Science 10

Unit A: Energy and matter in chemical change

Evidence of chemical change

Baking with baking powder

- When baking powder becomes wet, its ingredients react and produce carbon dioxide gas.
- The gas forms bubbles that become trapped in the batter; heating expands the bubbles and helps the baked product rise.
- Gas formation supports a chemical-change claim when the reactants can produce a new gaseous substance; bubbles from boiling alone are a physical change.

Reaction patterns

- Magnesium and oxygen forming magnesium oxide is synthesis; one more complex product forms from simpler reactants.
- Hydrogen peroxide breaking into water and oxygen is decomposition, while methane reacting with oxygen is combustion.
- Zinc displacing copper from a compound is single replacement.
- Two ionic compounds that exchange ions and form a precipitate are double replacement.

Key terms

synthesis

Reaction in which simpler substances combine to form a more complex product.

decomposition

Reaction in which one compound breaks into simpler substances.

combustion

Reaction with oxygen that releases energy; complete hydrocarbon combustion forms carbon dioxide and water.

single replacement

Reaction in which one element replaces another element in a compound.

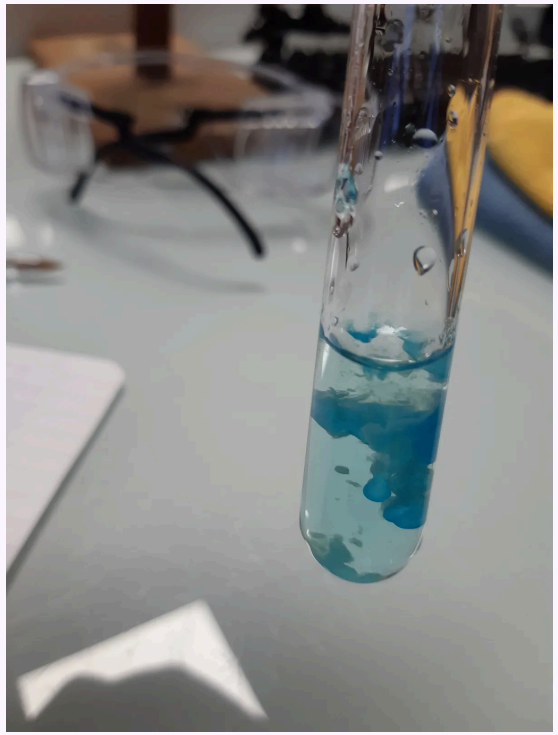
Key terms

double replacement

Reaction in which ions in two compounds exchange partners.

Evidence checklist

- Look for at least one sign that a new substance formed, such as an unexpected gas, a new colour, or a solid appearing.
- A change of state keeps the same chemical formula. Melted ice is still water.



Energy in reactions

- An exothermic reaction releases thermal energy to the surroundings. Many combustions do this.
- Photosynthesis, taken as a whole, absorbs energy, so this course treats it as endothermic.

Five categories

- The five patterns are synthesis, decomposition, hydrocarbon combustion, single replacement, and double replacement.
- Recognize the pattern from how the reactants and products are arranged.

Synthesis: $A + B \longrightarrow AB$

Decomposition: $AB \longrightarrow A + B$

Single replacement: $A + BC \longrightarrow AC + B$

Double replacement: $AB + CD \longrightarrow AD + CB$

Combustion (hydrocarbon): $C_xH_y + O_2 \longrightarrow CO_2 + H_2O$

Reactions in society

- Photosynthesis, respiration, combustion, and decay are chemical changes with different jobs.
- Combustion and respiration both release stored chemical energy. They are separate processes.
- Whether a process helps depends on its products and how people use them; the reaction type is just its name.
- Rate, amount, emissions, and conditions decide the impact.

Classifying equations

- Read the words of the equation before you look for a type.
- Synthesis joins reactants into one product. Decomposition splits one reactant apart.
- Single replacement swaps one element. Double replacement swaps two partners.
- Leave coefficients for the next lesson. This pass is classification only.

Evidence and reaction retrieval check

- Two clear aqueous solutions form a white solid. Name the evidence of chemical change and the likely reaction category.
- Methane reacts with oxygen to form carbon dioxide and water. Classify the reaction and identify the energy evidence you would expect.
- For each case, name one observation that would make you reconsider your classification.

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