Forming New Substances

Objectives

- **Describe** how chemical reactions produce new substances that have different chemical and physical properties.
- **Identify** four signs that indicate that a chemical reaction might be taking place.
- **Explain** what happens to chemical bonds during a chemical reaction.

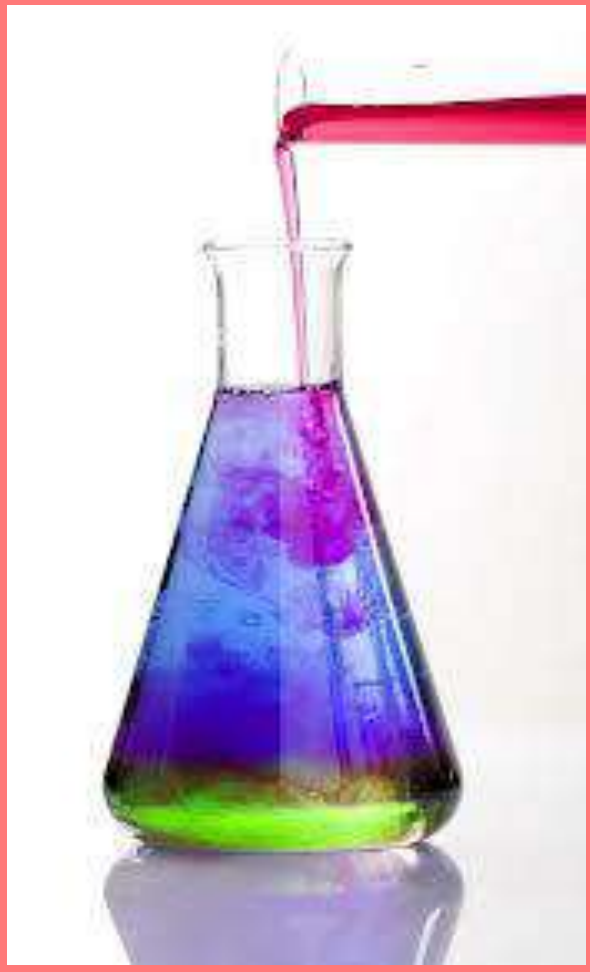
I. Chemical Reactions

A. Signs of Chemical Reactions In some chemical reactions, gas bubbles form. Other reactions form solid precipitates. A precipitate is a solid substance that is formed in a solution. During other chemical reactions, energy is given off. This energy may be in the form of light, thermal energy, or electricity.

B. **A Change of Properties** The most important sign is the formation of new substances that have different properties.

II. Bonds: Holding Molecules Together

A. Breaking and Making Bonds How do new substances form in a chemical reaction? First, chemical bonds in the starting substances must break. The atoms then rearrange, and new bonds form to make the new substances. The next slide shows how bonds break and form in the reaction between hydrogen and chlorine.



B. **New Bonds, New Substances** When chlorine gas and hydrogen gas react, the bonds between the hydrogen atoms and chlorine atoms break. A new bond forms between each hydrogen and chlorine atom. A new substance, hydrogen chloride, is formed.

Reaction of Hydrogen and Chlorine

hydrogen + chlorine → **hydrogen chloride**

Breaking Bonds Hydrogen and chlorine are diatomic. Diatomic molecules are two atoms bonded together. The bonds joining these atoms must first break before the atoms can react with each other.

Making Bonds A new substance, hydrogen chloride, forms as new bonds are made between hydrogen atoms and chlorine atoms.

Chemical Reactions

- Decomposition of hydrogen peroxide by potassium permanganate
- Potassium iodide,water, and hydrogen peroxide 30% (perhydrol) mixed with the dishwashing liquid