

Telling physical and chemical changes apart

Grade 7 science (Year 8 · Class 7) · Lesson

Quick answer: A physical change alters the shape, size or state of a material without making a new substance, while a chemical change makes new substances with different properties. Signs of a chemical change include gas bubbles, a colour change, a new solid, heat or light, and a new smell.

Level: Grade 7 science (Year 8 · Class 7) · **Curriculum:** MS-PS1-2

What is the difference between a physical change and a chemical change?

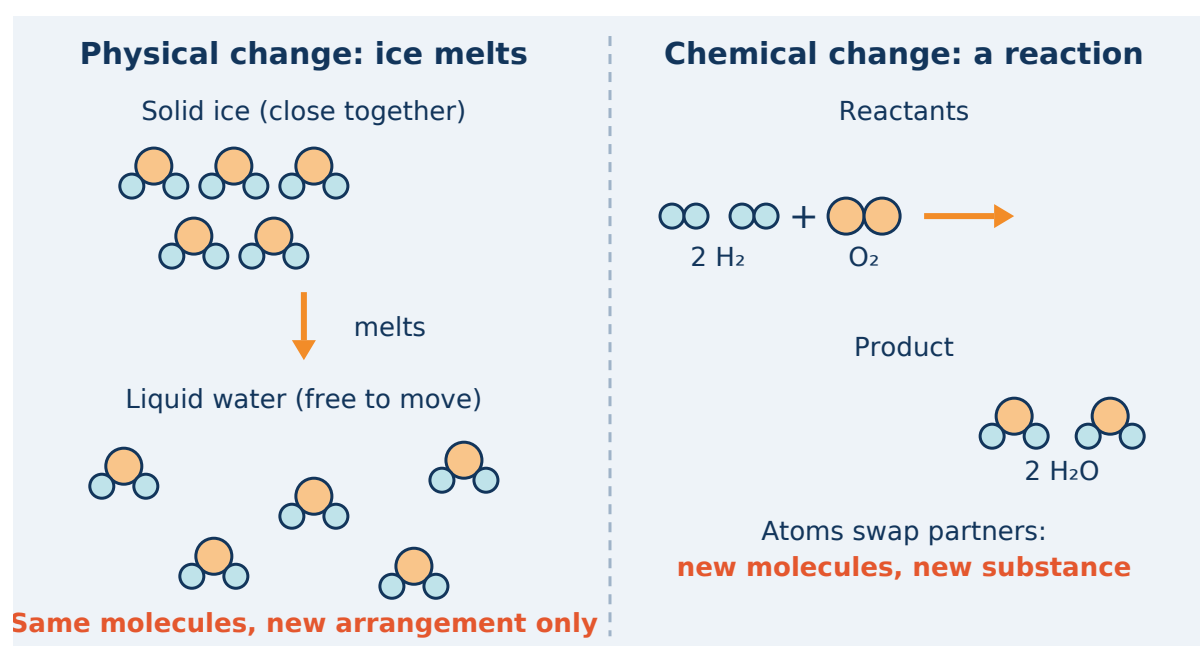
Butter melts, bread toasts and a bicycle chain turns orange in the rain. Scientists sort these changes into two groups by asking one question: has a new substance been made?

Definition

A physical change alters the shape, size or state of a material but makes no new substance. The particles stay the same, so the change can often be undone.

Definition

A chemical change, also called a chemical reaction, makes one or more new substances with different properties. Atoms are rearranged into new combinations, and the change is usually hard to reverse.



Melting keeps the same water molecules. A reaction builds new molecules from the same atoms.

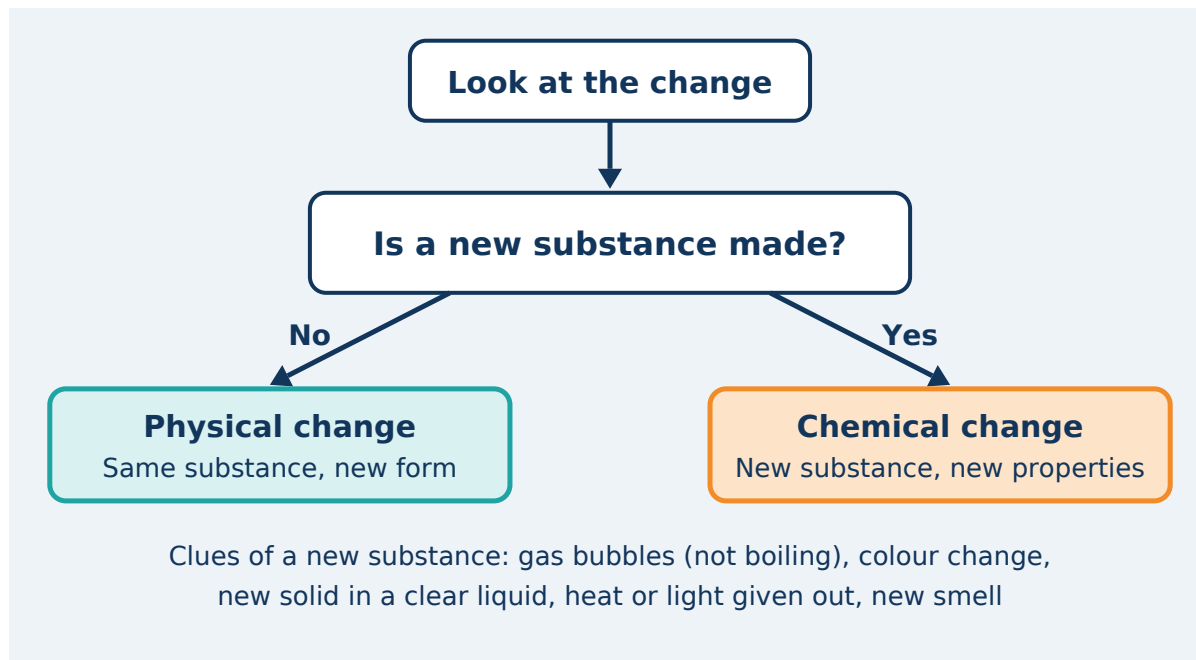
What are the signs that a chemical change has happened?

You cannot see atoms rearranging, so you look for clues that a new substance has appeared:

- **Gas bubbles** that are not caused by boiling.
- **A colour change** that was not just mixing.
- **A new solid** forming in a clear liquid.
- **Heat or light** given out, or the mixture getting cold.
- **A new smell** or a fizzing, crackling sound.

One clue alone may not be enough. The best proof is that the new material has different properties from the starting ones.

Observation	Chemical sign?	Why
Bubbles rise from a tablet in water	Yes	A gas is made
Bubbles rise in a boiling kettle	No	Water vapour is the same substance
Sugar vanishes in tea	No	Sugar is still there, dissolved
A cut apple turns brown	Yes	A new brown substance forms
Wax melts near a flame	No	Same wax, new state
Egg white turns firm and white	Yes	Proteins change for good



A decision chart. Always ask whether a new substance has been made.

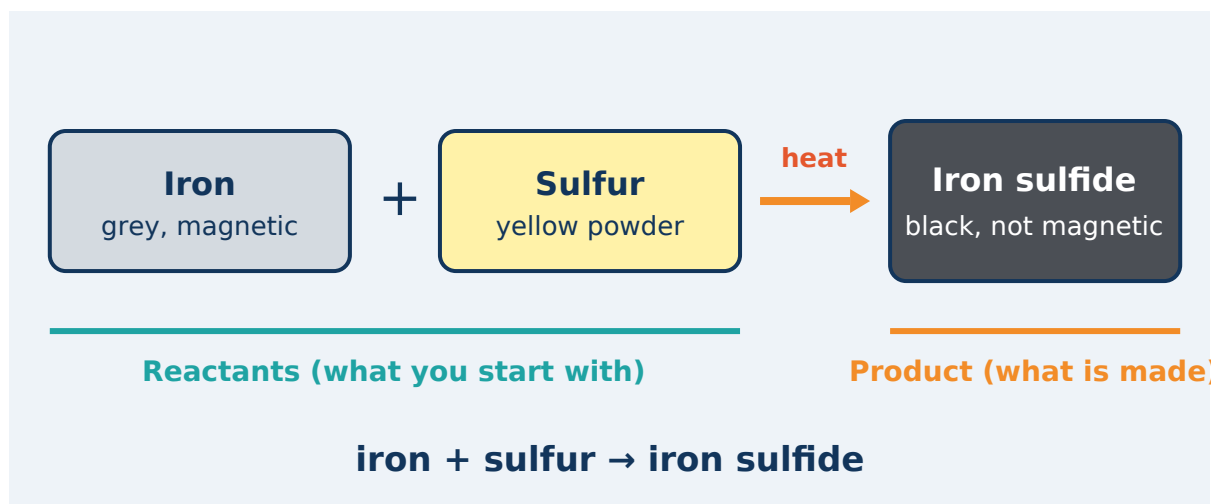
Common mistake

Bubbles do not always mean a reaction. Boiling water makes bubbles of water vapour, which is the same substance as the liquid. A temperature change alone is not proof either, because some substances cool the water as they dissolve.

What are reactants and products?

Definition

Reactants are the starting substances in a chemical reaction. Products are the new substances that are formed.



Heating two reactants gives a product with new properties.

Worked example 1

Kwabena in Kumasi heats a mixture of grey iron filings and yellow sulfur powder. It glows and leaves a black solid that a magnet no longer attracts. Name the reactants and the product, and write the word equation.

The reactants are iron and sulfur. The product is iron sulfide. Word equation: **iron + sulfur → iron sulfide**.

How do you write a word equation?

Formula

reactant 1 + reactant 2 → product 1 + product 2

The plus sign means "and". The arrow means "react to make". Use full names, not formulas.

1. Name every reactant and put a plus sign between them.
2. Draw an arrow pointing to the right.
3. Name every product, with plus signs between them.

Worked example 2

Priya in Mumbai cooks on a gas stove. Methane burns in the oxygen of the air and makes carbon dioxide and water vapour. Write the word equation.

Reactants: methane and oxygen. Products: carbon dioxide and water. **methane + oxygen → carbon dioxide + water**.

Worked example 3

Nia in Cape Town drops a strip of zinc into dilute hydrochloric acid. Bubbles of hydrogen rise and zinc chloride solution is left. Write the word equation and name two signs of a chemical change.

Word equation: **zinc + hydrochloric acid → zinc chloride + hydrogen**. Signs: gas bubbles and the zinc strip getting smaller.

Lina's tip

Ask whether you could get the original material back just by cooling, drying or filtering. If you cannot, and the new material behaves differently, the change is chemical.

Key points to remember

- Physical change: no new substance (melting, cutting, dissolving).
- Chemical change: new substances form (burning, rusting, cooking).
- Signs: gas, colour change, new solid, heat or light, smell.
- Reactants are on the left of the arrow and products on the right.
- Word equation: reactants → products, using full names.

Telling physical and chemical changes apart: frequently asked questions

What is a chemical change?

A chemical change is a reaction that makes one or more new substances. The atoms are rearranged, so the new materials have different properties from the starting ones.

What are the signs of a chemical change?

Look for gas bubbles that are not boiling, a colour change, a new solid forming in a liquid, heat or light being given out, or a new smell. The strongest proof is a new substance with different properties.

Is dissolving a chemical change?

No. When sugar or salt dissolves, the particles spread out among the water, but the substance is still the same. You can get it back by evaporating the water.

What are reactants and products?

Reactants are the substances you start with in a reaction and products are the new substances that are made. In a word equation, reactants go on the left of the arrow and products on the right.

How do you write a word equation?

Write the names of the reactants joined by plus signs, then an arrow, then the names of the products. For example: zinc + hydrochloric acid → zinc chloride + hydrogen.