**LAB 13: Types of Chemical Reactions**

**Goal of the lab:** Identify 5 different types of chemical reactions based on your observations and draw particle diagrams to represent these reactions.

**Background info:**

Chemical reactions are written as equations in the format: Reactants 🡪 Products

A hydrate is a compound in which water molecules are chemically bound to another compound or element.

**Materials and Equipment**

Burner zinc (Zn)

Crucible tongs copper wire (Cu)

Microspatula copper (II) sulfate 5 H2O (CuSO4 5H2O)

Test tubes silver nitrate (AgNO3)

Test tube holder sodium chloride (NaCl)

Test tube rack 6M Hydrochloric acid (HCl)

Wood splints

Safety goggles

Graduated cylinder

**Pre-lab questions:**

1. What is the goal of the lab?

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1. Finish the products of the particle diagram for the balanced equation: 2H2 + O2 🡪 2H2O.

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| --- | --- |
| **Particle Diagrams for Reactants** | **Particle Diagrams for Products** |
|  |  |
| KEY: |  |  |

1. What is a hydrate?

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**Procedure:**

Safety precautions:

* Tie long hair back.
* Wear goggles.
* Be cautious near hot items and use Hot Hands or tongs if necessary.

There are 5 stations with different reactions at each. As you rotate through the stations, follow the directions to complete each reaction.

**Reaction A**

1. Record your observations on the appearance of the copper wire below.

2. Using the crucible tongs, hold the wire in the hottest part of a burner for 1-2 minutes. Examine the wire and note any change in its appearance caused by heating. Record your observations below.

|  |  |  |
| --- | --- | --- |
| \_\_\_ Cu (s) + \_\_\_ O2 (g) | 🡢 | \_\_\_ CuO (s) |

3. Type of reaction: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
|  **2 Observations Before Reaction** | **2 Observations After Reaction** |
| **1.** **2.**  | **1.** **2.**  |

4. Balance the equation above. Then draw the correct number of each reactant and product as a particle diagram below.

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| **Particle Diagrams for Reactants** | **Particle Diagrams for Products** |
|  |  |
| KEY: |  |  |

**Reaction B**

1. Place a small amount (a small scoop) of hydrated copper (II) sulfate into a small test tube. Record the appearance of the copper (II) sulfate.

2. Heat the hydrate over a Bunsen burner until the chemical reaction is complete (the reaction should be obvious). Note any changes in its appearance caused by heating and record your observations below.

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| --- | --- | --- |
| \_\_\_\_\_CuSO4•5H2O(s) | 🡢 | \_\_\_\_\_ CuSO4 (s) + \_\_\_\_\_ H2O(g) |

3. Type of reaction: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| --- | --- |
|  **2 Observations Before Reaction** | **2 Observations After Reaction** |
| **1.** **2.**  | **1.** **2.**  |

4. Balance the equation above. Then draw the correct number of each reactant and product as a particle diagram below.

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| **Particle Diagrams for Reactants** | **Particle Diagrams for Products** |
|  |  |
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**Reaction C**

1. Place a small piece of zinc into a small test tube. Add enough dilute hydrochloric acid (HCl) to just cover the piece of zinc. Record the appearance of each before adding them together.

2. Note the appearance after they have reacted and record your observations below.

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| --- | --- | --- |
| \_\_\_\_\_ Zn (s) + \_\_\_\_\_ HCl (aq) | 🡢 | \_\_\_\_\_\_ ZnCl2 (s) + \_\_\_\_\_\_ H2(g) |

3. Type of reaction: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| --- | --- |
|  **2 Observations Before Reaction** | **2 Observations After Reaction** |
| **1.** **2.**  | **1.** **2.**  |

4. Balance the equation above. Then draw the correct number of each reactant and product as a particle diagram below.

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| **Particle Diagrams for Reactants** | **Particle Diagrams for Products** |
|  |  |
| KEY: |  |  |

**Reaction D**

1. Place 10 drops of AgNO3 into a test tube. Add 10 drops of NaCl to the same test tube. Record your observations on the appearance of each before adding them together.

2. Note the appearance after they have reacted and record your observations below.

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| --- | --- | --- |
| \_\_\_\_ AgNO3(aq) + \_\_\_\_ NaCl (aq) | 🡢 | \_\_\_\_\_ AgCl (s) + \_\_\_\_\_ NaNO3 (aq) |

3. Type of reaction: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| --- | --- |
|  **2 Observations Before Reaction** | **2 Observations After Reaction** |
| **1.** **2.**  | **1.** **2.**  |

4. Balance the equation above. Then draw the correct number of each reactant and product as a particle diagram below.

|  |  |
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| **Particle Diagrams for Reactants** | **Particle Diagrams for Products** |
|  |  |
| KEY: |  |  |

**Reaction E**

1. Attach the Bunsen burner to the gas valve and turn the gas valve on. Note the appearance and smell of the methane gas by WAFTING and record your observations below.
2. Light the Bunsen burner. Note what happens during the reaction and record your observations below.

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| --- | --- | --- |
| \_\_\_\_ CH4 (g) + \_\_\_\_ O2 (g) | 🡢 | \_\_\_\_ CO2 (g) + \_\_\_\_\_ H2O (g) |

3. Type of reaction: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
|  **2 Observations Before Reaction** | **2 Observations After Reaction** |
| **1.** **2.**  | **1.** **2.**  |

4. Balance the equation above. Then draw the correct number of each reactant and product as a particle diagram below.

|  |  |
| --- | --- |
| **Particle Diagrams for Reactants** | **Particle Diagrams for Products** |
|  |  |
| KEY: |  |  |

**Post-lab questions:**

For reactions A through E, how do you know chemical changes occurred based on your observations? Give specific evidence for each reaction.

A: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

B: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

C: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

D: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

E: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_