

Chemistry
Laboratory Activity
Types of Chemical Reactions

Background

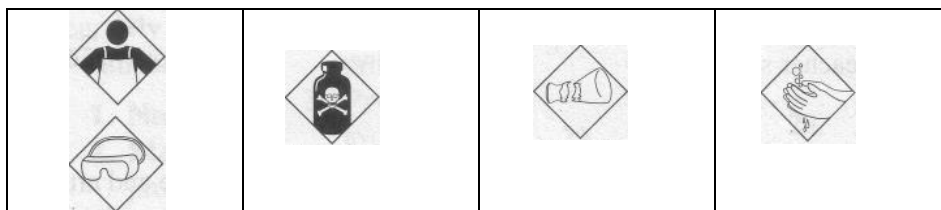
Chemists classify chemical reactions in order to organize the many reactions that occur daily in living things, laboratories, and industry. Knowing the categories of chemical reactions can help you remember and understand them. It also can help you recognize patterns and predict the products of many chemical reactions.

Chemists classify reactions in different ways. One way is to distinguish among five types of chemical reactions: synthesis, combustion, decomposition, single-replacement, and double-replacement reactions.

Objectives

The purpose of this lab activity is to represent three chemical reactions on the three levels: Macroscopic, Microscopic, and Symbolic.

Safety



Materials

3 x Mg ribbons	A solution of Sodium Hydroxide (1M)
Copper wire	A solution of Hydrochloric acid (1M)
Stand and 4 clamps	A solution of silver nitrate (0.1M)
3% solution of hydrogen peroxide	Manganese Dioxide
beakers	Four test tubes
Wooden splint	Distilled Water
Lighter	Thermometer

Procedure I (Demonstration)

1. Using a metallic clamp, hold a magnesium ribbon and ignite it.

Description of the reaction	Burning a Magnesium Ribbon
Visible Sign	
Macroscopic Level	<ul style="list-style-type: none">- The appearance of a strong white light.- The appearance of a white solid.
Microscopic Level	
Symbolic Level	
Type of the Reaction	

Procedure II

1. Place a magnesium ribbon in a test tube.
2. Add approximately 5.0 cm³ of hydrochloric acid (HCl) solution to the tube.

Note:

- Ionic compounds containing the chloride ions are water soluble with group 2 elements.
- Mg belongs to group 2.

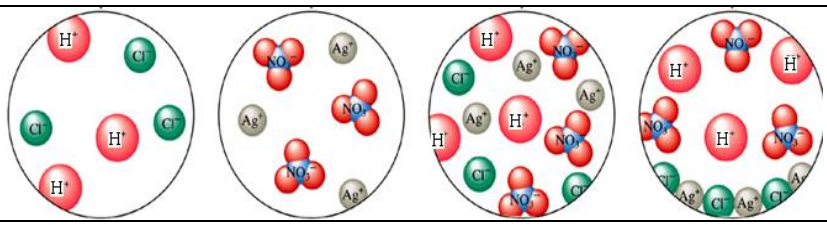
Description of the reaction	Reaction of Magnesium with Hydrochloric Acid
Visible Sign	
Macroscopic Level	
Microscopic Level	
Symbolic Level	
Type of the Reaction	This is a single replacement reaction that follows the general form $A + BC \rightarrow AC + B$

Procedure III

1. Add approximately 5.0 cm³ of hydrochloric acid (HCl) solution to a test tube
2. To the same test tube, add approximately 5.0 cm³ of silver nitrate (AgNO₃) solution

Note:

- Ionic compounds containing the silver ion are insoluble in water except when combined with the nitrate ion.
- All nitrates are soluble in water.

Description of the reaction	Reaction of Silver Nitrate with Hydrochloric Acid
Visible Sign	
Macroscopic Level	
Microscopic Level	
Symbolic Level	
Type of the Reaction	

Procedure IV

1. Add approximately 8.0cm³ of hydrogen peroxide H₂O₂ into a test tube.
2. Add few grams of manganese dioxide (MnO₂) to the tube.
3. Light a wooden splint, and then blow it out. While it is still glowing, place it next to the test tube.

Note:

- Manganese dioxide is a catalyst in this reaction.

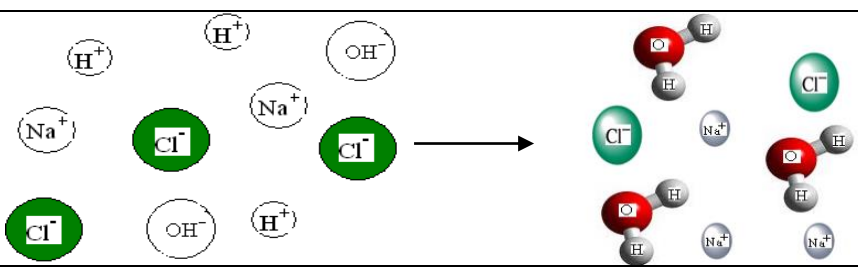
Description of the reaction	Decomposition of Hydrogen Peroxide
Visible Sign	
Macroscopic Level	
Microscopic Level	
Symbolic Level	$2 \text{H}_2\text{O}_2 (\text{aq}) \xrightarrow{\text{catalyst: MnO}_2} 2 \text{H}_2\text{O} (\text{l}) + \text{O}_2 (\text{g})$
Type of the Reaction	

Procedure V

1. Add approximately 20.0cm³ of hydrochloric acid in a 100ml beaker.
2. Immerse the thermometer in the acidic solution. Record the temperature.
3. Add approximately 20.0cm³ of sodium hydroxide solution into the 100ml beaker.
4. Immerse the thermometer in the obtained solution. Record the temperature.

Note:

- Ionic compounds that contain the Na⁺ ions are water soluble.

Description of the reaction	Reaction of hydrochloric acid with potassium hydroxide
Visible Sign	
Macroscopic Level	
Microscopic Level	
Symbolic Level	
Type of the Reaction	

Procedure VI

1. Add approximately 20.0cm³ of silver nitrate in a 100ml beaker
2. Immerse the copper wire into the silver nitrate solution.

Note:

- All nitrates are soluble in water.
- The copper (II) ions have a blue color in solution

Description of the reaction	Reaction of Copper solid with Silver Nitrate
Visible Sign	
Macroscopic Level	<ul style="list-style-type: none">- The appearance of silver metal.- The appearance of blue color.
Microscopic Level	
Symbolic Level	
Type of the Reaction	

