

Rate of Reaction Required Practical 1

Worksheet

Combined Science - Chemistry - Key Stage 4

The Rate and Extent of Chemical Change

Dr Deng



Independent practice



Task

The table shows results that were obtained from a reaction between magnesium and different concentrations of hydrochloric acid. Hydrogen gas was collected using a gas syringe and the time taken to collect 50cm³ of gas was recorded.

- 1) State the independent and dependent variable.
- 2) Plot a graph using the data from the table. Draw a line of best fit.
- 3) Describe the relationship between concentration of hydrochloric acid and time taken to collect 50cm³ of hydrogen gas.
- 4) Explain how the concentration of hydrochloric acid affects rate of reaction with magnesium.

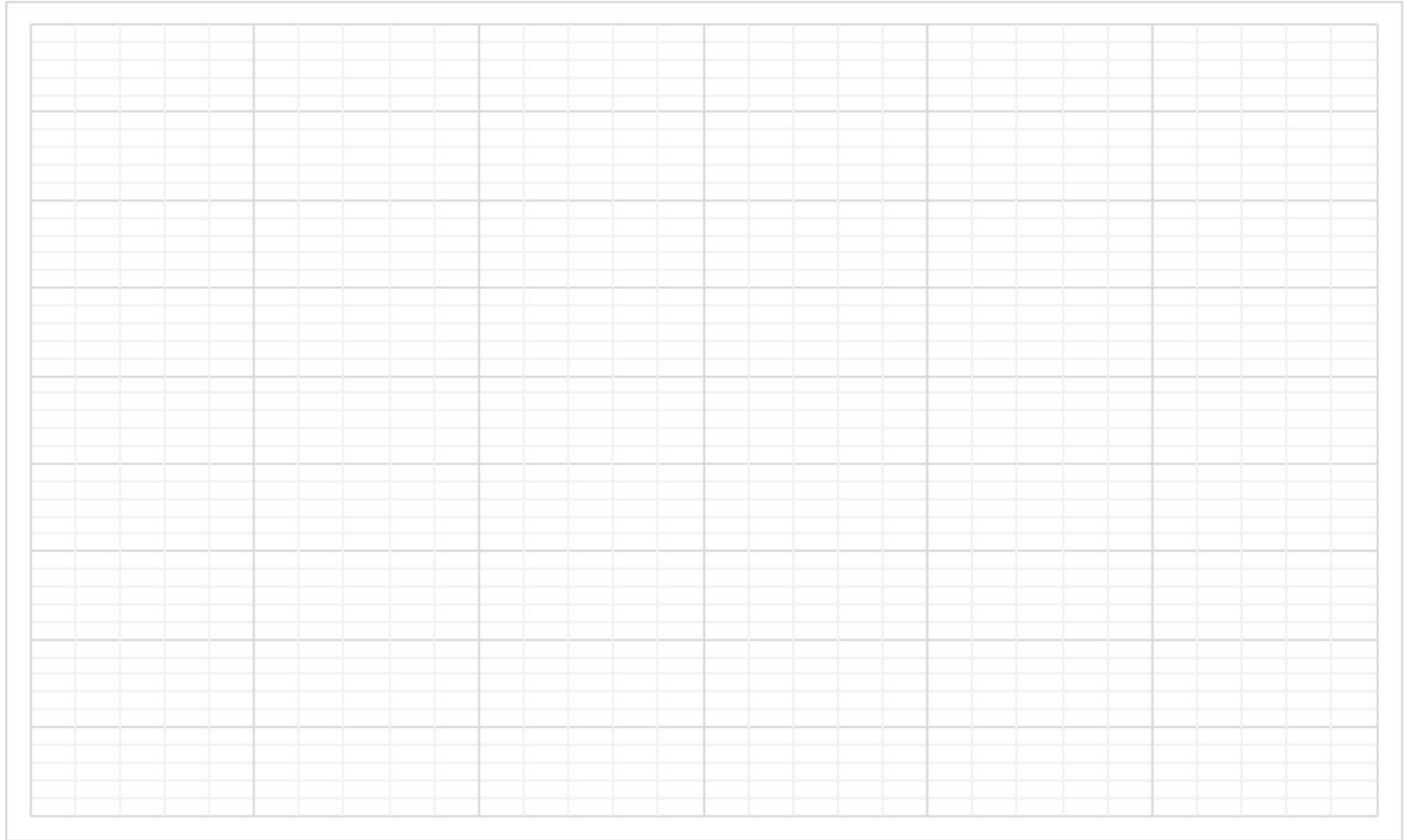
Concentration of HCl (M)	Time taken to collect 50cm ³ hydrogen gas (s)
0.5	170
1.0	90
1.5	56
2.0	34
2.5	28

Table of results



Graph paper





Answer

1) Independent variable: *Concentration of hydrochloric acid (M)*

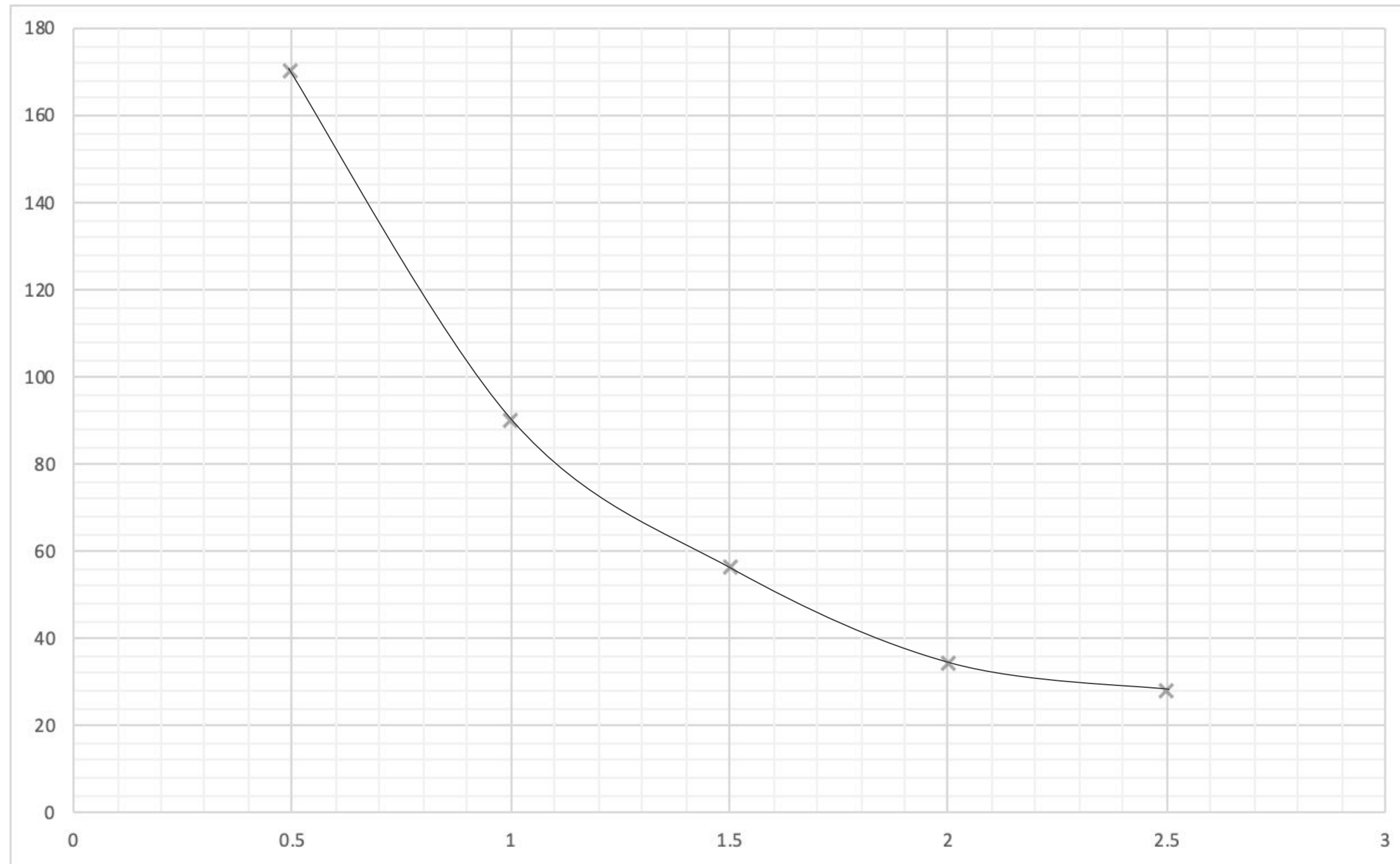
Dependent variable: *Time taken to collect 50cm³ hydrogen gas (s)*



Answer

2) Plot a graph using the data from the table. Draw a line of best fit.

Time taken to collect 50cm³ hydrogen gas (s)



Concentration of hydrochloric acid (M)

Success criteria:

- ★ Scale
- ★ Axis title + units
- ★ Correct data points
- ★ Line of best fit (smooth curve)



Answer

3) Describe the relationship between concentration of hydrochloric acid and time taken to collect 50cm^3 of hydrogen gas.

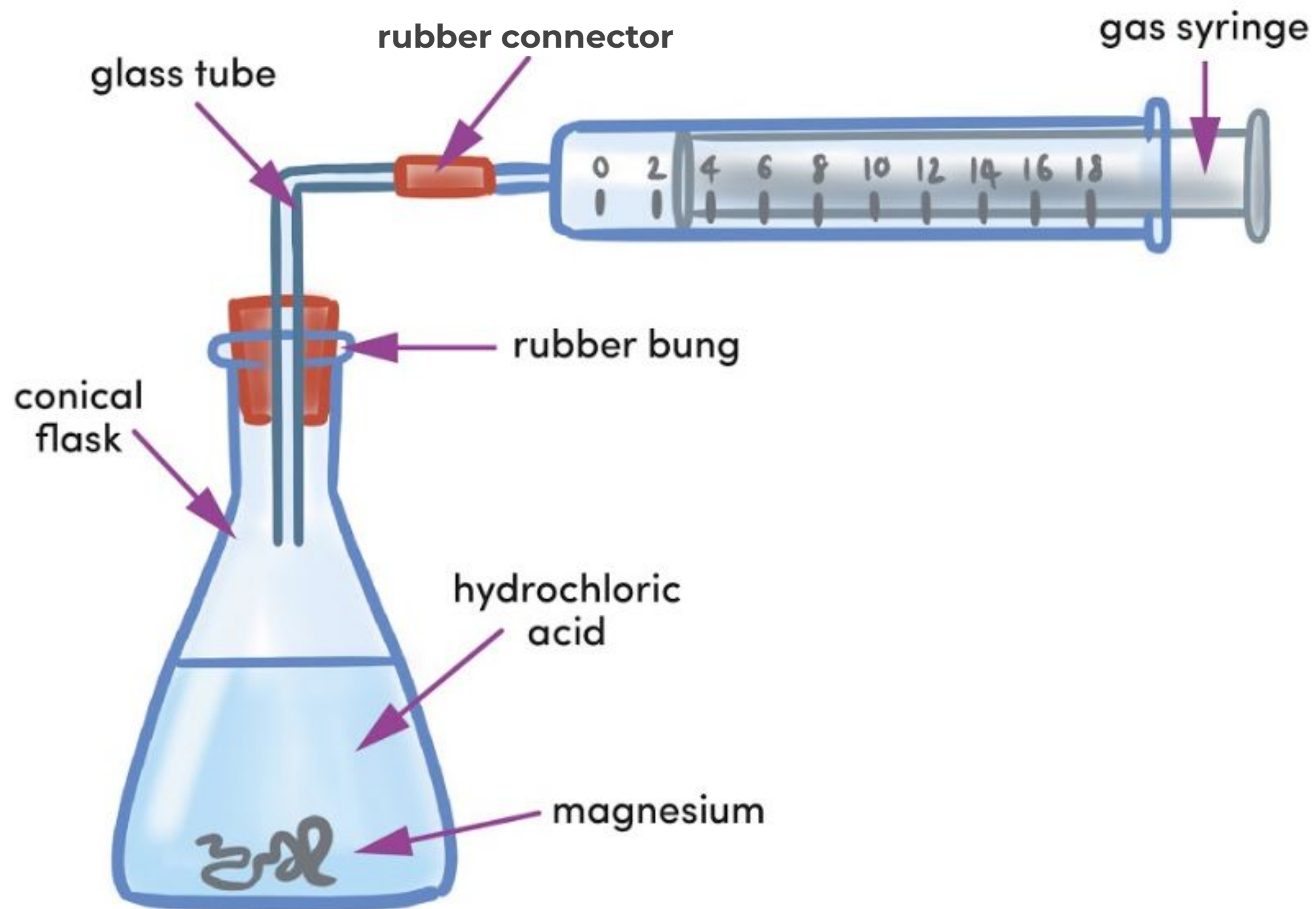
As the concentration of hydrochloric acid increases, the time taken to collect 50cm^3 of hydrogen gas decreases.

4) Explain how the concentration of hydrochloric acid affects rate of reaction with magnesium.

Increasing the concentration of hydrochloric acid increases the rate of reaction. There are more number of reacting particles per unit volume, therefore particles collide more frequently.



Writing a method to find rate of reaction



Source: Oak





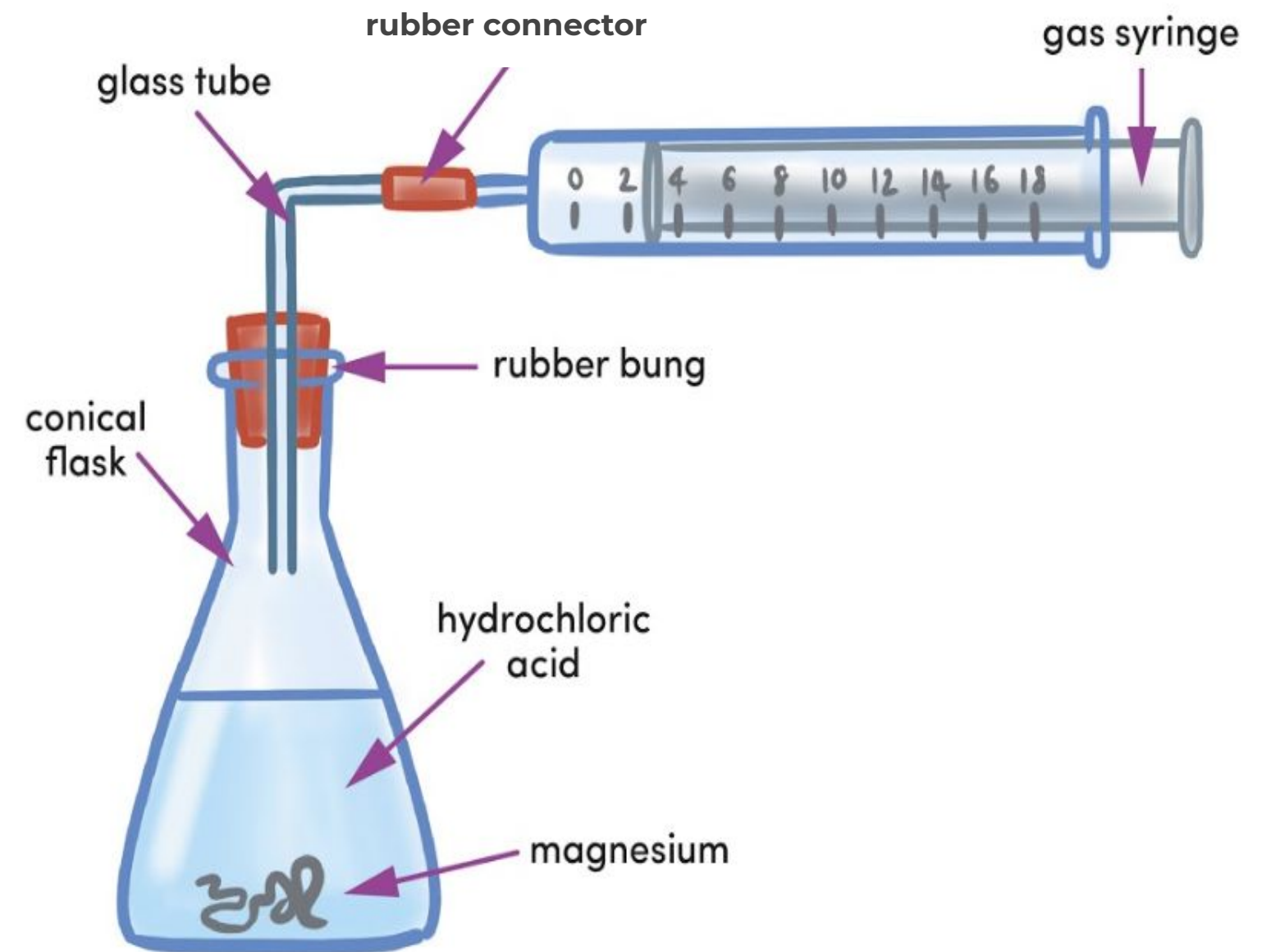
Hypothesis: Increasing the concentration of hydrochloric acid increases the rate of reaction.

Task 1 - Identify the following

Independent variable:

Dependent variable:

Two control variables:



Source: Oak



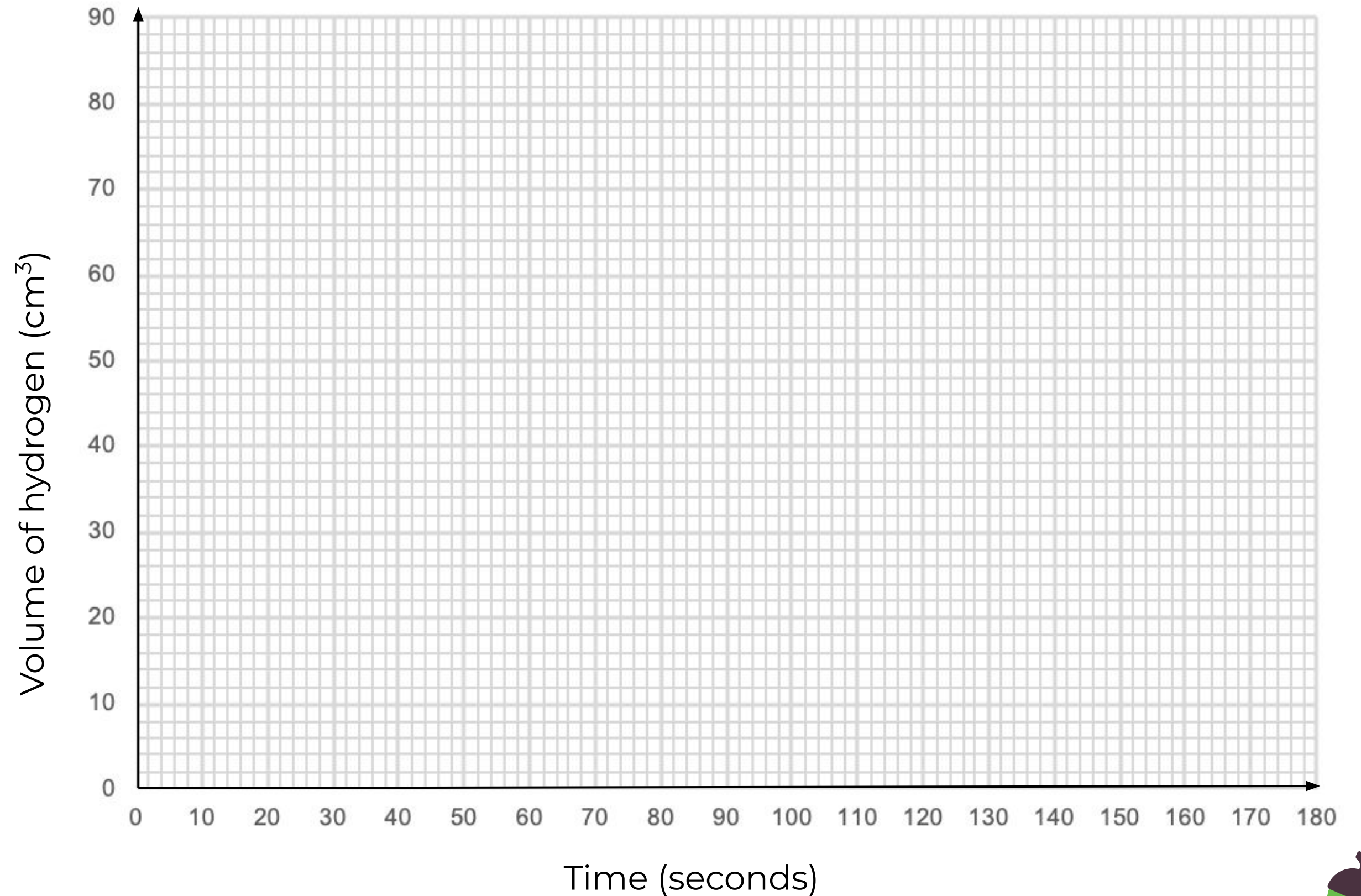
Hypothesis: Increasing the concentration of hydrochloric acid increases the rate of reaction.

Task 2 - Write a method for an investigation to show how the concentration of hydrochloric acid affects the rate of the reaction with magnesium



Task 3 - Plot a graph from the table of results given and draw line of best fit

Time (s)	Volume of hydrogen (cm ³)
0	0
20	22
40	40
60	54
80	65
100	70
120	72
140	74
160	74
180	74



Task 4

Describe the two ways gas can be collected from a chemical reaction to calculate rate of reaction.

In terms of collision theory, explain why increasing the concentration of hydrochloric acid increases the rate of reaction.



Answer

Task 1

Independent variable: Concentration of hydrochloric acid (M)

Dependent variable: Volume of hydrogen gas (cm³)

Control variables: Volume of hydrochloric acid

Mass of magnesium

Temperature



Answer

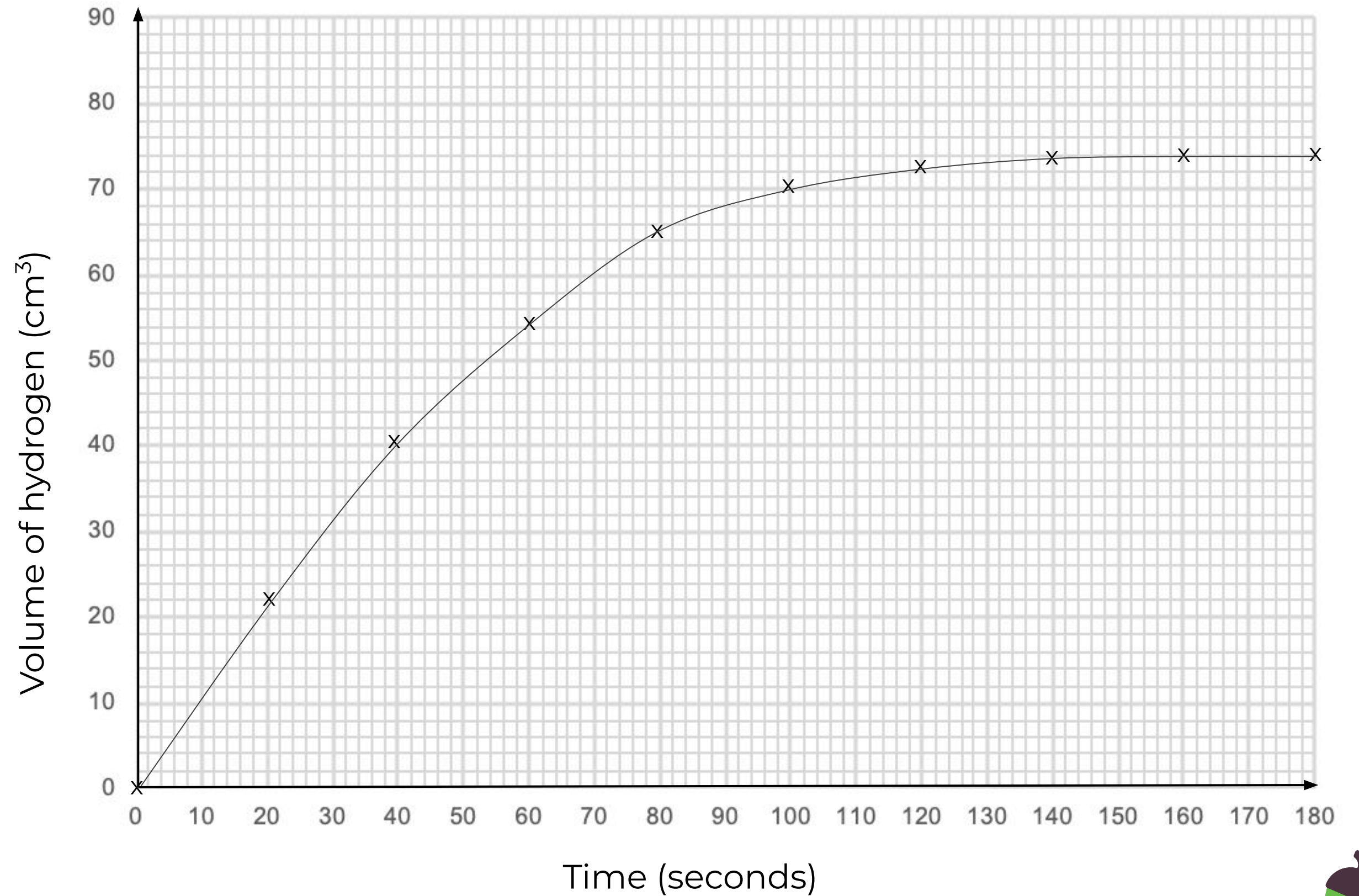
Task 2

1. Measure 20 cm³ of 0.5 M hydrochloric acid using a measuring cylinder, then pour the acid into a conical flask.
2. Place two 2 cm magnesium strips into the conical flask. Insert a rubber bung into the conical flask and attach it to a delivery tube that is connected to a gas syringe.
3. Measure the volume of gas in the syringe every 20 seconds for 3 minutes.
4. Record the results in a table.
5. Repeat 3 times and find a mean.
6. Repeat procedure using 1.0 M and 1.5 M of hydrochloric acid.



Task 3 answer

Time (s)	Volume of hydrogen (cm ³)
0	0
20	22
40	40
60	54
80	65
100	70
120	72
140	74
160	74
180	74



Task 4 answer

Describe the two ways gas can be collected from a chemical reaction to calculate rate of reaction.

- 1) Using a gas syringe
- 2) Using an inverted measuring cylinder in a trough of water

In terms of collision theory, explain why increasing the concentration of hydrochloric acid increases the rate of reaction.

The higher the concentration of hydrochloric acid, the more particles per unit volume. Particles collide more frequently, rate of reaction increases.

