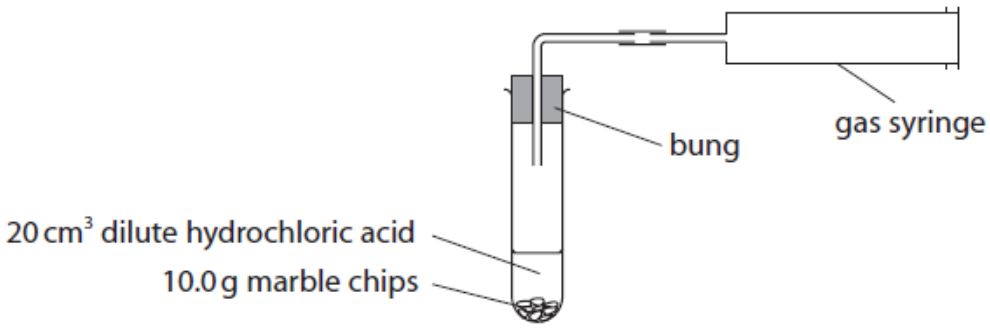


Figure 10

Rate of reaction can be calculated using

$$\text{rate of reaction} = \frac{\text{volume of gas produced in 1 minute}}{\text{1 minute}}$$

Figure 12 shows the rates of reaction calculated from the results of this experiment.

The rate of reaction for the time interval 2 to 3 minutes is missing.

time interval	0 to 1 minute	1 to 2 minutes	2 to 3 minutes	3 to 4 minutes	4 to 5 minutes
rate of reaction in $cm^3\ min^{-1}$	52	26		6	3

Figure 12

(i) Calculate the rate of reaction for the time interval 2 to 3 minutes.

(1)

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rate of reaction = ... $cm^3\ min^{-1}$

(ii) State and explain what happens to the rate of reaction as the acid reacts with the marble chips in this experiment.

(3)

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(Total for question = 4 marks)

(**QU05b 1SC0/2CF, June 2023**)

Q9.

A student used the apparatus shown in Figure 1 to investigate the reaction between marble chips and dilute hydrochloric acid.

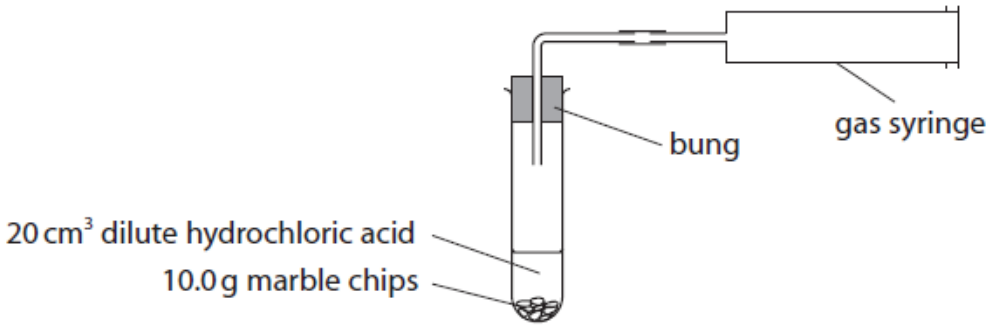


Figure 1

Rate of reaction can be calculated using

$$\text{rate of reaction} = \frac{\text{volume of gas produced in 1 minute}}{\text{1 minute}}$$

Figure 3 shows the rates of reaction calculated from the results of this experiment.

The rate of reaction for the time interval 2 to 3 minutes is missing.

time interval	0 to 1 minute	1 to 2 minutes	2 to 3 minutes	3 to 4 minutes	4 to 5 minutes
rate of reaction in $cm^3\ min^{-1}$	52	26		6	3

Figure 3

(i) Calculate the rate of reaction for the time interval 2 to 3 minutes.

(1)

.....

rate of reaction = ... $cm^3\ min^{-1}$

(ii) State and explain what happens to the rate of reaction as the acid reacts with the marble chips in this experiment.

(3)

.....

.....

.....

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.....

(Total for question = 4 marks)

(**QU01b 1SC0/2CH, June 2023**)

Q10.

Hydrogen peroxide decomposes to form water and oxygen.

The rate of this reaction can be found by measuring the volume of oxygen formed after different time intervals.

Hydrogen peroxide solution is placed in a conical flask.
The apparatus is set up as shown in Figure 5.

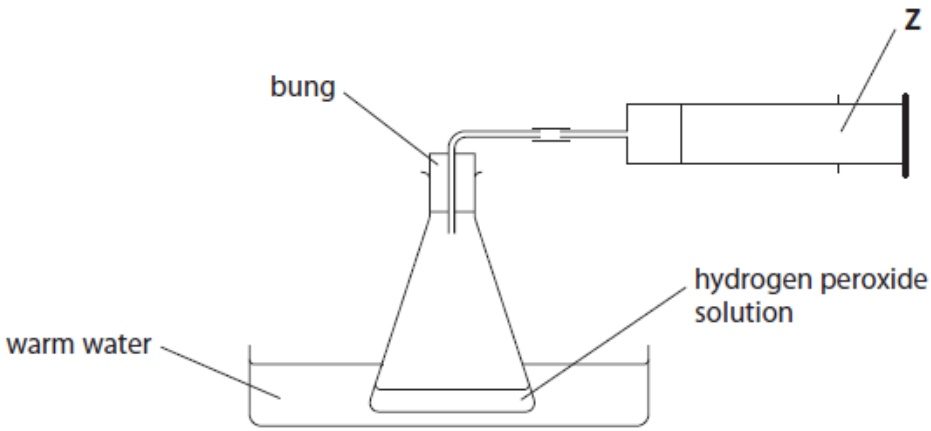


Figure 5

The experiment is repeated three times

once using a more dilute solution of hydrogen peroxide
once using a lower temperature
once using a larger flask

In each case, all other conditions are kept the same.

Circle the word that shows the change in the rate of decomposition in each case.

(2)

	change in rate		
hydrogen peroxide solution is more dilute	faster	slower	unchanged
the temperature used is lower	faster	slower	unchanged
the reaction is carried out in a larger flask	faster	slower	unchanged

(Total for question = 2 marks)

(**Q08 1SC0/2CF, June 2018**)

Q11.

A student investigates the reaction between marble chips and dilute hydrochloric acid.

The student measures the total volume of carbon dioxide gas produced each minute, for 10 minutes.

Figure 1 shows part of the apparatus used in the experiment.

Complete Figure 1 by drawing and labelling apparatus that could be used to collect and measure the volume of the carbon dioxide gas.

(2)

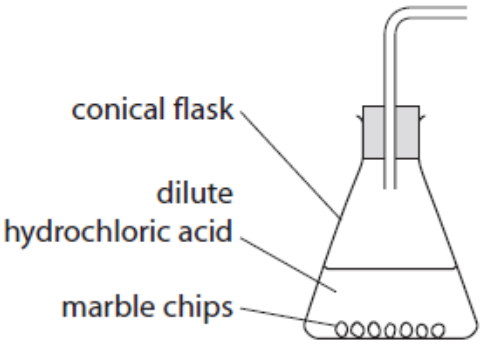


Figure 1

(Total for question = 2 marks)

(**QU01a 1SC0/2CH, June 2024**)

Q12.

Some pieces of calcium carbonate were added to dilute hydrochloric acid in a conical flask and the volume of carbon dioxide produced was measured.

Complete the diagram in Figure 5 to show the apparatus to collect the gas produced and measure its volume.

(2)

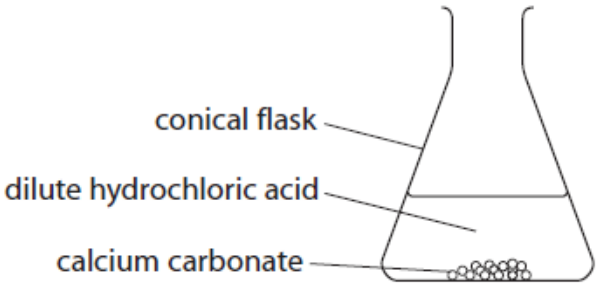


Figure 5

(Total for question = 2 marks)

(**Q04b 1SC0/2CH, Nov 2021**)

Q13.

A student investigates the reaction between marble chips and dilute hydrochloric acid.

The student measures the total volume of carbon dioxide gas produced each minute, for 10 minutes.

Figure 8 shows part of the apparatus used in the experiment.

Complete Figure 8 by drawing and labelling apparatus that could be used to collect and measure the volume of the carbon dioxide gas.

(2)

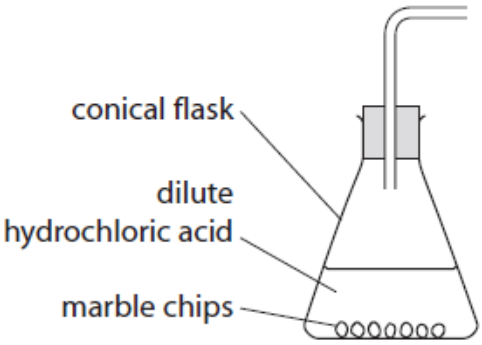


Figure 8

(Total for question = 2 marks)

(**QU05a 1SC0/2CF, June 2024**)

Q14.

Hydrogen peroxide, H_2O_2, decomposes into oxygen and water.

A catalyst can be used to increase the rate of this reaction.

(i) Use a word or phrase from the box to complete the sentence about the mass of the catalyst in a reaction.

(1)

stays the same	increases	decreases

During a reaction, the mass of a catalyst ..... .

(ii) Complete the balanced equation for this reaction and add the missing state symbol.

(2)

.....H_2O_2(aq) → 2H_2O(.....) + O_2(g)

(Total for question = 3 marks)

Q15.

The rate of reaction between magnesium ribbon and dilute hydrochloric acid at room temperature is investigated.

The apparatus used is shown in Figure 11.

The volume of hydrogen gas given off was measured at regular intervals during the reaction.

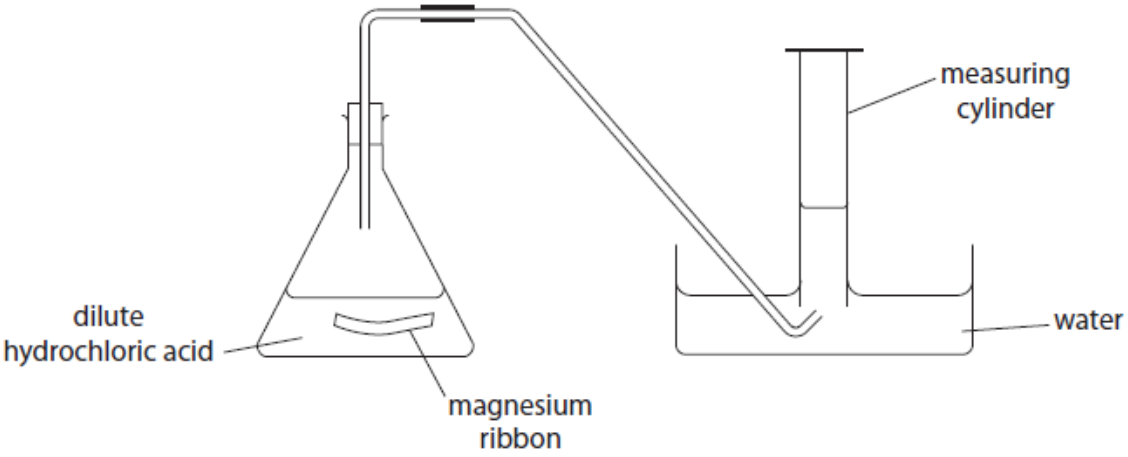


Figure 11

The graph in Figure 12 shows the results of this experiment.

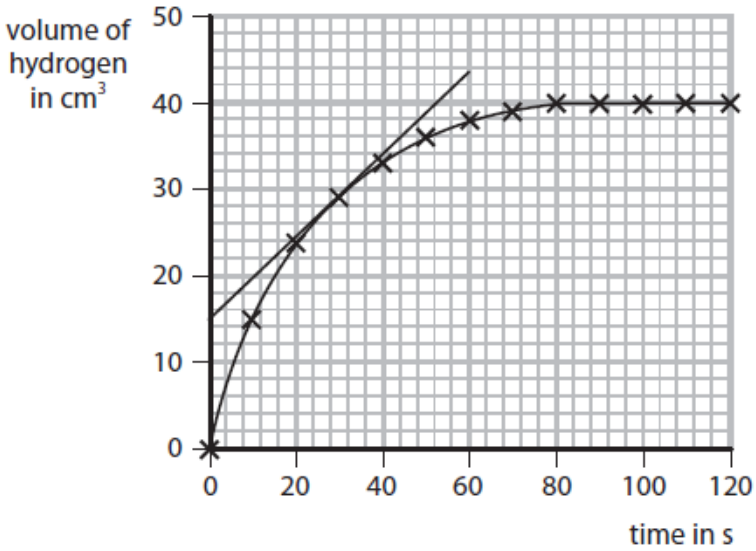


Figure 12

(i) State a change that can be made to the apparatus in Figure 11 to measure the volumes of gas more accurately.

(1)

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(ii) A tangent has been drawn to the line on the graph in Figure 12.

Calculate the rate of reaction at this point.

(2)

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.....

rate of reaction = ... $cm^3\ s^{-1}$

(iii) On the graph in Figure 12, draw the line you would expect to obtain if the magnesium ribbon in this experiment was replaced with an equal mass of powdered magnesium. All other conditions are kept the same.

(1)

(Total for question = 4 marks)

(**Q20 1SC0/2CH, June 2018**)

Q16.

A catalyst is added to some reactions.

Explain the meaning of **catalyst.**

(2)

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.....

(**Q23 1SC0/2CF, June 2013**)

Q17.

The apparatus in Figure 7 can be used to measure the rate of the reaction between marble chips and hydrochloric acid.

The student needs different sized marble chips.

Describe how the student can make small and medium sized marble chips from large chips.

(2)

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(Total for question = 2 marks)

(**QU05c 1SC0/2CF, June 2019**)

Q18.

A student used the apparatus in Figure 7 to investigate the rate of the reaction between a metal and dilute hydrochloric acid.

Pieces of the metal were placed in dilute hydrochloric acid in the flask, and the total volume of gas produced was measured every minute.

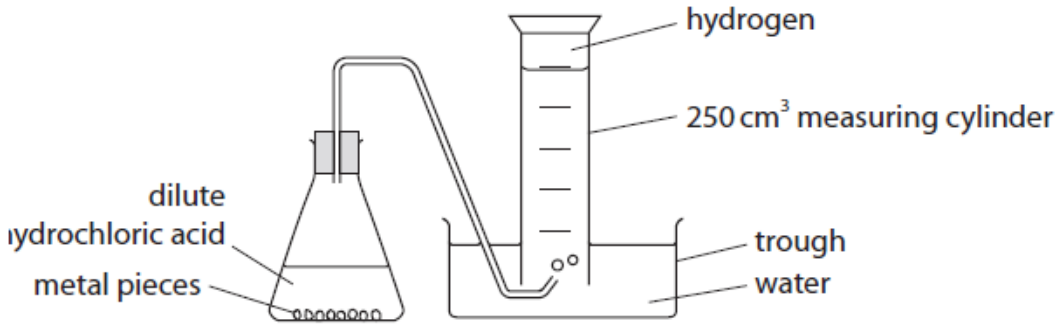


Figure 7

Figure 8 shows a graph of the student's results.

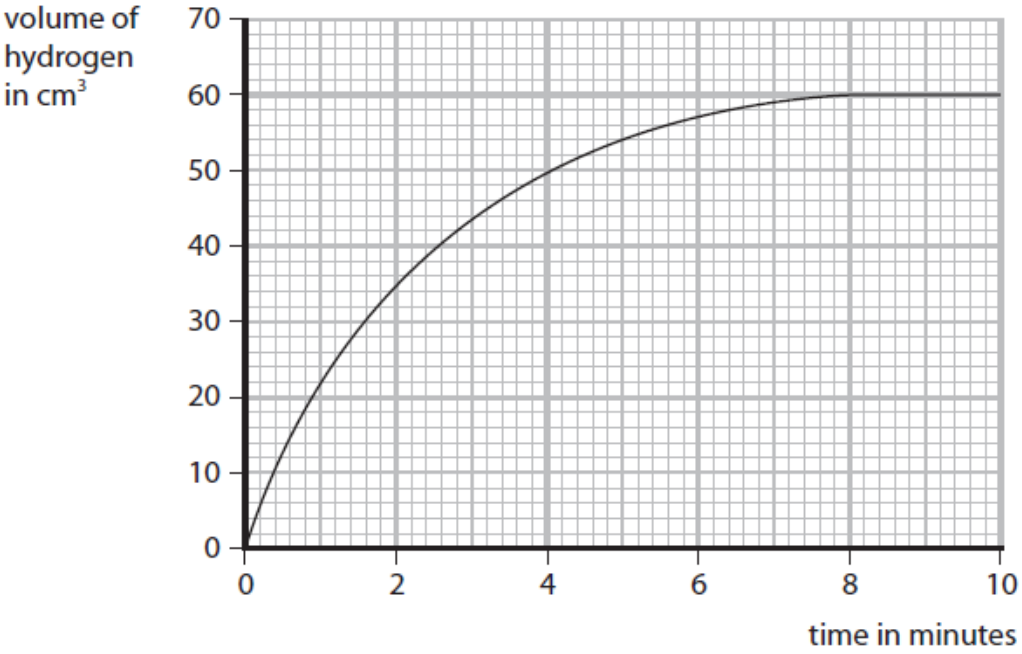


Figure 8

The apparatus in Figure 7 can be used to measure the rate of the reaction between marble chips and hydrochloric acid.

The student needs different sized marble chips.

Describe how the student can make small and medium sized marble chips from large chips.

(2)

.....

.....

.....

(Total for question = 2 marks)

(**QU05c 1SC0/2CF, June 2022**)

Q19.

Zinc metal reacts with dilute hydrochloric acid to produce hydrogen gas.

zinc + hydrochloric acid → zinc chloride + hydrogen

A student investigated the effect of doubling the concentration of the hydrochloric acid on this reaction.

The student made the following prediction.

> When the concentration of the hydrochloric acid is doubled the rate of reaction will double and the reaction will be more exothermic.

Devise a plan, including the apparatus you would use, to test the student's prediction.

You are provided with pieces of zinc and two bottles of dilute hydrochloric acid.
One bottle of hydrochloric acid is double the concentration of the other.

(Total for question = 6 marks)

(**Q06b 1SC0/2CF, Nov 2020**)

Q20.

* The reaction profile for an uncatalysed exothermic reaction is shown in Figure 8.

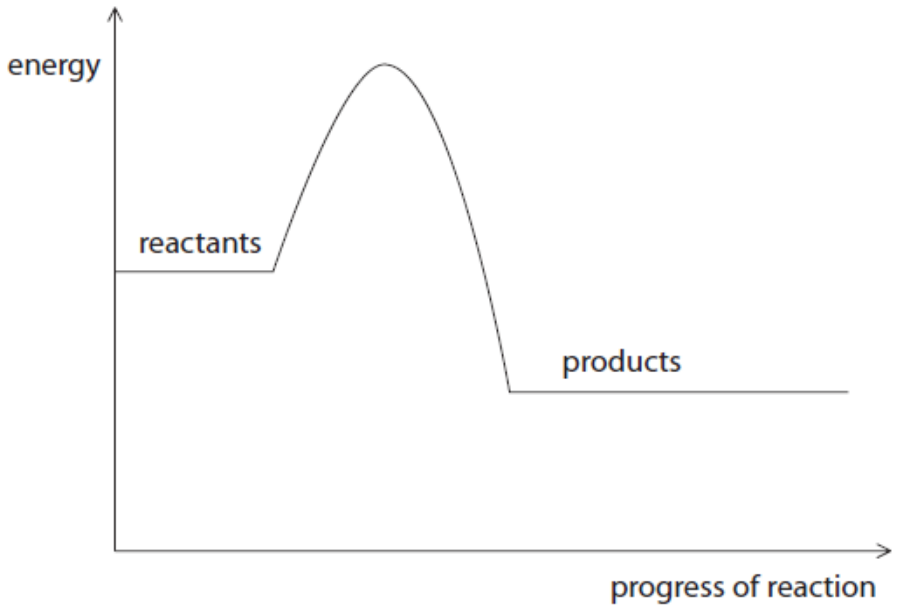


Figure 8

Using some examples of catalysts you have met in chemistry, discuss what catalysts do and their effect on the activation energy of a reaction.

You can use Figure 8 to illustrate your answer.

(6)

(Total for question = 6 marks)

(**QU06b 1SC0/2CH, June 2022**)

Q21.

A student used the apparatus shown in Figure 10 to investigate the reaction between marble chips and
dilute hydrochloric acid.

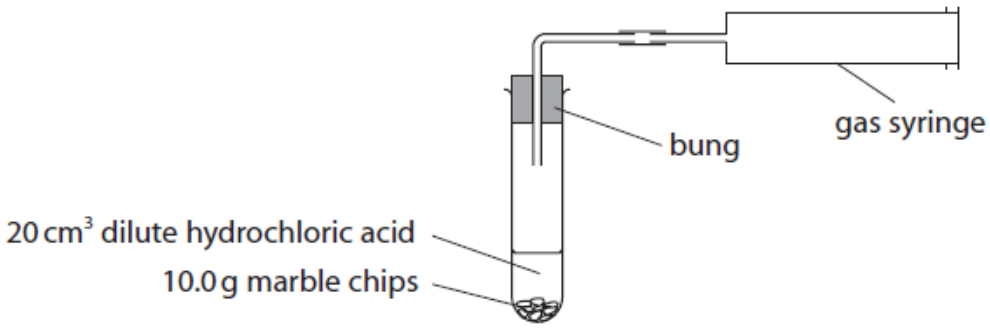


Figure 10

The student recorded the volume of gas every minute as shown in Figure 11.

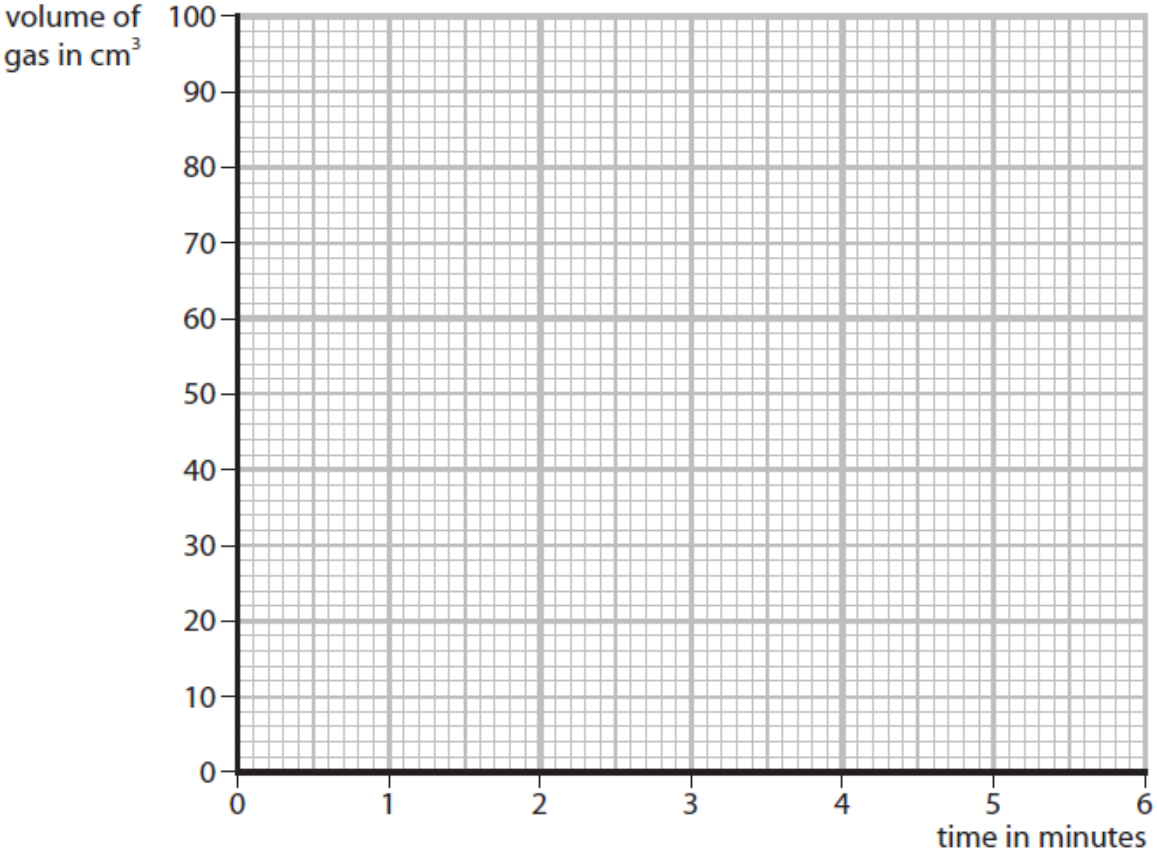
time in minutes	0	1	2	3	4	5	6
volume of gas in cm³	0	52	78	91	97	100	100

Figure 11

On the grid, plot the results shown in Figure 11.

Draw a curve of best fit.

(3)



(Total for question = 3 marks)

(**QU05a 1SC0/2CF, June 2023**)

Q22.

A student used the apparatus shown in Figure 10 to investigate the reaction between marble chips and
dilute hydrochloric acid.

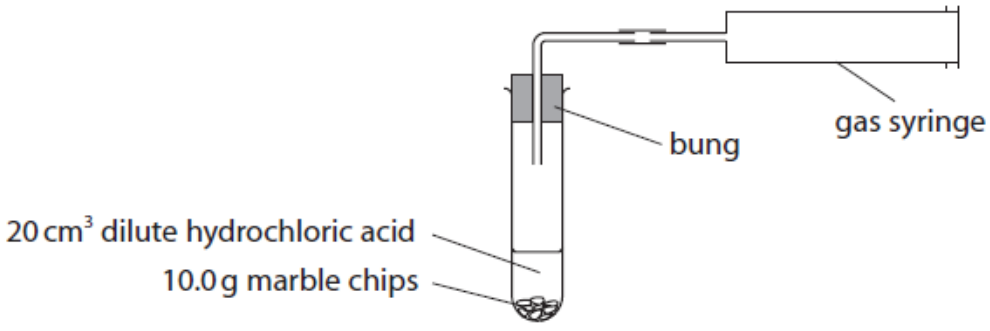


Figure 10

The student recorded the volume of gas every minute as shown in Figure 11.

time in minutes	0	1	2	3	4	5	6
volume of gas in cm^3	0	52	78	91	97	100	100

Figure 11

On the grid, plot the results shown in Figure 11.

Draw a curve of best fit.

The student repeated the experiment using the same volume of acid and the same mass of marble chips but used smaller marble chips.

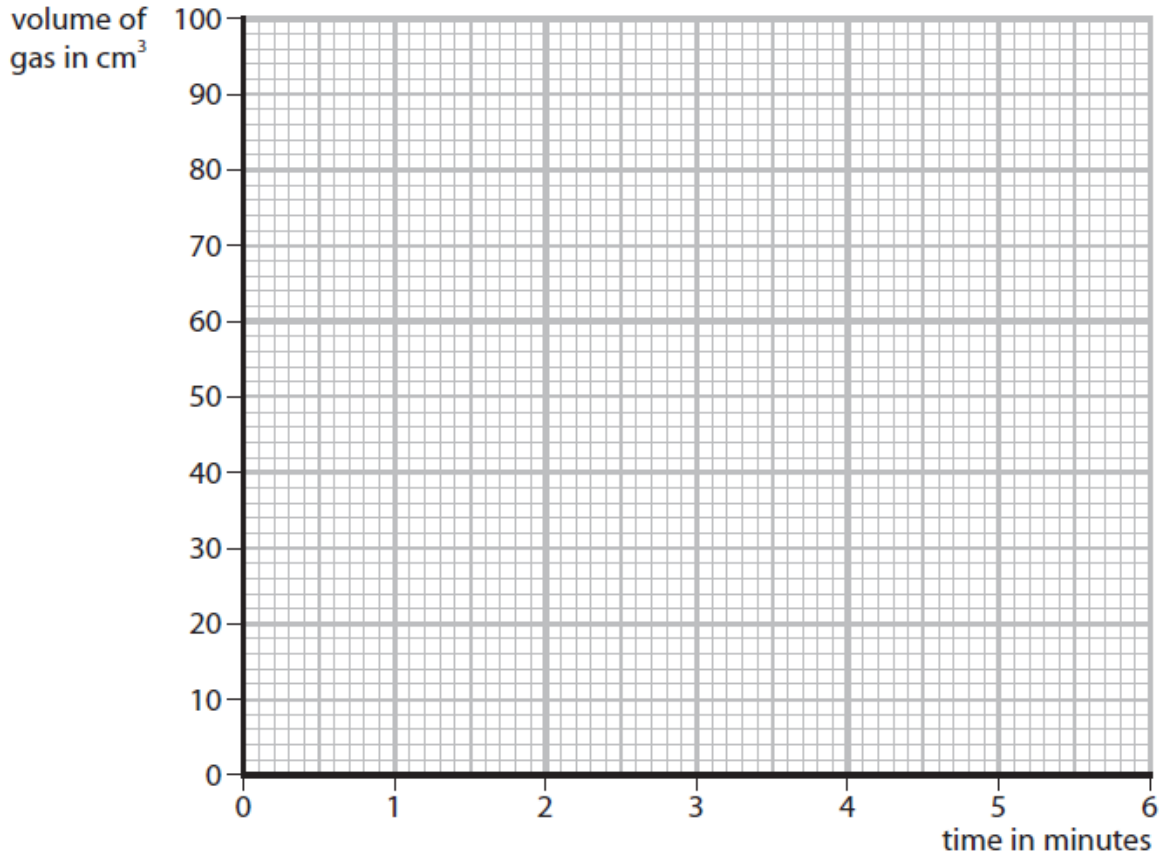
All other conditions remained the same.

The student found that the reaction with the smaller marble chips was faster to start with but produced the same volume of gas.

Using this information, draw a line on the grid to show the results for the reaction with the smaller marble chips.

Label this line 'C'.

(2)



(Total for question = 2 marks)

Q23.

A student used the apparatus shown in Figure 1 to investigate the reaction between marble chips and
dilute hydrochloric acid.

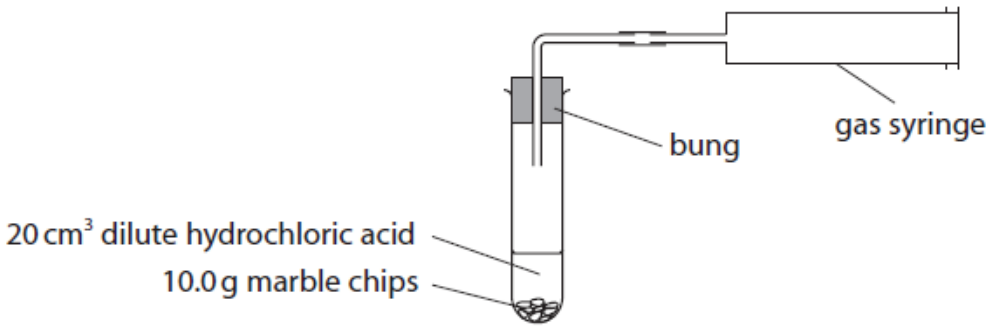


Figure 1

The student repeated the experiment using the same volume of acid and the same mass of marble chips but used smaller marble chips.

All other conditions remained the same.

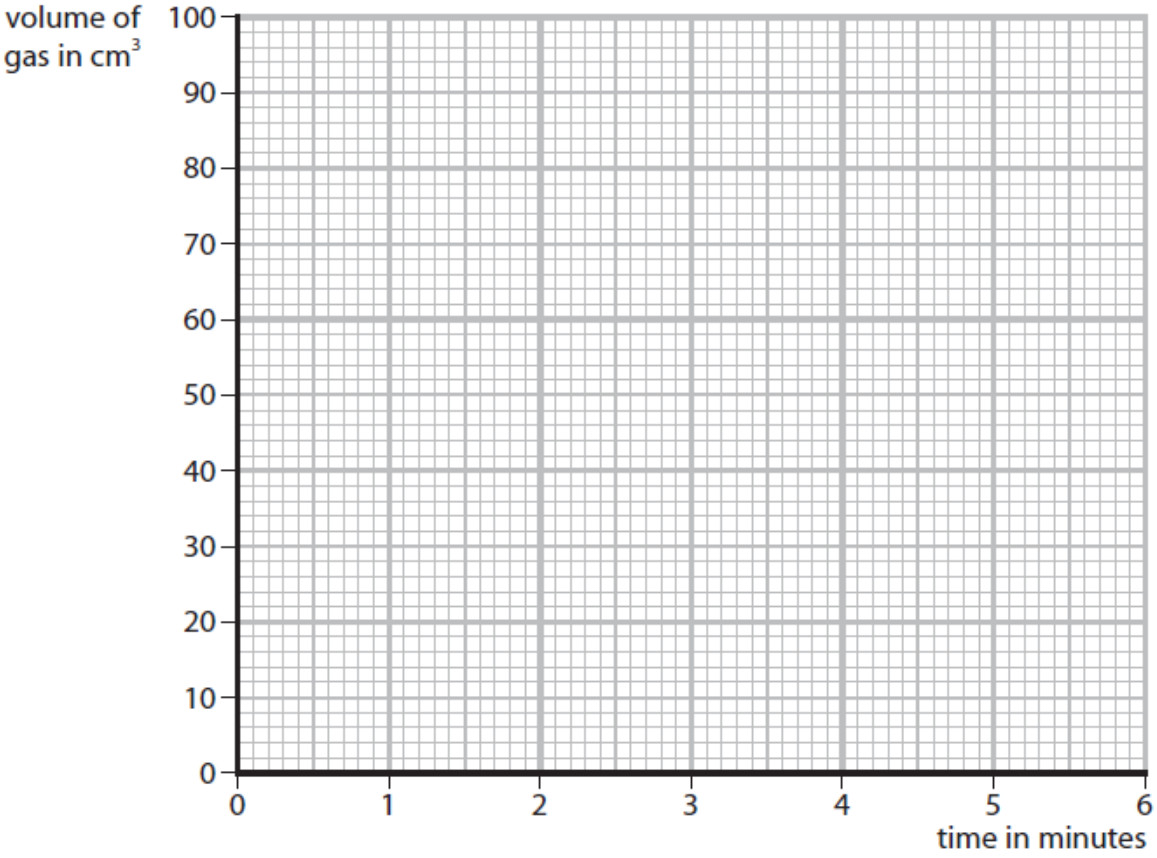
The student found that the reaction with the smaller marble chips was faster to start with but produced the
same volume of gas.

Using this information, draw a line on the grid to show the results for the reaction with the smaller marble chips.

Label this line 'C'.

(2)

(3)



(Total for question = 2 marks)

(**QU01c 1SC0/2CH, June 2023**)

Q24.

Energy changes and rates of reaction

(a) When zinc reacts with copper sulfate solution, zinc sulfate solution and copper are formed.

(i) An experiment was carried out to measure the temperature change when zinc powder reacts with copper sulfate solution.

initial temperature of copper sulfate solution = 20 °C
final temperature of mixture after the reaction = 46 °C

Explain what the temperature readings show about the type of heat change that occurs during this reaction.

(2)

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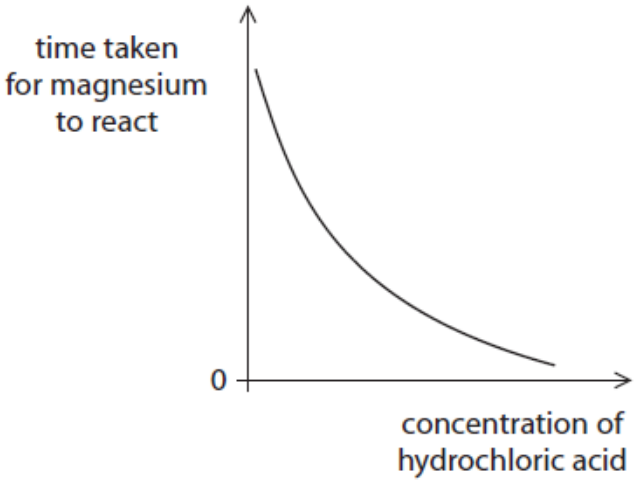
.....

(ii) Complete the equation for the reaction between zinc and copper sulfate by putting formulae in the spaces provided.

(2)

$Zn + CuSO_4 \rightarrow$ ..... + ...

(b) A length of magnesium ribbon was added to excess hydrochloric acid. The time for all of the magnesium to react was recorded. The experiment was repeated with the same lengths of magnesium ribbon but different concentrations of the acid.
The graph shows the time taken for the magnesium to react with different concentrations of this acid.



Use the graph to explain how the rate of this reaction changes as the concentration of hydrochloric acid increases.

(2)

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*(c) Marble chips react with dilute hydrochloric acid to produce carbon dioxide gas. The rate of this reaction can be changed by changing the size of the marble chips.

Describe experiments to investigate what effect using smaller marble chips has on the rate of this reaction.

(6)

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(Total for question = 12 marks)

(**Q06 1SC0/2CF, June 2014**)

Q25.

When solutions **P** and **Q** are mixed together, a purple mixture forms.
This mixture slowly becomes colourless.

A student pours 25 cm^3 of solution **P** into a conical flask and then adds 25 cm^3 of solution **Q**.

The student investigates this reaction using the apparatus shown in Figure 7.
The student measures the time taken for the cross to become visible.
The experiment is repeated at different temperatures.

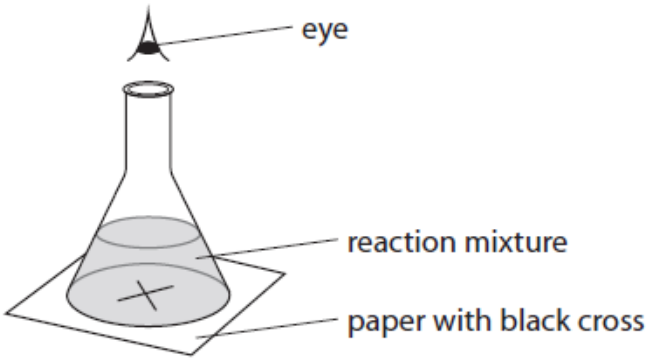


Figure 7

Figure 8 shows the results.

temperature in °C	time in s
20	45
40	19
60	10

Figure 8

The student repeats the experiment at 20 °C, with the addition of a catalyst.

Explain how the addition of a catalyst will affect the rate of reaction.

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(Total for question = 2 marks)

(**QU05d 1SC0/2CF, June 2025**)

Q26.

When solutions **P** and **Q** are mixed together, a purple mixture forms.
This mixture slowly becomes colourless.

A student pours 25 cm^3 of solution **P** into a conical flask and then adds 25 cm^3 of solution **Q**.

The student investigates this reaction using the apparatus shown in Figure 1.
The student measures the time taken for the cross to become visible.
The experiment is repeated at different temperatures.

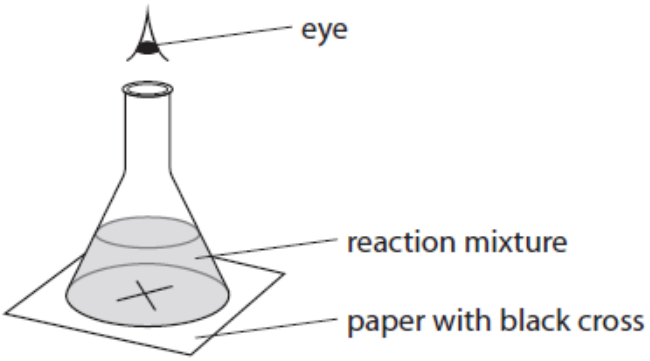


Figure 1

Figure 2 shows the results.

temperature in °C	time in s
20	45
40	19
60	10

Figure 2

The student repeats the experiment at 20 °C, with the addition of a catalyst.

Explain how the addition of a catalyst will affect the rate of reaction.

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(Total for question = 2 marks)

(**QU01d 1SC0/2CH, June 2025**)

Q27.

An investigation was carried out into the rate of reaction of calcium carbonate with dilute hydrochloric acid.

5.0 g of small lumps of calcium carbonate were reacted with 50 cm^3 of 0.50 mol dm^{-3} hydrochloric acid.
Another 5.0 g of the same sized lumps of calcium carbonate were reacted with 50 cm^3 of 1.0 mol dm^{-3} hydrochloric acid.
The volume of gas collected in two minutes was recorded for each experiment.

The two experiments were then repeated, each using 5.0 g of large lumps of calcium carbonate.

Figure 4 shows the results.

concentration of hydrochloric acid in mol dm^{-3}	volume of gas collected in cm^3	
	small lumps of calcium carbonate	large lumps of calcium carbonate
0.50	17.2	3.1
1.0	35.1	5.6

Figure 4

Explain, in terms of collision of particles, how these results show the effect of the size of the lumps of calcium carbonate and the effect of the concentration of the acid on the rate of this reaction.

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(Total for question = 6 marks)

(**Q05c 1SC0/2CH, June 2019**)

Q28.

During any reaction, reactants are used up and the rate of reaction decreases.

Explain, in terms of particles, why the rate of reaction decreases.

(2)

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(Total for question = 2 marks)

(**Q04c 1SC0/2CH, SAM 2016**)

Q29.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Sodium thiosulfate solution, $Na_2S_2O_3$, reacts with dilute hydrochloric acid.

$$Na_2S_2O_3(aq) + 2HCl(aq) \rightarrow 2NaCl(aq) + H_2O(l) + SO_2(g) + S(s)$$

(i) When dilute hydrochloric acid is mixed with sodium thiosulfate solution, the mixture turns cloudy.

Explain why the mixture turns cloudy.

(2)

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(ii) In an investigation, different concentrations of hydrochloric acid are reacted with sodium thiosulfate solution.
The mixture goes cloudy at different rates.

Describe how the rate at which the mixture goes cloudy can be measured.

(3)

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(iii) You are provided with some dilute hydrochloric acid which has a concentration of 50 g dm^{-3}.

For this experiment, dilute hydrochloric acid with a concentration of 20 g dm^{-3} is required.

How much water must be added to 100 cm^3 of 50 g dm^{-3} hydrochloric acid to make dilute hydrochloric acid with a concentration of 20 g dm^{-3}?

(1)

☒ **A** 200 cm^3

☒ **B** 150 cm^3

☒ **C** 100 cm^3

☒ **D** 50 cm^3

(Total for question = 6 marks)

(**Q03a 1SC0/2CH, Nov 2020**)

Q30.

The word equation for the reaction between magnesium and dilute hydrochloric acid is

magnesium + hydrochloric acid → magnesium chloride + hydrogen

The reaction was carried out using the apparatus shown in Figure 6.

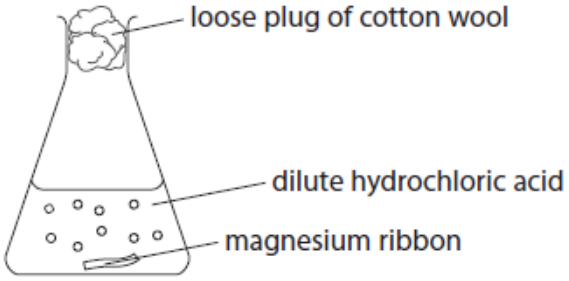


Figure 6

A strip of magnesium ribbon was placed in the conical flask.
100 cm^3 of dilute hydrochloric acid was added to the conical flask.

The mass of the flask and contents was measured at regular intervals.
The loss in mass was calculated.
Figure 7 shows a graph of the results.

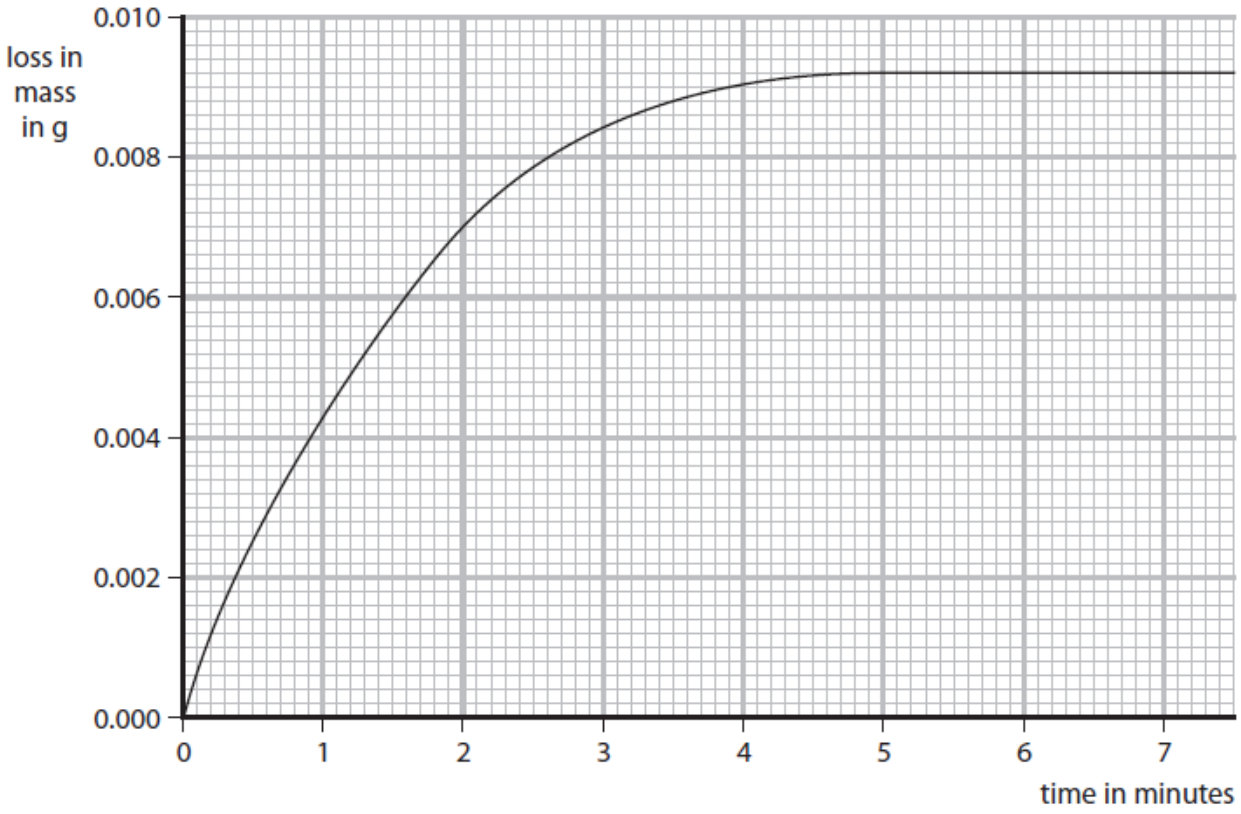


Figure 7

The graph shows that the rate of reaction slows as the reaction takes place.

Explain, in terms of particles, why the rate of reaction between magnesium ribbon and dilute hydrochloric acid slows as the reaction takes place.

(3)

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(Total for question = 3 marks)

(**Q04c 1SC0/2CF, June 2019**)

Q31.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

The experiment was repeated, but with acid of a higher concentration.

The rate of reaction was faster.

(i) Explain why the rate of reaction increases when the concentration of acid is increased.

(2)

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(ii) Another student suggests four other ways of increasing the rate of this reaction.

Which one is correct?

(1)

☒ **A** use the same acid but at a lower temperature

☒ **B** use a larger trough

☒ **C** use a smaller flask

☒ **D** use the same metal but in a powdered form

(Total for question = 3 marks)

(**QU05b 1SC0/2CF, June 2019**)

Q32.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

A student used the apparatus in Figure 7 to investigate the rate of the reaction between a metal and dilute hydrochloric acid.

Pieces of the metal were placed in dilute hydrochloric acid in the flask, and the total volume of gas produced was measured every minute.

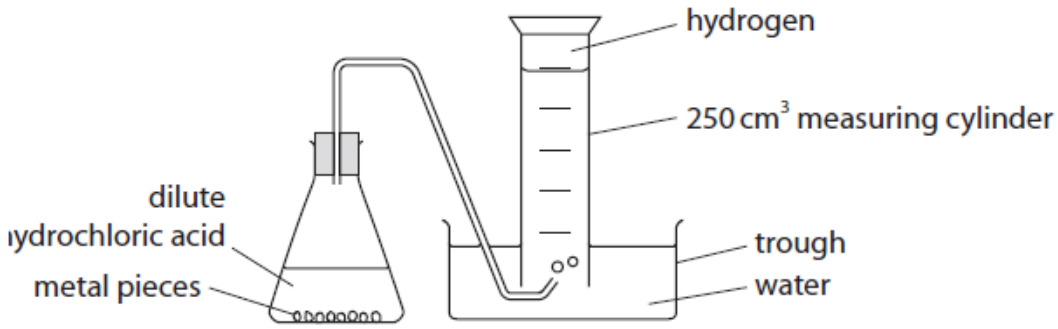


Figure 7

Figure 8 shows a graph of the student's results.

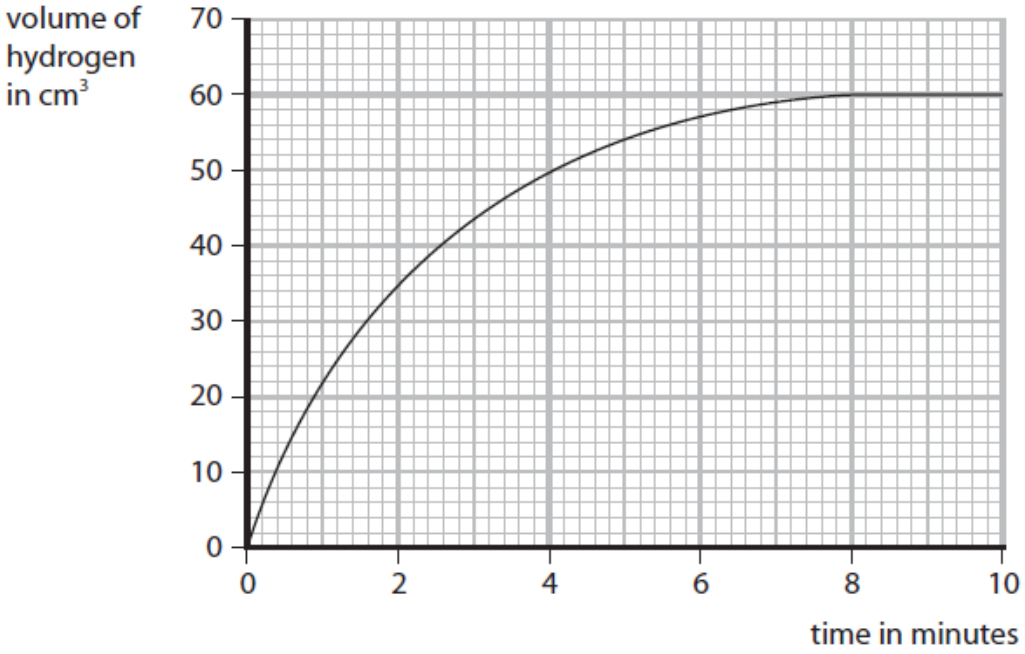


Figure 8

The experiment was repeated, but with acid of a higher concentration.

The rate of reaction was faster.

(i) Explain why the rate of reaction increases when the concentration of acid is increased.

(2)

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.....

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(ii) Another student suggests four other ways of increasing the rate of this reaction.

Which one is correct?

(1)

☒ **A** use the same acid but at a lower temperature

☒ **B** use a larger trough

☒ **C** use a smaller flask

☒ **D** use the same metal but in a powdered form

(Total for question = 3 marks)

(**QU05b 1SC0/2CF, June 2022**)

Q33.

The word equation for the reaction between magnesium and dilute hydrochloric acid is

magnesium + hydrochloric acid → magnesium chloride + hydrogen

The reaction was carried out using the apparatus shown in Figure 6.

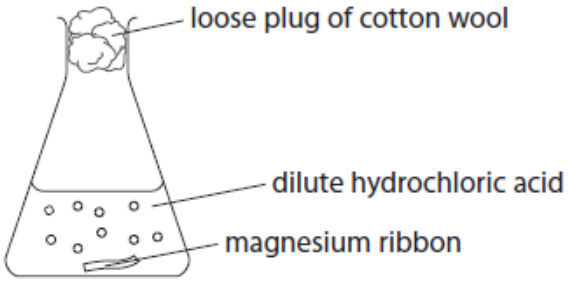


Figure 6

A strip of magnesium ribbon was placed in the conical flask.
100 cm^3 of dilute hydrochloric acid was added to the conical flask.

The mass of the flask and contents was measured at regular intervals.
The loss in mass was calculated.
Figure 7 shows a graph of the results.

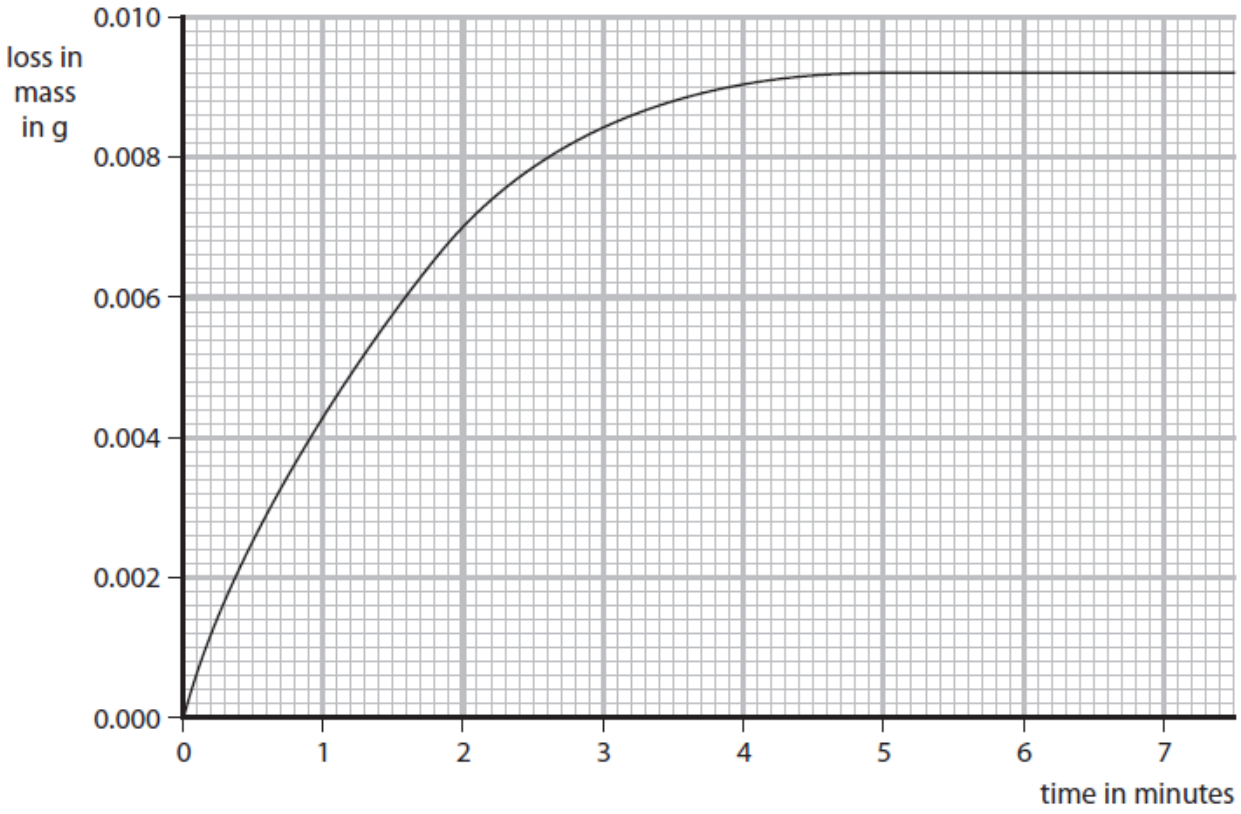


Figure 7

Explain why there is a loss in mass of the flask and contents.

(2)

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(Total for question = 2 marks)

(**Q04b 1SC0/2CF, June 2019**)

Q34.

Calcium carbonate reacts with dilute hydrochloric acid to produce carbon dioxide gas.

The rate of reaction between calcium carbonate and dilute hydrochloric acid at room temperature was investigated.

The investigation was carried out with different sized calcium carbonate pieces.

The mass of calcium carbonate and all other conditions were kept the same.

The results are shown in Figure 1.

size of calcium carbonate pieces used	volume of carbon dioxide gas produced in five minutes in cm^3
large	16
small	48
powder	90

Figure 1

The experiments were repeated at a higher temperature.
The rate of reaction for each experiment increased.

Explain, in terms of particles, why the rate of reaction increased when the temperature was increased.

(3)

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(Total for question = 3 marks)

(**Q02c 1SC0/2CH, Nov 2020**)

Q35.

This question is about molecules containing two atoms.

In an experiment, hydrochloric acid is reacted with zinc.

The volume of gas produced is measured by collecting the gas in an upturned measuring cylinder over water.

Give a method of collecting and measuring the gas that would give a more accurate volume of gas.

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(Total for question = 1 mark)

(**QU06a 1SC0/2CH, June 2025**)

Q36.

Magnesium reacts with dilute sulfuric acid to form magnesium sulfate and hydrogen gas.

A student wants to find out the effect of temperature on the rate of this reaction.

The student used the following method.

step 1 pour 25 cm^3 of dilute sulfuric acid into a conical flask
step 2 warm the acid until its temperature is 30 °C
step 3 add a piece of magnesium to the acid
step 4 start a stopwatch
step 5 wait until the reaction has finished
step 6 stop the stopwatch
step 7 repeat steps 1–6 but at 50 °C.

The reaction at 50 °C was faster than the reaction at 30 °C.

Give **one** reason, in terms of particles, why the reaction at 50 °C was faster than the reaction at 30 °C.

(1)

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(Total for question = 1 mark)

(**Q01d 1SC0/2CF, Nov 2021**)

Q37.

* Hydrochloric acid reacts with magnesium metal to produce hydrogen gas.

magnesium + hydrochloric acid → magnesium chloride + hydrogen

Describe how you could use magnesium ribbon and a solution of hydrochloric acid to show that decreasing the concentration of the hydrochloric acid changes the rate of this reaction.

(6)

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(**Q25 1SC0/2CF, June 2013**)

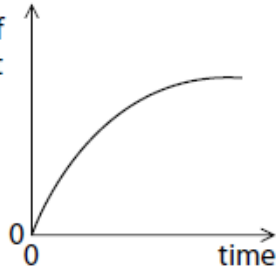
Q38.

The decomposition of hydrogen peroxide is catalysed by adding a small amount of manganese(IV) oxide.

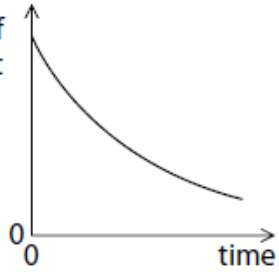
Which of these graphs shows the mass of the catalyst as the reaction takes place?

(1)

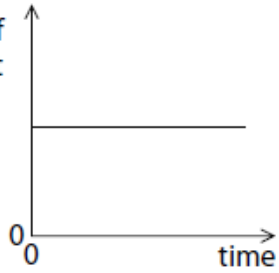
☒ **A**



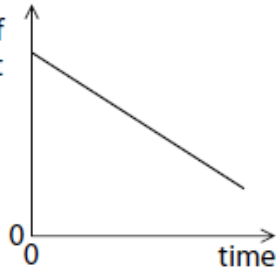
☒ **B**



☒ **C**



☒ **D**



(Total for question = 1 mark)

(Q04d 1SC0/2CH, SAM 2016)

Q39.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

A student used the apparatus shown in Figure 10 to investigate the reaction between marble chips and dilute hydrochloric acid.

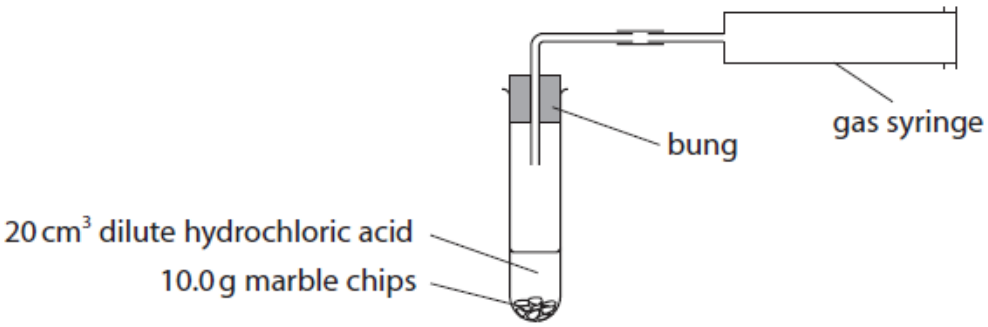


Figure 10

Which of the following changes would make the reaction faster?

(1)

☒ **A** use a larger boiling tube

☒ **B** use a larger volume of the dilute acid

☒ **C** use a more concentrated acid

☒ **D** use a smaller boiling tube

(Total for question = 1 mark)

(**QU05d 1SC0/2CF, June 2023**)

Q40.

Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .

A student investigates the reaction between marble chips and dilute hydrochloric acid.

The student measures the total volume of carbon dioxide gas produced each minute, for 10 minutes.

Which change would make the rate of reaction slower?

(1)

- ☒ **A** using the same acid at a higher temperature
- ☒ **B** using acid of a lower concentration
- ☒ **C** using a larger flask
- ☒ **D** adding a catalyst

(Total for question = 1 mark)

(**QU05d 1SC0/2CF, June 2024**)