AQA - Rate of reaction – GCSE Chemistry Paper_2

1. June/2021/Paper_2F/No.4

0 4 This question is about reactions between gases.

When hydrogen gas is heated with iodine gas, hydrogen iodide gas is produced.

The equation for this reversible reaction is:

$$\text{hydrogen} + \text{iodine} \rightleftharpoons \text{hydrogen iodide}$$

This reversible reaction reaches equilibrium in a sealed container.

0 4 . 1 How does the equation show that the reaction is reversible?

[1 mark]

_____

0 4 . 2 Which **two** statements are correct when the reaction reaches equilibrium?

[2 marks]

Tick (✓) **two** boxes.

- The forward reaction and reverse reaction are both exothermic. ☐
- The gases have escaped from the container. ☐
- The hydrogen no longer reacts with iodine. ☐
- The mass of each substance does not change. ☐
- The rates of the forward reaction and reverse reaction are equal. ☐

0 4 . 3 The initial mixture of hydrogen and iodine in the sealed container is purple.

Hydrogen iodide is colourless.

How will the colour of the mixture in the sealed container have changed when equilibrium is reached?

[1 mark]

Tick (✓) **one** box.

The mixture will have become a deeper purple. ☐

The mixture will have become a paler purple. ☐

The mixture will have become colourless. ☐

0 4 . 4 The rate of reaction between gases is affected by changing the pressure.

Complete the sentences.

[3 marks]

When the pressure of the reacting gases is increased,

the rate of reaction _____.

This is because at higher pressures the distance

between the particles _____.

This means that the frequency of collisions _____.

0 4 . 5 Give **one** other way of changing the rate of reaction between gases.

You should **not** refer to pressure in your answer.

[1 mark]

_____

_____

2. June/2021/Paper_2F/No.5

0 5 A student investigated the rate of the reaction between zinc and sulfuric acid.

This is the method used.

1. Pour 40 cm^3 of sulfuric acid into a conical flask.

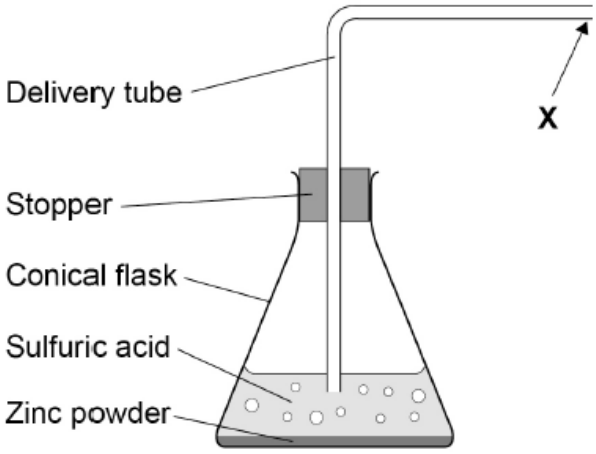
2. Add 2.0 g of zinc powder to the conical flask.

3. Put the stopper in the conical flask.

4. Measure the volume of hydrogen gas collected every 30 seconds for 5 minutes.

Figure 4 shows part of the apparatus used.

Figure 4



0 5 . 1 **X** shows where a piece of equipment is connected to measure the volume of hydrogen gas collected.

Complete **Figure 4** to show the equipment used.

[1 mark]

0 5 . 2 The student made an error setting up the delivery tube shown in **Figure 4**.

Describe the error **and** the problem this error would cause.

[2 marks]

Error made _____

_____

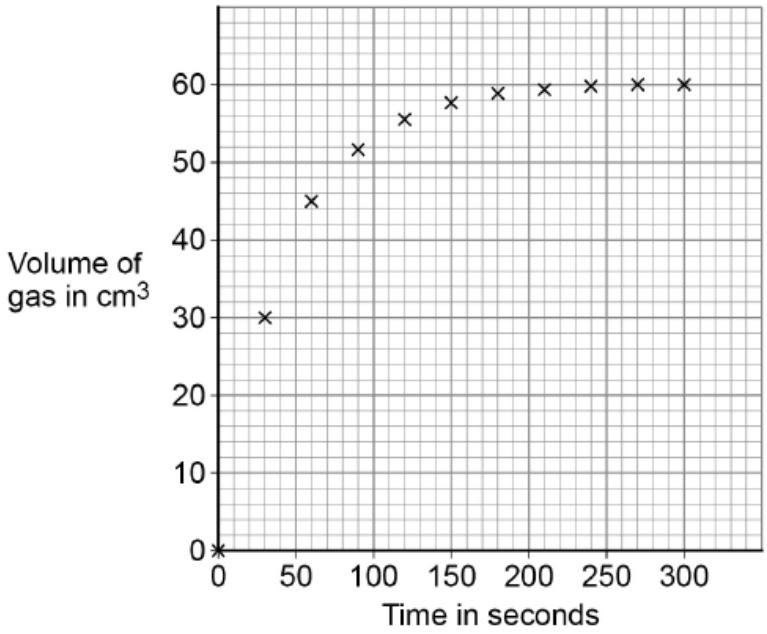
Problem caused _____

_____

The student then set up the apparatus correctly.

Figure 5 shows the student's results.

Figure 5



0 5 . 3 Complete **Figure 5** by drawing a line of best fit.

[1 mark]

0 5 . 4 Determine the mean rate of reaction between 0 seconds and 60 seconds.

Use the equation:

$$\text{mean rate of reaction} = \frac{\text{volume of gas formed}}{\text{time taken}}$$

Use data from **Figure 5**.

Give the unit.

Choose the answer from the box.

[4 marks]

cm^3/s	g/s	s/cm^3	s/g

Mean rate of reaction = _____ Unit _____

0 5 . 5 The student repeated the investigation using sulfuric acid of a higher concentration.

The student plotted the results and drew a line of best fit.

How would the line of best fit for higher concentration compare with the line of best fit for lower concentration?

[1 mark]

Tick (✓) **one** box.

The line of best fit for higher concentration would have a less steep slope. ☐

The line of best fit for higher concentration would have a steeper slope. ☐

The lines of best fit would have slopes with the same steepness. ☐

3. June/2021/Paper_2H/No.7

0 7 Potash alum is a chemical compound.

The formula of potash alum is $KAl(SO_4)_2$

0 7 . 1 Give a test to identify the Group 1 metal ion in potash alum.

You should include the result of the test.

[2 marks]

Test _____

_____

Result _____

_____

0 7 . 2 Name **one** instrumental method that could identify the Group 1 metal ion **and** show the concentration of the ion in a solution of potash alum.

[1 mark]

_____

_____

A student identifies the other metal ion in potash alum.

The student tests a solution of potash alum by adding sodium hydroxide solution until a change is seen.

0 7 . 3 Give the result of this test.

[1 mark]

0 7 . 4 This test gives the same result for several metal ions.

What additional step is needed so that the other metal ion in potash alum can be identified?

Give the result of this additional step.

[2 marks]

Additional step

Result

0 7 . 5 Describe a test to identify the presence of sulfate ions in a solution of potash alum.

Give the result of the test.

[3 marks]

Test

Result

4. June/2021/Paper_2H/No.8

0 8 This question is about copper and alloys of copper.

Solders are alloys used to join metals together.

Some solders contain copper.

Table 4 shows information about three solders, **A**, **B** and **C**.

Table 4

Solder	Melting point in °C	Metals in solder
A	183	tin, copper, lead
B	228	tin, copper, silver
C	217	tin, copper, silver

0 8 . 1 Solder **B** and solder **C** are now used more frequently than solder **A** for health reasons.

Suggest **one** reason why.

Use **Table 4**.

[1 mark]

0 8 . 2 Suggest **one** reason why solders **B** and **C** have different melting points.

Use **Table 4.**

[1 mark]

Copper can be obtained by:

- processing copper ores
- recycling scrap copper.

0 8 . 3 Suggest **three** reasons why recycling scrap copper is a more sustainable way of obtaining copper than processing copper ores.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

Copper is extracted from low-grade ores by phytomining.

0 8 . 4 Describe how copper is extracted from low-grade ores by phytomining.

[4 marks]

0 8 . 5 Phytomining has **not** been widely used to extract copper.

Suggest **two** reasons why.

[2 marks]

1

2

5. June/2021/Paper_2H/No.9

0 9 A student investigated how a change in concentration affects the rate of the reaction between zinc powder and sulfuric acid.

The equation for the reaction is:

$$Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$$

This is the method used.

1. Pour 50 cm^3 of sulfuric acid of concentration 0.05 mol/dm^3 into a conical flask.

2. Add 0.2 g of zinc powder to the conical flask.

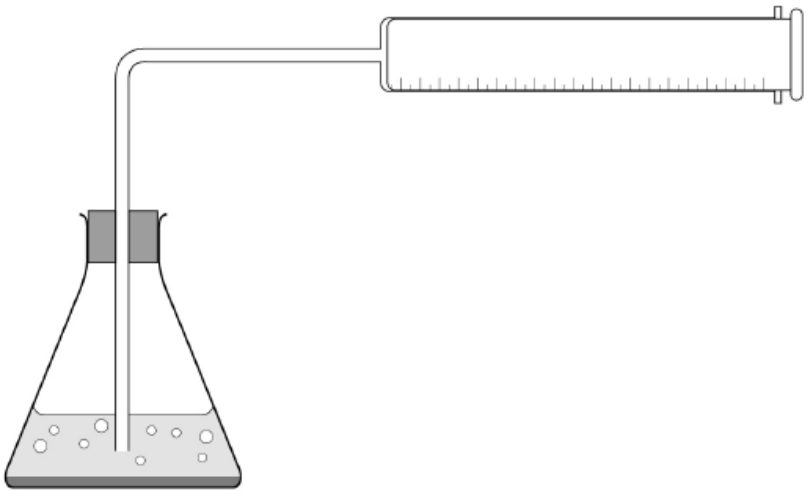
3. Put the stopper in the conical flask.

4. Measure the volume of gas collected every 30 seconds for 5 minutes.

5. Repeat steps 1 to 4 with sulfuric acid of concentration 0.10 mol/dm^3

Figure 8 shows the apparatus used.

Figure 8



0 9 . 1 The student made an error in setting up the apparatus in **Figure 8**.

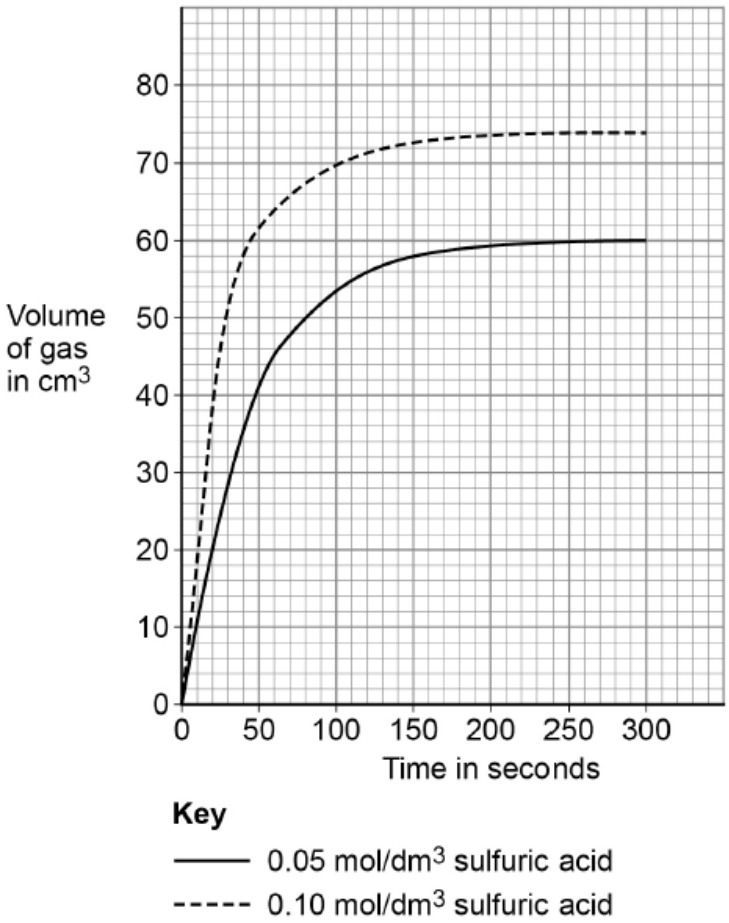
What error did the student make?

[1 mark]

The student corrected the error.

Figure 9 shows the student's results.

Figure 9



0 9 . 2 Explain why the lines of best fit on **Figure 9** become horizontal.

[2 marks]

0 9 . 3 How does **Figure 9** show that zinc powder reacts more slowly with 0.05 mol/dm^3 sulfuric acid than with 0.10 mol/dm^3 sulfuric acid?

[1 mark]

0 9 . 4 Determine the rate of the reaction for 0.05 mol/dm^3 sulfuric acid at 80 seconds.

Show your working on **Figure 9**.

Give your answer to 2 significant figures.

[5 marks]

Rate of reaction (2 significant figures) = _____ cm^3/s

0 9 . 5 The activation energy for the reaction between zinc and sulfuric acid is lowered if a solution containing metal ions is added.

What is the most likely formula of the metal ions added?

[1 mark]

Tick (✓) **one** box.

Al^{3+} ☐

Ca^{2+} ☐

Cu^{2+} ☐

Na^{+} ☐