

Reaction Patterns and Prediction

Student Worksheet | g09_u08_w30

I can: classify equation patterns and make a cautious product prediction supported by evidence.

Guardrail: A pattern is a model for organizing possibilities, not proof that a reaction occurs. Preserve formula subscripts, balance coefficients, and use observation/data before claiming products. Use printed data cards only—no chemical handling. Sources are listed in **sources.md**.

1. Classify $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$ as synthesis, decomposition, combustion, single replacement, or double replacement. Cite the equation shape.

2. Classify $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$. What evidence would you need before claiming this decomposition occurred in a real sample?

3. Classify $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$. Identify the reactant feature that supports the classification.

4. Classify $\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$. Describe the partner change that supports a single-replacement model.

5. Classify $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$. Describe the ion-partner exchange.

6. Balance and classify $\text{N}_2 + \text{H}_2 \rightarrow \text{NH}_3$.

7. Balance and classify $\text{KClO}_3 \rightarrow \text{KCl} + \text{O}_2$.

8. Balance and classify $\text{C}_3\text{H}_8 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$.

9. A generic card shows $\text{A} + \text{BC} \rightarrow \text{AC} + \text{B}$. Name the pattern and state one limitation of using this shape alone.

10. A generic card shows $\text{AB} + \text{CD} \rightarrow \text{AD} + \text{CB}$. Name the pattern and state what must be checked before calling it a real reaction.

11. **Data card A:** Two clear solutions are mixed on paper; a solid is reported in the observation column. Which pattern is supported most directly? What additional evidence would strengthen the claim?

12. **Data card B:** A formula card lists a hydrocarbon plus O_2 and products CO_2 and H_2O . Classify the model and explain why an equation alone does not show flame temperature or completeness.
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13. Predict a plausible pattern product set, then balance: $\text{Al} + \text{O}_2 \rightarrow$ _____. State why this is a model prediction.
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14. Predict a plausible pattern product set, then balance: $\text{H}_2\text{O}_2 \rightarrow$ _____. State an observation that could support the model.
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15. A student labels $\text{NaCl} + \text{KNO}_3 \rightarrow \text{NaNO}_3 + \text{KCl}$ “a reaction” solely because partners exchange. Critique the claim using the pattern guardrail.
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16. In $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$, explain why changing H_2O to H_2O_2 is not a valid balancing move, even if it seems to fix oxygen.
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17. **Data card C:** An open cup is 22.0 g before and 21.4 g after a gas-forming model. Calculate the mass difference and state why it does not identify a reaction pattern by itself.
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18. A card proposes $\text{Fe} + \text{O}_2 \rightarrow \text{Fe}_2\text{O}_3$. Balance it, then list the evidence that is still missing before claiming it occurred.
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19. Compare two claims: “This equation has a combustion pattern” and “This combustion reaction occurred completely.” Which claim needs more evidence, and why?
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20. Write one evidence-based conclusion for this data: a card begins with Zn and CuSO_4 ; final card reports copper-colored solid and a changed solution color. Include a cautious prediction and one limitation.
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