

Lab 2: Types of Reactions

Objectives:

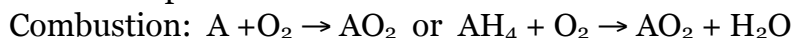
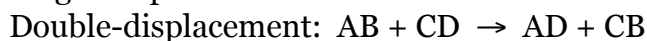
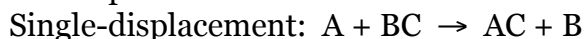
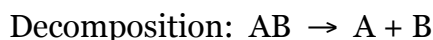
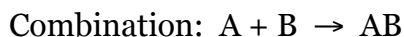
1. Observe changes in chemical and physical properties during a variety of chemical reactions
2. Write balanced chemical equations for all reactions carried out
3. Identify type of reaction carried out (some may be more than one type)

Skills:

- Develop chemical reaction observational technique
- Handle chemicals safely, both solid and solution form

Background:

A chemical reaction consists of reactants and products. The reactants are what you start with (also called starting materials) and the products are the new compounds that form during the reaction. From section 5.3 of your text chemical reactions can be classified into five general categories: (1) **Combination** (2) **Decomposition** (3) **Single displacement** (4) **Double displacement** (metathesis) (5) **Combustion**. These reaction types can be represented by generic chemical equations as follows:



Within the above categories, reactions can be further categorized as **precipitation** or redox (**oxidation-reduction**) reactions (section 5.4 of your text). During a precipitation reaction, an insoluble solid (precipitate) is formed as a product. A redox reaction occurs when electrons are exchanged between the reactants. In addition, reactions can be classified as **exothermic** (releasing heat) or **endothermic** (consuming heat). In this lab you will carry out various reactions and make careful observations about what you see. In the data report you will express them as balanced chemical equations and determine what type of reaction has taken place.

Evidence for reactions are: (a) precipitate formation, (b) gas evolution, (c) pH change, (d) heat released or absorbed, and (e) color change. Some of these don't always indicate reaction, but usually do. Look for each of them in each reaction.

Pre-Lab (due Thursday, January 22):

1. List the hazardous chemicals (there are at least *seven*) we will be working with and what hazards (e.g., explosive, toxic, etc.) they pose. Please cite the reference work you used to determine these hazards (if it's a book, cite the author, title, publisher, publication date; if it's a website, cite the company or organization that sponsors the website, the URL and the last update date; if it's an MSDS, cite which company wrote it and the date on the MSDS).

Safety Notes:

- Handle all chemicals carefully (rinse them off your skin immediately)
- Take only the amount of chemicals that you need and never put unused chemicals back into the reagent bottle
- Discard all used or leftover chemicals in the waste containers provided (**do not pour any chemicals down the sink and** do not put your rinse water in the waste)
- Clean up any spills immediately and clean up everything when finished

Procedure:

Carry out the following reactions. For each reaction, **carefully write down all observations** (color change, gas evolution, formation of a precipitate, or temperature change) below the appropriate reaction on the pages you created for the pre-lab. Your observations will be turned in and graded along with the data sheet.

Use *clean, dry* test tubes for the reactions.

The reactions:

First reaction: Burn a piece of Mg strip by holding it with tongs and lighting it with a gas burner. The product should be placed in the solid waste container after it is cool.

Second reaction: Wet a piece of pH paper and hold it over, but not touching, an open bottle of conc. ammonium hydroxide (NH₄OH). **Recap the bottle** and throw the pH paper in the trash.

Third reaction: Place a piece of Mg strip in a test tube containing 2.0 M HCl. When you are finished, pour the solution into the liquid waste.

Fourth reaction: Mix equal volumes of 2.0 M HCl and 2.0 M AgNO₃. When you are finished, pour the solution into the liquid waste.

Fifth reaction: Measure the pH of 0.1 M HCl and 0.1 M NaOH by dropping one drop of each on different spots on a piece of wet pH paper. **Do not dip the paper into the solution!** Compare the color of the spots to the chart with the pH paper to determine pH. Then mix equal volumes of the two solutions and stir well with a stirring rod. Use the stirring rod to place a drop of the mixture on a fresh area on the pH paper and record the pH. When you are finished, pour the solution into the liquid waste and throw away the pH paper.

Sixth reaction: Add a small amount of solid CaCO₃ to a test tube containing 2.0 M HCl. When you are finished, pour the solution into the liquid waste.

Seventh reaction: Place a small piece of copper in a test tube containing 2.0 M ZnSO₄. When you are finished, pour the solution into the liquid waste.

Eighth reaction: Place a small piece of zinc in a test tube containing 2.0 M CuSO₄. When you are finished, pour the solution into the liquid waste.

Lab 2 data sheet (due a week after the lab is done)

Data: For each reaction, list **all the evidence** for reaction that you observed (see a through e in the introduction). For each reaction write the **balanced chemical equation**. For each reaction, list **all** types of reaction that apply (yes, I'm implying that *some* of the reactions are more than one type): Combination, decomposition, single displacement, double displacement, combustion.

Reaction 1

Evidence of reaction (observations):

Balanced chemical equation:

Type (or types) of reaction:

Reaction 2

Evidence of reaction (observations):

Balanced chemical equation:

Type (or types) of reaction:

Reaction 3

Evidence of reaction (observations):

Balanced chemical equation:

Type (or types) of reaction:

Reaction 4

Evidence of reaction (observations):

Balanced chemical equation:

Type (or types) of reaction:

Reaction 5

Evidence of reaction (observations):

Balanced chemical equation:

Type (or types) of reaction:

Reaction 6

Evidence of reaction (observations):

Balanced chemical equation:

Type (or types) of reaction:

Reaction 7

Evidence of reaction (observations):

Balanced chemical equation:

Type (or types) of reaction:

Reaction 8

Evidence of reaction (observations):

Balanced chemical equation:

Type (or types) of reaction: