Stage 2

# Interpreting graphs

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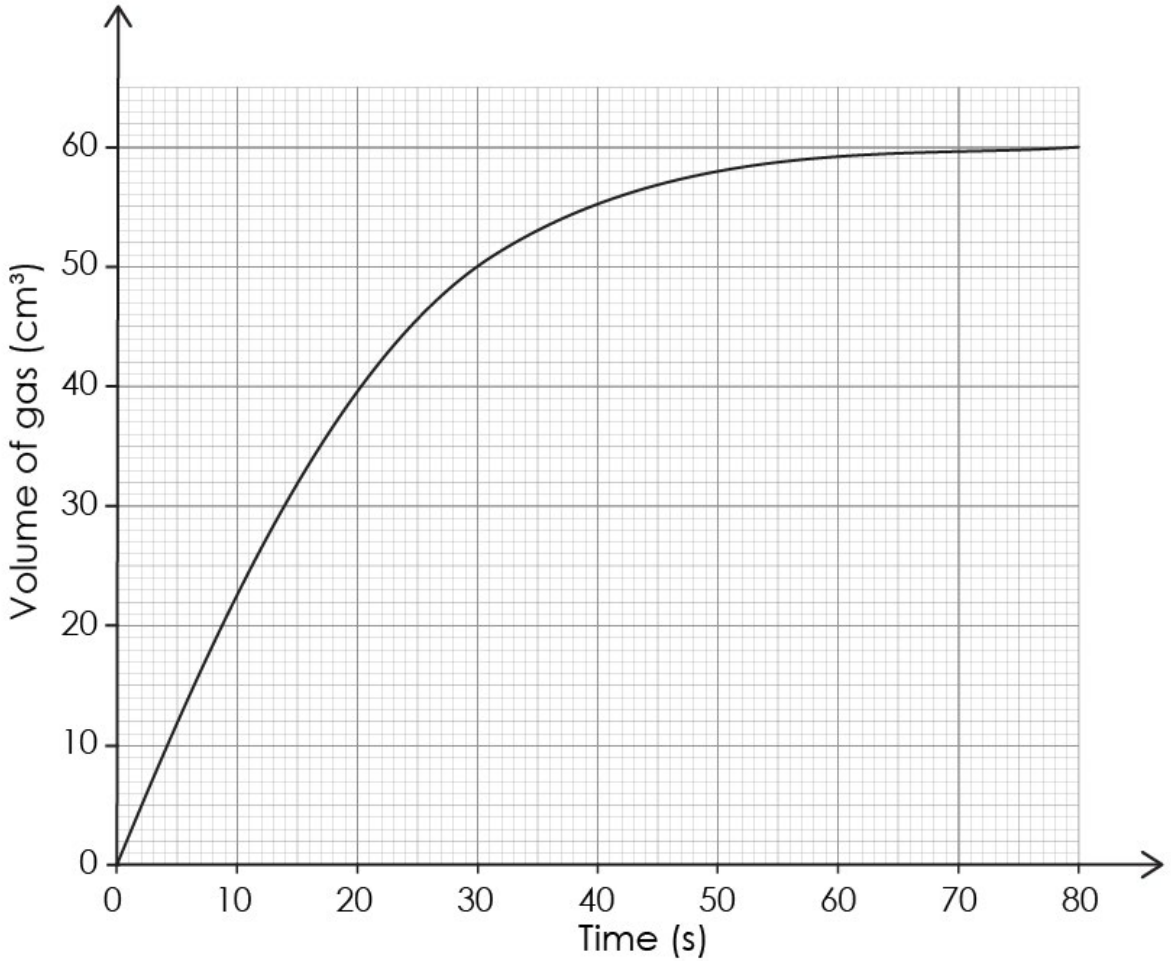
# Introduction

In this lesson we will cover the maths skills needed to answer a graph question.

## Learning objectives

1. Interpret graphs to describe the relationship between data.
2. Describe the trend on rates of reaction graphs.
3. Explain the trend on rates of reaction graphs.

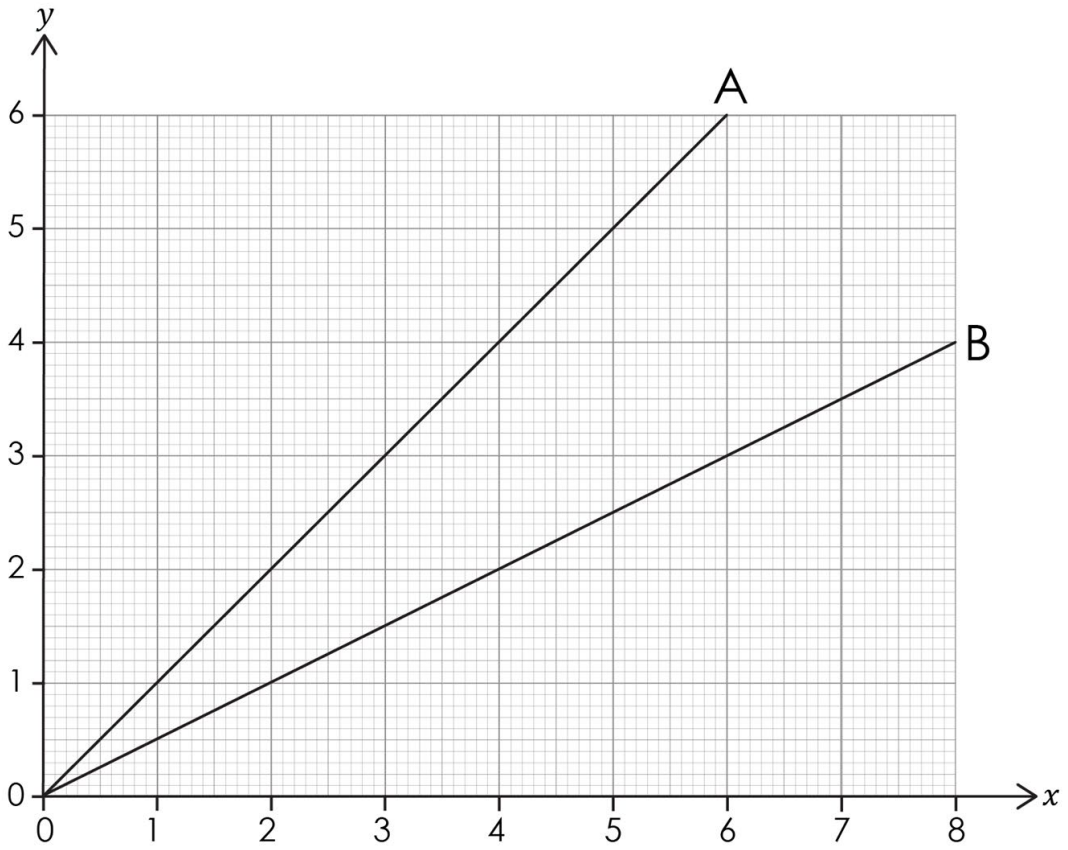
# Lesson question




Imagine you are investigating the reaction between hydrochloric acid and magnesium.

**Describe** and **explain** how the **rate of reaction** changes over **time.**

# Learning from stage 1




In creating graphs, we learned how to compare the gradient of two lines:

- The gradient of a slope describes its steepness.
- The greater a gradient the steeper the slope.
- A steeper slope means a faster rate.

Which of these lines has a higher rate?

Explain your answer.

# Describing the trend or pattern

Describing the trend or pattern in a graph involves ‘saying what you see’. When we describe the trend in a graph, we:

- **start** by looking at the labels on the axes
- **describe** the overall trend or pattern.

A trend is a pattern in a set of results. We:

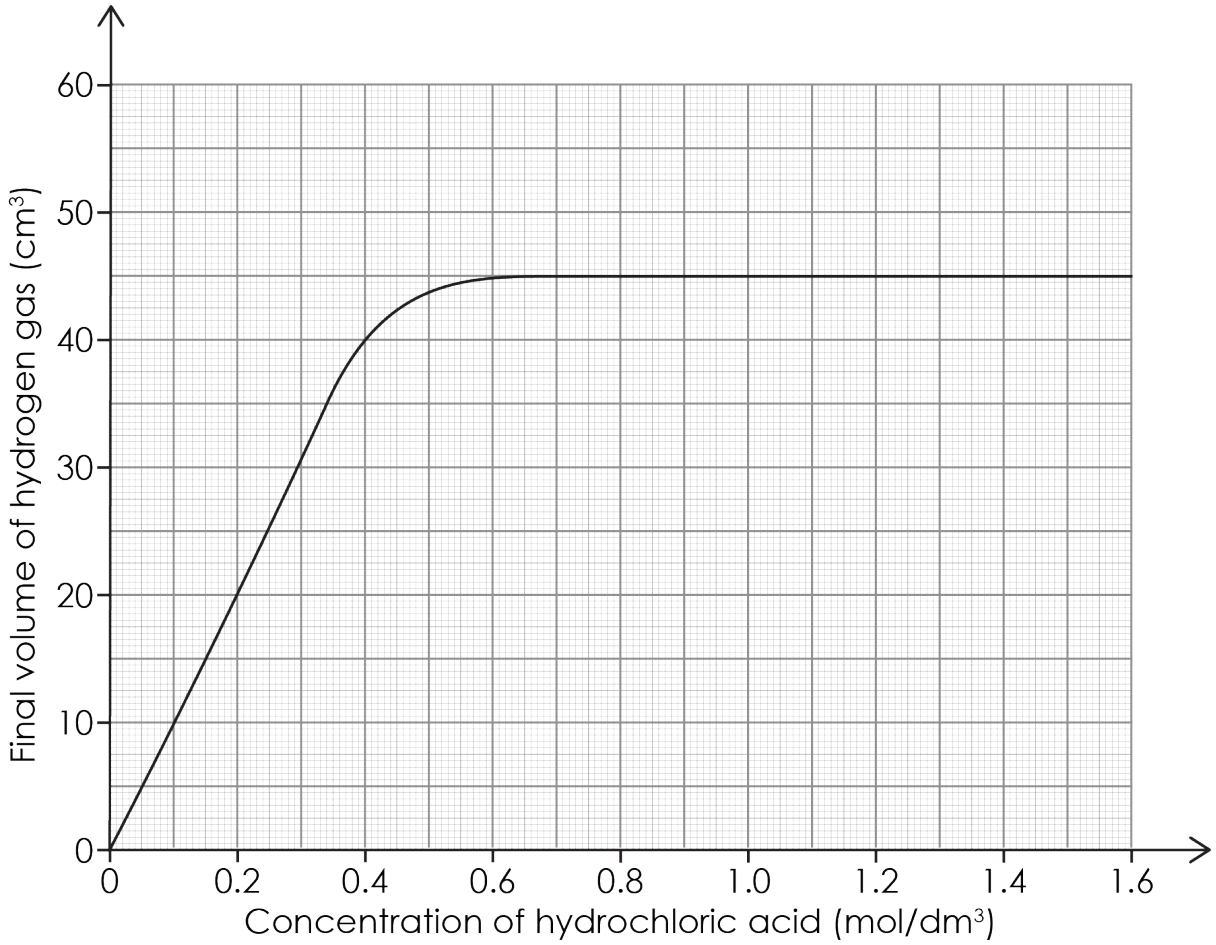
- **use** the labels on the axes to **describe** the overall trend
- **highlight** any significant differences in the overall trend.

We can also use data to help describe the trend.

Let’s look at an example.

# Describing the pattern

a) Describe the overall pattern
b) Describe any significant differences (using data)

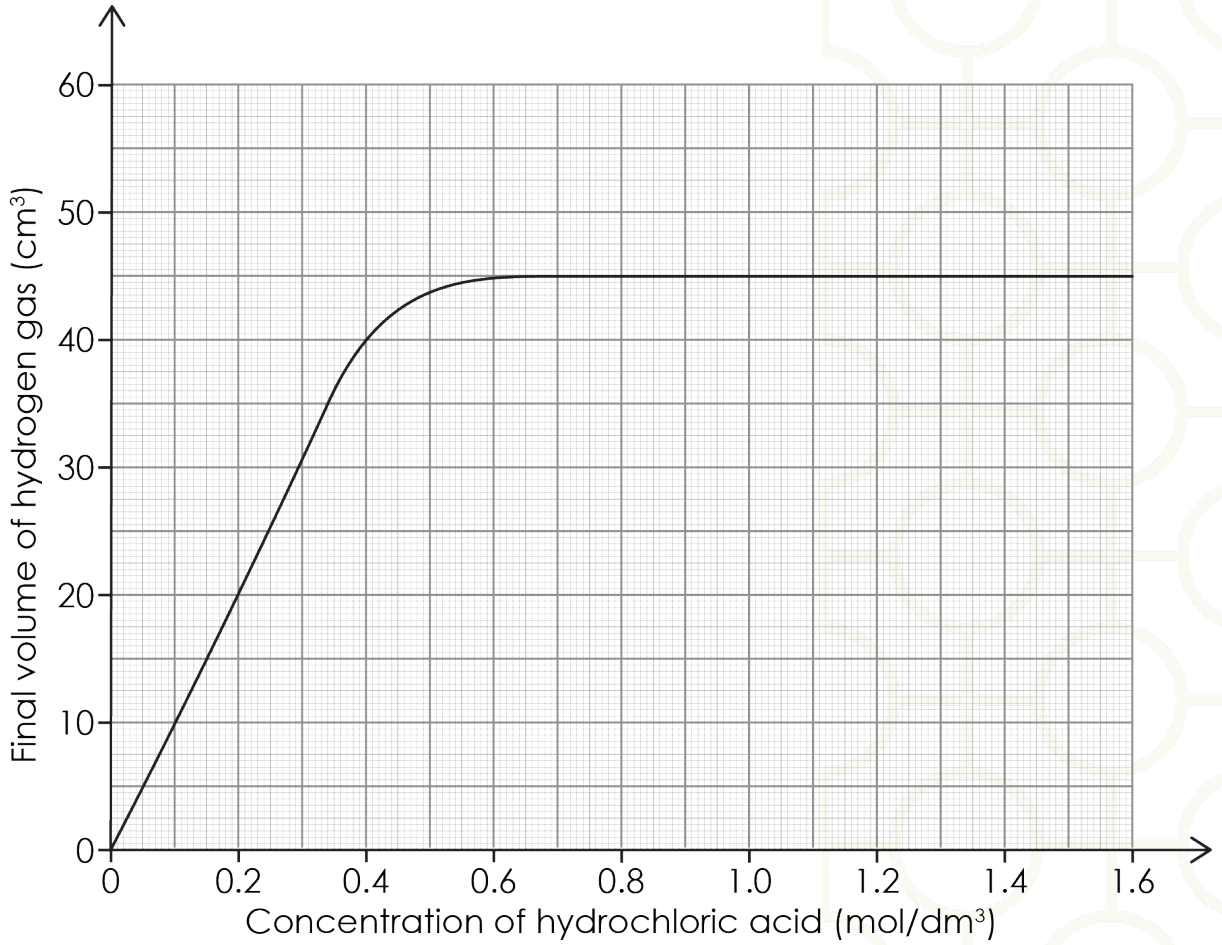



Activity

# Describing the pattern – answers

a) As the concentration of hydrochloric acid increases the final volume of hydrogen gas increases.

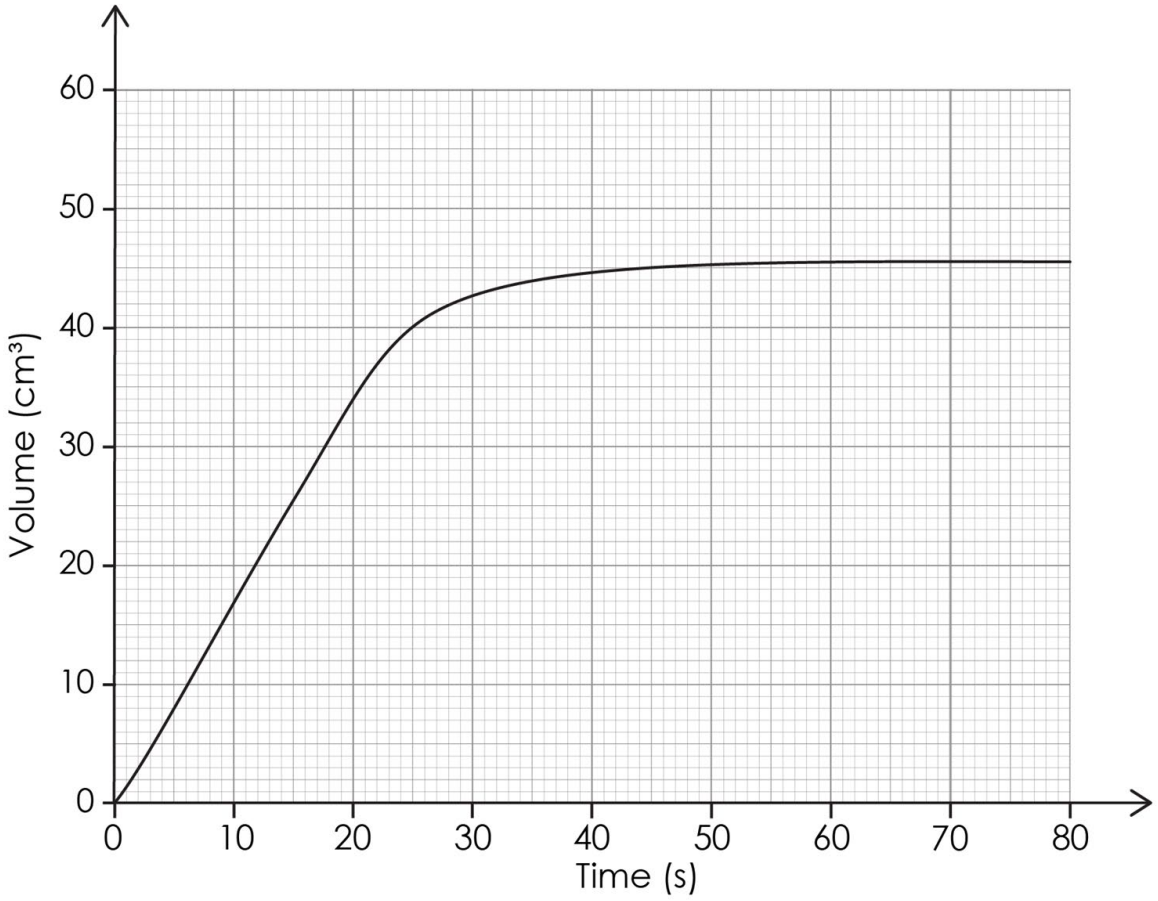
b) At low concentrations below 0.4 mol/dm$^3$ there is a linear relationship between concentration of hydrochloric acid and the final volume of hydrogen gas. After 0.6 mol/dm$^3$ the maximum volume of hydrogen gas remains steady at 45 cm$^3$.




Answers

# Describing the trend – time series graphs

Activity




A time series graph shows how a **variable** changes over time.

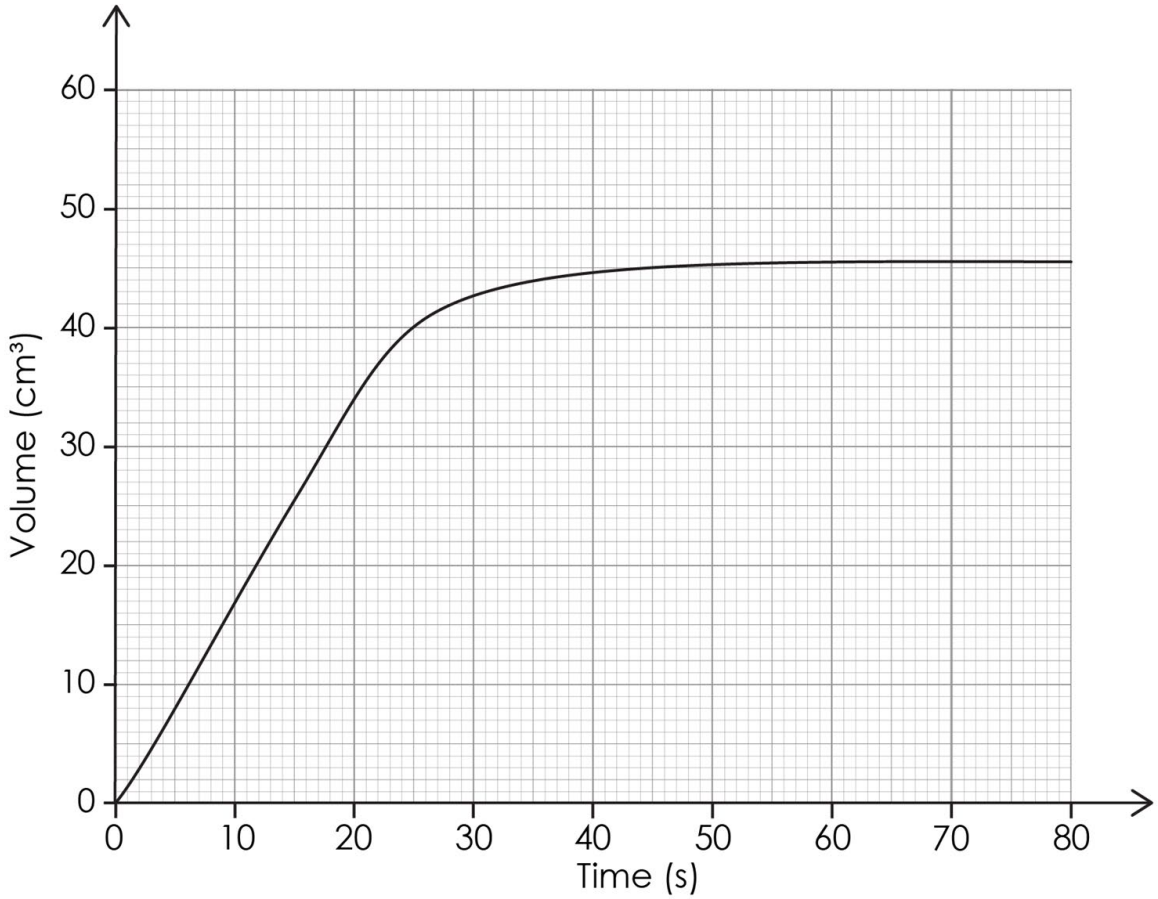
The **rate of reaction** can be found by finding the gradient of the slope.

a) Describe the overall trend.

b) Describe any significant differences (using data).

# Describing the trend – time series graphs – answers

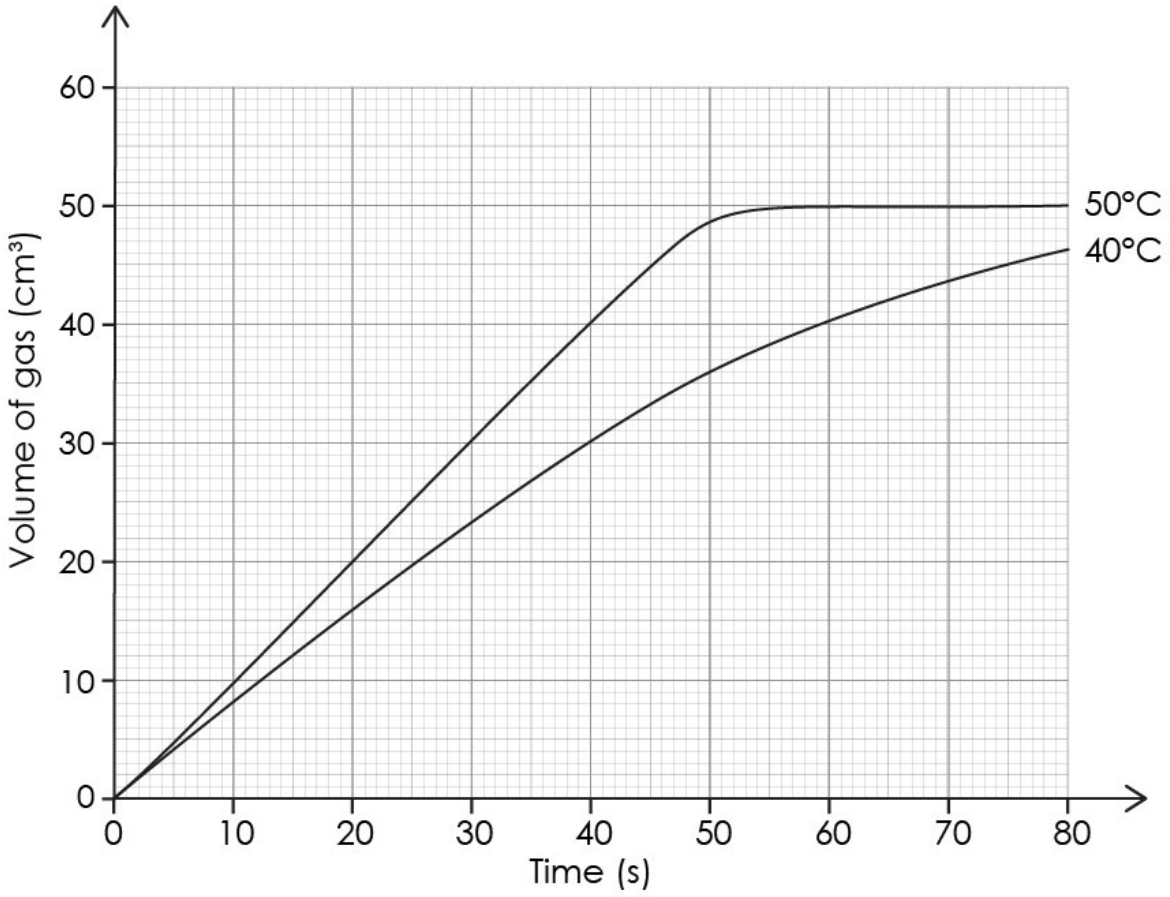
Answers




a) The volume of gas increases over time.

b) The rate of reaction is fastest between 0 and 20 seconds. The rate slows between 20 and 55 seconds. After 55 seconds the reaction stops.

# Graphs with multiple lines of best fit




This time series graph has two **lines of best fit**.

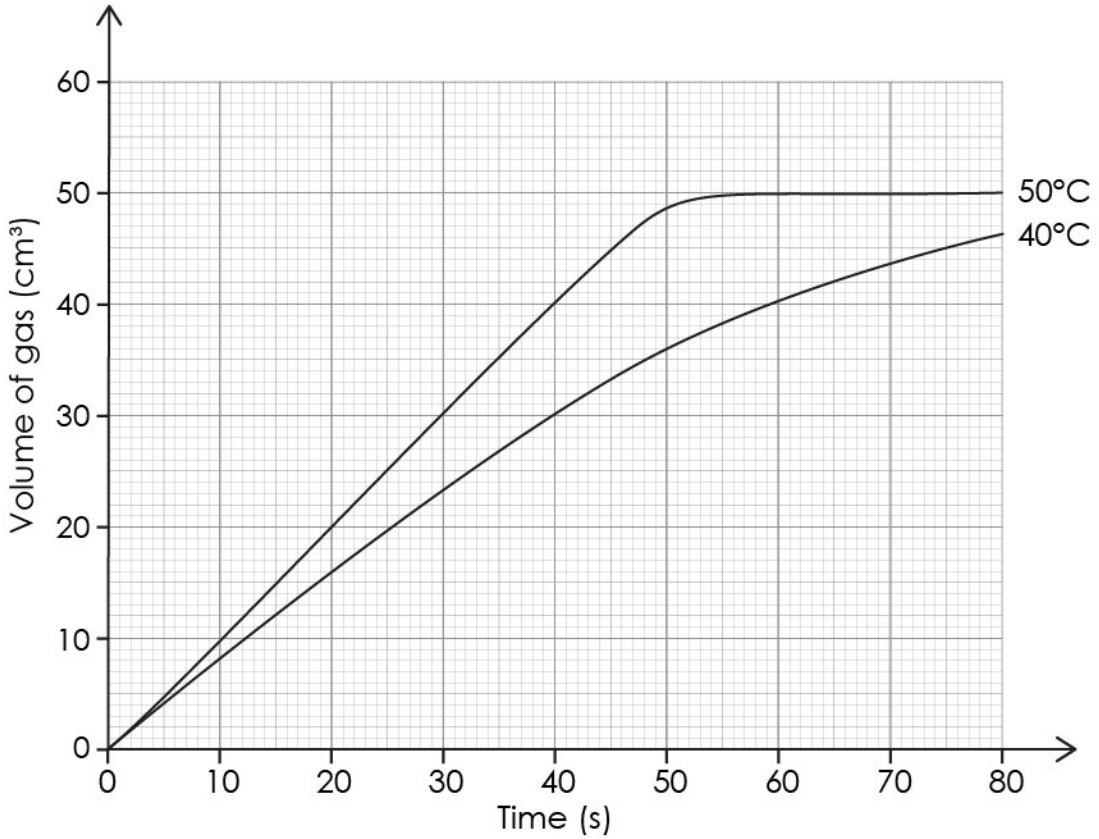
We can describe how the variable affects the rate of reaction:

- as the temperature increases the rate of reaction increases.

How do we know the rate of reaction is faster at the higher temperature?

Activity

# Graphs with multiple lines of best fit – answer



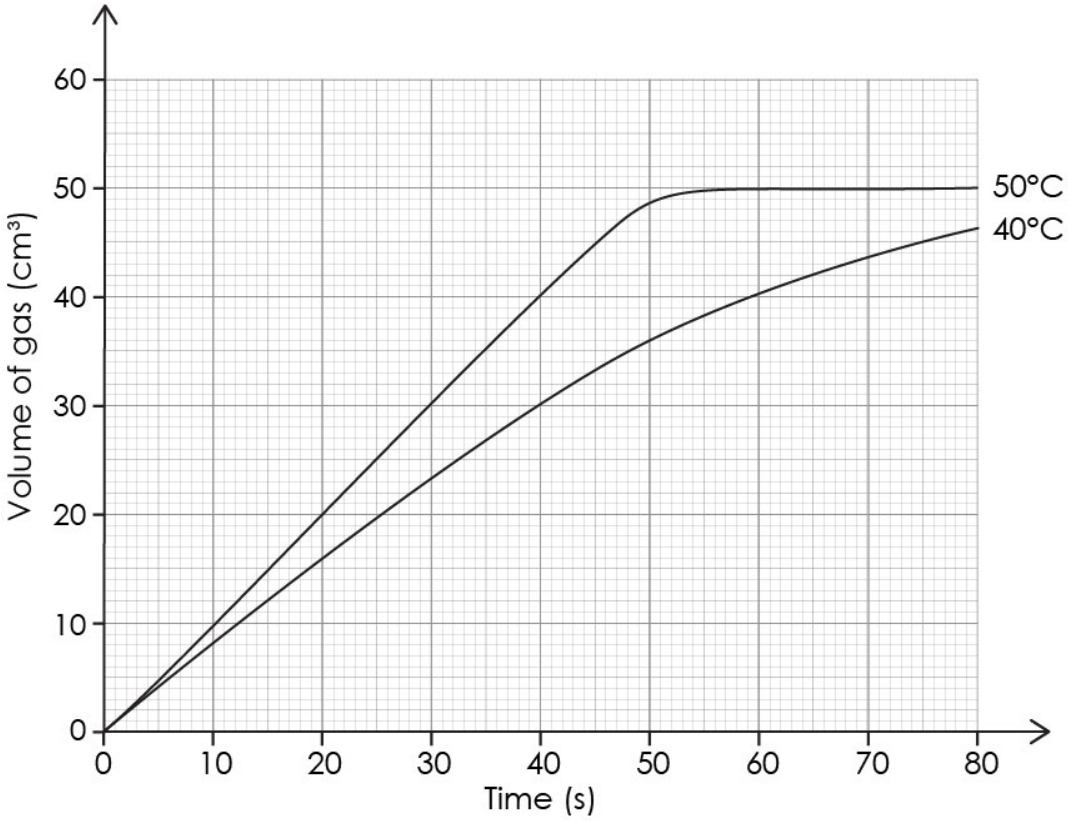

The gradient of the slope is steeper for 50°C than for 40°C.

Answer

# Explaining the line of best fit

You may be asked to explain the relationship on a graph.

This is where we link the **description** with an **explanation** using a **connective** like 'because'.

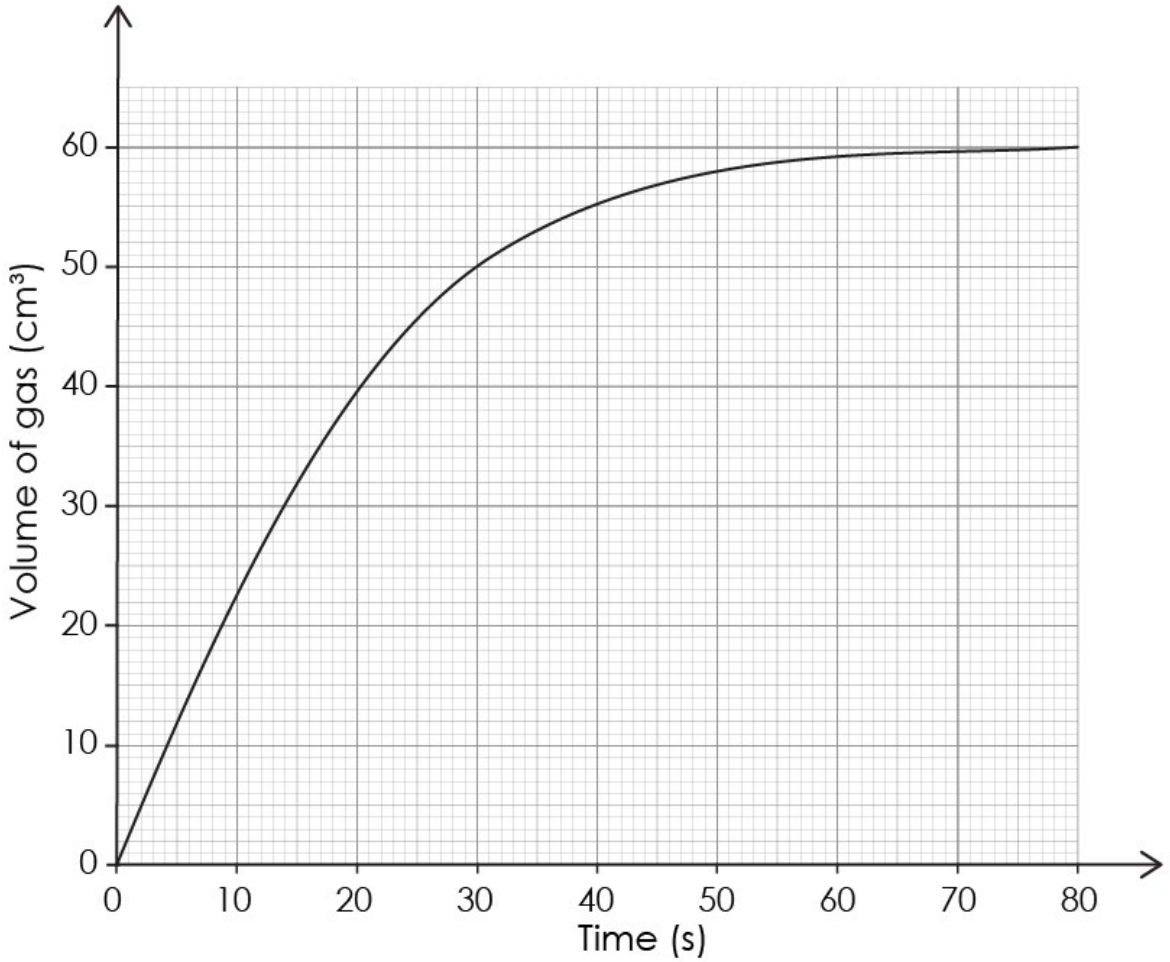



Let's use this graph as an example:

**As temperature increases the rate of reaction increases because** the **particles have more kinetic energy**, **so** there are more frequent successful collisions.

# Returning to the lesson question

Let's go back to the example from the beginning of this section:




Imagine you are investigating the reaction between hydrochloric acid and magnesium.

**Describe** and **explain** how the **rate of reaction** changes over **time.**

Lesson question

# Returning to the lesson question – answers

Answers

**Describe** and **explain** how the **rate of reaction** changes over **time.**

First, describe the **overall trend**:

- the rate of reaction decreases over time.

Then, describe and explain any **significant differences**:

- The fastest rate of reaction is in the first 10 seconds.
- The rate of reaction decreases over time as the concentration of the hydrochloric acid decreases.
- The lower the concentration the fewer successful collisions will occur.