

# Lab 5: Reaction Types — Evidence, Balancing, Classification

Name: \_\_\_\_\_ Partner(s): \_\_\_\_\_

Date: \_\_\_\_\_ Period: \_\_\_\_\_

## Purpose:

Perform multiple reactions, record evidence of change, write balanced equations, and classify each reaction type.

*Standards: HS-PS1-2, HS-PS1-3*

## Materials & Equipment:

- Test tubes (6) & rack; well plate; droppers; pH paper
- 0.1 M  $\text{CuSO}_4$ , 0.1 M  $\text{AgNO}_3$ , 0.1 M  $\text{NaOH}$ , 0.1 M  $\text{HCl}$ ; Mg ribbon;  $\text{NaHCO}_3$
- Bunsen burner or hot plate (combustion teacher-led); waste beaker; safety gear

## Procedure:

1. Label test tubes #1–#5 in a rack.
2. Reaction 1 — Synthesis (teacher demo): ignite Mg ribbon; observe bright light and  $\text{MgO}$  formation.
3. Reaction 2 — Decomposition: heat ~1 g  $\text{NaHCO}_3$ ; observe gas/residue.
4. Reaction 3 — Single Replacement: add Mg to 2 mL 0.1 M  $\text{CuSO}_4$ ; observe color change/solid.
5. Reaction 4 — Double Replacement: mix 2 mL 0.1 M  $\text{NaOH}$  with 2 mL 0.1 M  $\text{AgNO}_3$ ; observe precipitate.
6. Reaction 5 — Neutralization: 2 mL 0.1 M  $\text{HCl}$  + 2 mL 0.1 M  $\text{NaOH}$ ; test pH before/after.
7. For each reaction, write the balanced equation and classify the type.
8. Dispose of waste as directed; clean and return equipment.

## Data & Observations:

*Note gas, precipitate, temperature, color change and odor if present.*

| Reaction #                | Evidence of Change | Balanced Equation | Classification |
|---------------------------|--------------------|-------------------|----------------|
| 1 (Synthesis)             |                    |                   |                |
| 2<br>(Decomposition)      |                    |                   |                |
| 3 (Single<br>Replacement) |                    |                   |                |
| 4 (Double<br>Replacement) |                    |                   |                |
| 5 (Neutralization)        |                    |                   |                |

**Analysis Questions:**

1. Choose one ambiguous reaction and defend your classification using evidence and the balanced equation.
2. Explain how your balanced equations reflect the law of conservation of mass for one reaction you performed.
3. Predict products and classification for  $\text{AgNO}_3(\text{aq}) + \text{NaCl}(\text{aq}) \rightarrow ?$ . Justify.

**Conclusion (CER):**

1. **Claim:** State which reaction types you confirmed and identify the type for each reaction performed.
2. **Evidence:** Cite specific observations (e.g., precipitate formed, gas evolved) and your balanced equations.
3. **Reasoning:** Explain why those evidences align with each classification using reaction patterns and particle models.
4. **Error/Improvement:** Identify a limitation (e.g., ambiguous evidence) and propose a follow-up test to disambiguate.

## Lab 5: Reaction Types — Evidence, Balancing, Classification — Rubric

*Weights: Only Analysis & Explanations (×2) and Conclusion (×2) are doubled.*

| Criterion                    | 1  | 2  | 3  | 4   | 5   |
|------------------------------|--|--|--|---|---|
| Preparation & Safety         | Unprepared; reminders; unsafe behaviors observed.                  | Partially prepared; inconsistent safety; multiple reminders. | Prepared; follows safety; few reminders.             | Models safe practice; assists peers; anticipates risks.                 | Exemplary; proactive safety leadership; mitigates hazards.                          |
| Data & Observations          | Sparse/incorrect; missing key evidence.                            | Basic evidence only; limited specificity.                    | Complete observations; sufficient evidence recorded. | Detailed comparisons across reactions; anomalies flagged.               | Exceptional precision; evidence directly supports classifications.                  |
| Analysis & Explanations (×2) | Incorrect/irrelevant; lacks connection to equations.               | Partial reasoning; weak links to equations or evidence.      | Correct reasoning with appropriate support.          | Strong reasoning; addresses anomalies and limitations.                  | Insightful analysis; integrates evidence and equations convincingly.                |
| Conclusion (×2)              | No/weak claim; unsupported.  | Vague claim; minimal evidence.                               | Clear claim with some support.                       | Well-supported claim; multiple data points cited.                       | Compelling claim; precise evidence & reasoning; generalizes appropriately.          |
| Clarity & Mechanics          | Disorganized; frequent grammar/format issues impede understanding. | Partly organized; several errors; hard to follow at times.   | Generally clear; minor errors; readable structure.   | Well organized; concise; almost no errors; visuals/tables support text. | Polished, professional scientific writing; precise vocabulary; flawless formatting. |