

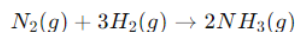
21.7: Real-World Examples of Chemical Reactions and Their Types

Real-World Examples of Chemical Reactions and Their Types

1. Synthesis Reaction: Formation of Ammonia

Scenario: The industrial production of ammonia (NH_3) through the Haber process is a crucial chemical reaction used to manufacture fertilizers.

Chemical Reaction:

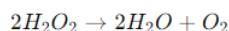


Explanation: In this synthesis reaction, nitrogen gas (N_2) combines with hydrogen gas (H_2) to form ammonia (NH_3). This process is critical for producing fertilizers that support global agriculture.

2. Decomposition Reaction: Decomposition of Hydrogen Peroxide

Scenario: Hydrogen peroxide (H_2O_2) is commonly used as a disinfectant and bleach. It decomposes over time or when catalyzed by an enzyme called catalase.

Chemical Reaction:

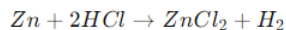


Explanation: In this decomposition reaction, hydrogen peroxide breaks down into water (H_2O) and oxygen gas (O_2). This reaction is utilized in disinfecting wounds, where the oxygen released helps kill bacteria.

3. Single Replacement Reaction: Zinc and Hydrochloric Acid

Scenario: Zinc (Zn) is often used in galvanizing processes to protect iron from rusting. When zinc reacts with hydrochloric acid (HCl), it demonstrates a single replacement reaction.

Chemical Reaction:

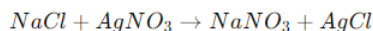


Explanation: In this single replacement reaction, zinc displaces hydrogen in hydrochloric acid, forming zinc chloride (ZnCl_2) and releasing hydrogen gas (H_2). This reaction can be observed in laboratory demonstrations involving metal-acid reactions.

4. Double Replacement Reaction: Reaction Between Sodium Chloride and Silver Nitrate

Scenario: A classic laboratory experiment involves mixing sodium chloride (NaCl) and silver nitrate (AgNO_3) to observe the formation of a precipitate.

Chemical Reaction:

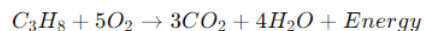


Explanation: In this double replacement reaction, the cations and anions of the reactants exchange places, forming sodium nitrate (NaNO_3) and silver chloride (AgCl). The silver chloride forms a white precipitate, demonstrating the reaction visually.

5. Combustion Reaction: Burning of Propane

Scenario: Propane (C_3H_8) is commonly used as a fuel for heating, cooking, and in portable stoves.

Chemical Reaction:



Explanation: In this combustion reaction, propane reacts with oxygen (O_2) to produce carbon dioxide (CO_2), water (H_2O), and energy in the form of heat and light. This exothermic reaction is essential for everyday heating and cooking applications.

Summary

These real-world examples illustrate the different types of chemical reactions: synthesis, decomposition, single replacement, double replacement, and combustion. Each type of reaction plays a vital role in various industrial, laboratory, and everyday processes, showcasing the diverse and impactful nature of chemical transformations.

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