

## Reactants and products

This resource is part of the **Structure strips** series of resources, designed to support literacy in science teaching. More resources in this series can be found at: [rsc.li/4aXYgzt](https://rsc.li/4aXYgzt).

### Learning objectives

- 1 Identify the reactants and products in a chemical equation.
- 2 Identify whether a chemical or physical change is occurring.
- 3 Define reactions as combination or decomposition from word and symbol equations.

### Introduction

Chemical reactions are when one or more new substances are formed from other substances. This can also be referred to as a chemical change. In a physical change no new substances are formed, for example a change of state or dissolving.

A chemical change can occur through two types of reaction.

- A combination reaction (also known as a synthesis reaction) is where two or more reactants chemically change into one or more products
- A decomposition reaction is where a compound breaks down to give two or more products.

In chemical reactions, the reactants are the chemicals that react together and are found before the arrow in a word equation. The products are the new substances produced and are found after the arrow in a word equation.

### How to use structure strips

Structure strips are a type of scaffolding that support learners to retrieve information independently. Use them to take an overview at the start of a topic, to activate prior knowledge, or to summarise learning at the end of a teaching topic. Visit [rsc.li/3EszCfr](https://rsc.li/3EszCfr) for more ideas on how to use structure strips with your learners.

Structure strips have sections containing prompts, sized to suggest the amount that learners must write. Ask learners to glue the strips into the margin of an exercise book and write their answers next to the sections, in full sentences or in bullet points. When learners have finished using the structure strip, they will have an A4 page set of notes and examples.

### Scaffolding

- Encourage learners to use the suggested key words in their answers. These link with our key terms support resources for introducing chemical change: [rsc.li/3Rej6T9](https://rsc.li/3Rej6T9).
- Learners can support each other with think, pair, share activities to discuss answers prior to answering the questions.
- To further support learners, include additional prompts in the structure strip. If learners are struggling to engage with the task, supply them with sentence starters created from the example answers.
- As learners grow in confidence, ask them to attempt the extension task first and then use the structure strip to improve or self-assess their attempt.

### Metacognition

This resource supports learners to develop their metacognitive skills in three key areas.

- **Planning:** the strips provide scaffolding to plan the written response. Learners will decide where to gather information from (textbooks, own notes, revision websites). Ask learners: is the source of information you are using reliable?
- **Monitoring:** learners are prompted by the questions in the structure strip and can check their own answer against the prompts. Ask learners: have you covered all of the prompts in the space provided? Do you need to change anything to complete the task?
- **Evaluation:** learners can self-assess or ask a peer to check their work against the answers. Ask learners: did you achieve what you meant to achieve? What will you do differently another time?

An example answer for the structure strip is on page 3.

## TEACHER NOTES

Structure strip Reactants and products	Example answer
Define the terms 'reactants' and 'products' in a chemical equation.	A reactant is a substance that you start with in a chemical reaction.  A product is a new substance that is made in a chemical reaction.
Write a word equation for the following reaction. Label the reactants and the products.  Magnesium reacts with hydrochloric acid to produce hydrogen. Magnesium chloride is also produced.	magnesium + hydrochloric acid → magnesium chloride + hydrogen  Reactants: magnesium and hydrochloric acid  Products: hydrogen and magnesium chloride
Describe some observations you might make which show a chemical reaction has occurred.	Some of the observations which may show a chemical reaction has occurred include bubbling, fizzing, colour change, precipitate formation or temperature change.
Is heating copper carbonate and observing a colour change a chemical or physical change? Explain your answer.	Heating copper carbonate and observing a colour change is an example of a chemical change. A colour change shows that a new product has been formed.
Is an ice lolly melting a chemical or physical change. Explain your answer.	An ice lolly melting is an example of a physical change because the ice lolly was a solid but is now a liquid but the substance is the same. It is only the state that has changed.
The equation below represents a decomposition reaction. Explain why.  copper bromide → copper + bromine	This is an example of a decomposition reaction because one compound has broken down into two products.
The equation below represents a combination reaction. Explain why.  zinc + sulfuric acid → zinc sulfate + hydrogen	This is an example of a combination reaction because it is a reaction where two substances are chemically changed to make two different products.

### Extension question

Get learners to answer the question after they have attempted the structure strip. The structure strip activates the required knowledge which learners then apply to the question.

Consider re-framing the context of this question to one your learners are more familiar with, to empower them to unlock their existing science capital. Read more about science capital here: [rsc.li/40FAMLP](https://rsc.li/40FAMLP).

### Example answers to extension question

Due to the nature of this task, answers will vary. Some of the key points learners can include in their summary are:

- the acid contains hydrogen, sulfur and oxygen
- magnesium contains only magnesium atoms
- magnesium atoms react with the sulfuric acid
- hydrogen gas is produced
- hydrogen contains only hydrogen atoms
- magnesium sulfate is formed
- magnesium sulfate contains magnesium, sulfur and oxygen
- bubbles or fizzing are observed
- a chemical change has occurred.

Learners can use these bullet points to self-assess or improve their answer. You can also supply them to less confident learners who need additional guidance.