

Name:
Science Class:
Teacher:
Hand in day:

Y9 Science

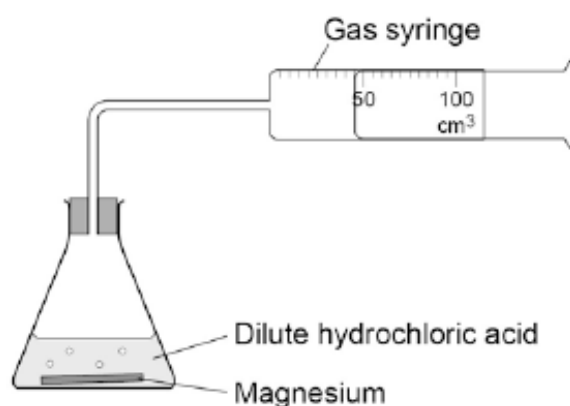
Term 1: Homework Booklet

Chemistry

	Hand in Date	Parents Signature
Rate of Reaction		
Homework 1		
Homework 2		
Homework 3		
Homework 4		
Homework 5		

Rate of Reaction 1:

Comprehension Task

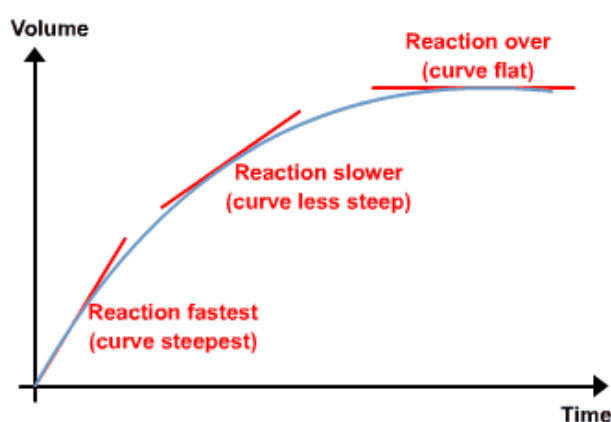


A measuring cylinder is used to measure out exactly 50 cm^3 of hydrochloric acid. A balance is used to weigh out exactly 2 g of magnesium. The magnesium was then reacted with an excess of dilute hydrochloric acid at room temperature. 'Excess' acid means we have more than we need. This ensures that all the magnesium reacts fully, and there is no magnesium left at the end of the reaction.

The reaction makes hydrogen, which is collected in a gas syringe. Hydrogen is a colourless, odourless gas, and is also very flammable. Collecting it in a gas syringe allows the volume of gas to be measured accurately.

The reaction happens because particles of the acid and particles of the magnesium collide with each other. The particles collide with each other continuously, but only a small percentage of them have enough energy to cause a reaction. The minimum energy that the collisions need to cause a reaction is called the activation energy.

The volume of gas is measured every 10 seconds using a stopwatch. The results are used to plot a graph, and the results show that the reaction is fastest at the beginning when the graph is steeper. This is because there are lots of particles at the beginning of the reaction so there are more frequent collisions happening.



The reaction then slows down, as there are less particles, so less frequent collisions occur. The reaction eventually stops when all the magnesium is used up. The graph shows that the reaction has stopped as it goes flat showing that no more gas is being made.

Questions

1. What piece of equipment was used to measure out the volume of acid?
2. What does 'excess' acid mean?
3. What piece of equipment was used to collect the volume of gas?
4. Why was this piece of equipment used?
5. Describe hydrogen gas
6. What is the activation energy?
7. Why does the reaction happen?
8. How does the graph show that the reaction is fastest at the beginning?
9. Why does the reaction slow down?
10. How does the graph show that the reaction has stopped?

Rate of Reaction 2:

Rate of reaction is calculated using the following equation:

$$\text{rate} = \frac{\text{change}}{\text{time}}$$

The time is usually measured in **seconds (s)**

The change may be a change in **volume (cm³)** of a gas being made, so **rate has units of cm³/s**

Or a change in the **mass (g)** of a reactant being used up, or a product being formed, so **rate has units of g/s**

Questions

You must show all of your working out

1. How many seconds are there in a minute? (1)
2. How many seconds will there be in 5 minutes? (1)
3. A reaction makes 50 cm³ of hydrogen gas in 15 seconds. Calculate the rate of reaction. State the units (2)
4. A reaction uses 2 g of sodium in 50 seconds. Calculate the rate of reaction. State the units. (2)
5. A reaction makes 65 cm³ of carbon dioxide gas in 9 minutes. Calculate the rate of reaction in cm³/s (2)
6. A reaction forms 3 g of iodine in 3 ½ minutes. Calculate the rate of reaction in g/s (2)

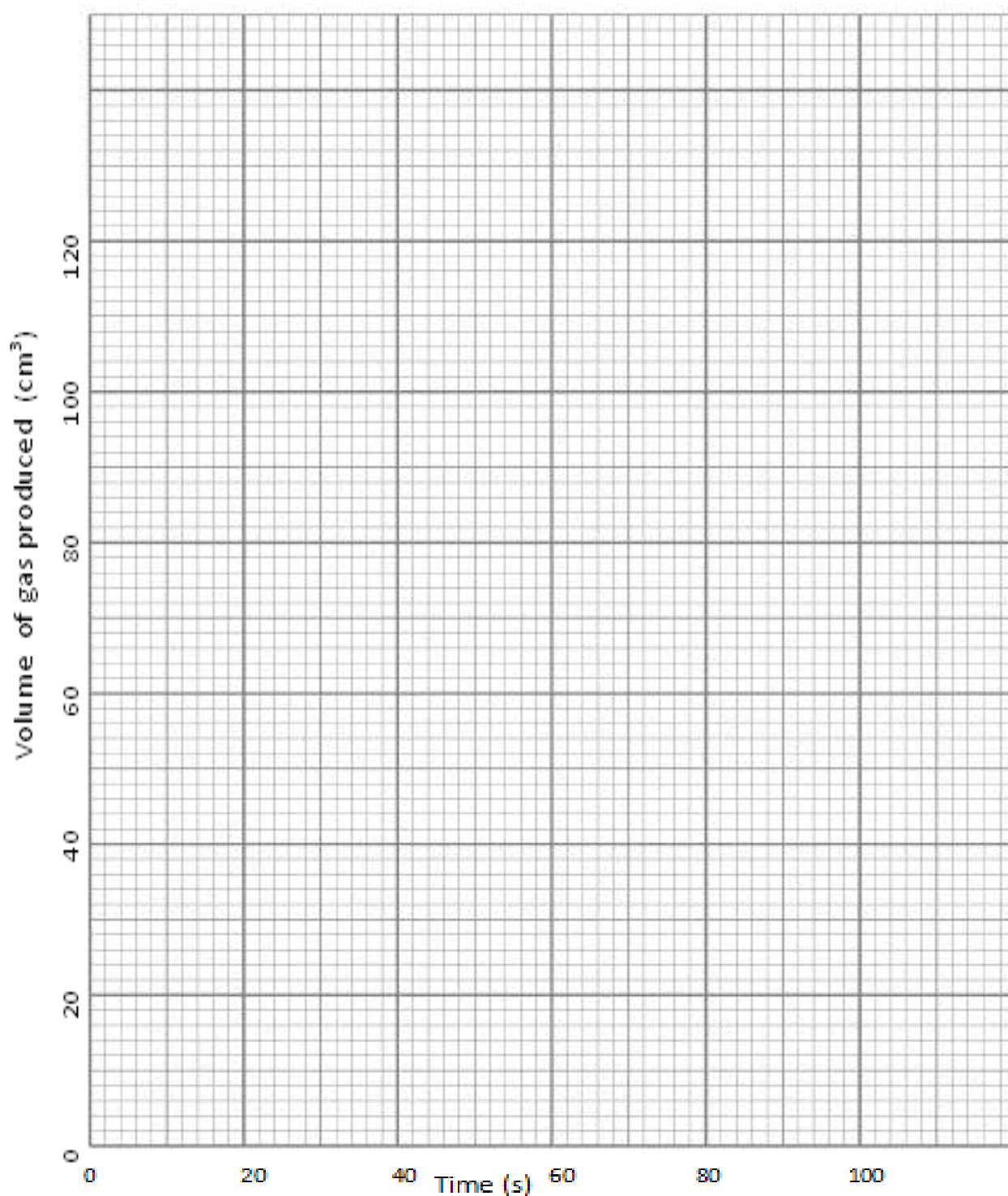
Rate of Reaction 3:

Magnesium was reacted with an excess of hydrochloric acid at room temperature.

The data in the table below was collected. Plot the data on the graph paper.

Put a **best fit curve** through your results.

Time (s)	0	10	20	30	40	50	60	70	80	90
Volume (cm ³)	0	50	78	98	110	116	118	120	120	120



1. **Excess** hydrochloric acid was used. Explain why? (1)

2. Name a piece of equipment that could be used to collect and measure the volume of gas being produced (1)

3. How can you tell from the shape of your graph that the reaction is fastest at the beginning? (1)

4. Explain why the reaction will gradually slow down and eventually stop. Use the words particles and collisions in your answer. (3)

5. How long did the reaction take to complete? (1)

6. Use the graph or the results table to calculate the average rate of reaction

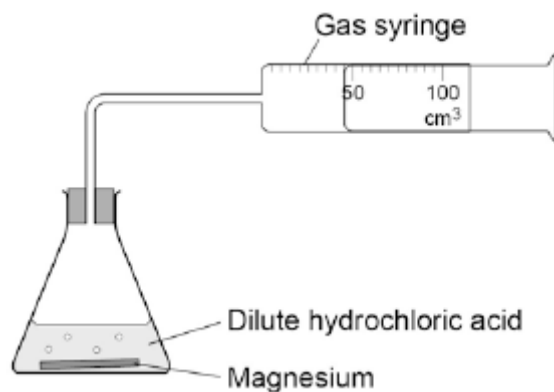
Use the equation, $\text{rate} = \frac{\text{change in volume}}{\text{time}}$

Give the answer to 2 decimal places, and state the units (3)

Rate of Reaction 4:

A student investigated the rate of the reaction between magnesium and dilute hydrochloric acid.

The student used the apparatus shown below to collect the gas produced.



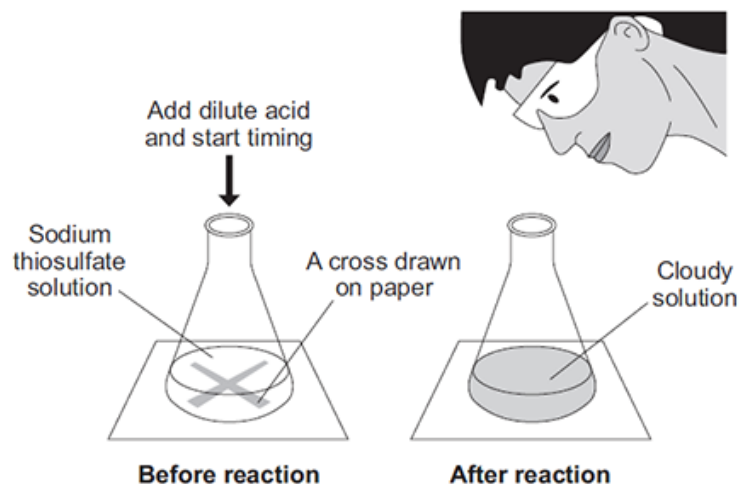
Outline a plan to investigate how the rate of this reaction changed when the concentration of the hydrochloric acid was changed.

- Describe how you would do the investigation and the measurements you would make.
- Describe how you would make it a fair test (which variables you would keep the same).

[illegible]

Rate of Reaction 5:

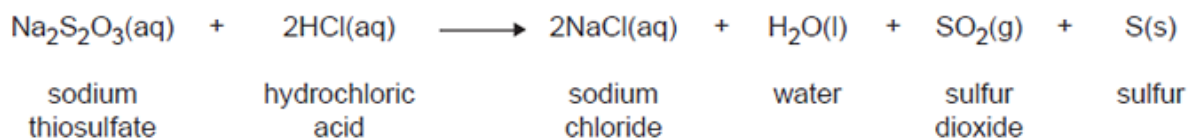
A student investigated the effect of temperature on the rate of a reaction. The picture below shows an experiment.



The student:

- put sodium thiosulfate solution into a conical flask
- heated the sodium thiosulfate solution to the required temperature
- put the flask on a cross drawn on a piece of paper
- added dilute hydrochloric acid and started a stopclock
- stopped the stopclock when the cross could no longer be seen
- repeated the experiment at different temperatures.

The equation for the reaction is:



(a) Explain why the solution goes cloudy.

(2)

(b) Give **two** variables the student must control to make the investigation a fair test.

1. _____

2. _____

(2)

(c) State the effect that increasing the temperature of the sodium thiosulfate solution has on the rate of the reaction.

Explain this effect in terms of particles and collisions.

(4)

(d) Suggest how the student should change the method to investigate the rate of reaction at 5°C.

(1)

(Total 9 marks)