Classifying Chemical Reactions Worksheet Answer Key PDF

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Part 1: Building a Foundation

Which of the following is a synthesis reaction?

undefined. A) $2H_2 + O_2 \rightarrow 2H_2O$ ✓

undefined. A) $2H_2O \rightarrow 2H_2 + O_2$

undefined. A) $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

undefined. A) $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$

A synthesis reaction combines multiple reactants to form one product.

Which of the following statements are true about decomposition reactions? (Select all that apply)

undefined. A) They involve the breakdown of a compound into simpler substances. ✓

undefined. A) They always require oxygen.

undefined. A) They can produce multiple products. ✓

undefined. A) They are the reverse of synthesis reactions. ✓

Decomposition reactions involve breaking down compounds into simpler substances, and they can produce multiple products.

Describe what occurs during a single replacement reaction and provide an example.

In a single replacement reaction, one element displaces another in a compound, resulting in a new element and a new compound.

List the general equations for the following reaction types:

1. Synthesis Reaction

$A + B \rightarrow AB$

2. Decomposition Reaction

$AB \rightarrow A + B$

3. Combustions Reaction

$Hydrocarbon + O_2 \rightarrow CO_2 + H_2O$

The general equations for the reaction types are: Synthesis: $A + B \rightarrow AB$; Decomposition: $AB \rightarrow A + B$; Combustions: $Hydrocarbon + O_2 \rightarrow CO_2 + H_2O$.

Part 2: Understanding and Interpretation

In a double replacement reaction, what typically forms as a result of the reaction?

undefined. A) A single new compound

undefined. A) A precipitate or gas ✓

undefined. A) Only elements

undefined. A) No new substances

Double replacement reactions typically produce a precipitate or gas as one of the products.

Which of the following are indicators of a chemical reaction? (Select all that apply)

undefined. A) Color change ✓

undefined. A) Formation of a precipitate ✓

undefined. A) Melting of ice

undefined. A) Gas production ✓

Indicators of a chemical reaction include color change, formation of a precipitate, and gas production.

Explain why balancing chemical equations is necessary and describe the principle it is based on.

Balancing chemical equations is necessary to ensure that the number of atoms of each element is conserved, based on the law of conservation of mass.

Part 3: Application and Analysis

Which reaction type is most likely occurring in the following scenario: A metal is placed in an acid solution, and hydrogen gas is released.

undefined. A) Synthesis

undefined. A) Decomposition

undefined. A) Single Replacement ✓

undefined. A) Double Replacement

The scenario describes a single replacement reaction where a metal displaces hydrogen from an acid.

Given the reaction: $2Na + Cl_2 \rightarrow 2NaCl$, identify the type of reaction and its characteristics. (Select all that apply)

undefined. A) Synthesis ✓

undefined. A) Involves a metal and a non-metal ✓

undefined. A) Produces a compound ✓

undefined. A) Requires an acid

This reaction is a synthesis reaction involving a metal and a non-metal, producing a compound.

Provide a real-world example of a combustion reaction and describe the reactants and products involved.

A common example of a combustion reaction is the burning of propane, where propane and oxygen react to produce carbon dioxide and water.

In the reaction $2H_2O_2 \rightarrow 2H_2O + O_2$, what is the role of hydrogen peroxide?

undefined. A) Reactant ✓

undefined. A) Product

undefined. A) Catalyst

undefined. A) Precipitate

In this reaction, hydrogen peroxide acts as a reactant that decomposes to form water and oxygen.

Analyze the following reaction: $Cu + 2AgNO_3 \rightarrow 2Ag + Cu(NO_3)_2$. Which of the following statements are true? (Select all that apply)

undefined. A) Copper is oxidized. ✓

undefined. A) Silver is reduced. ✓

undefined. A) This is a double replacement reaction.

undefined. A) Nitrate ions are spectator ions. ✓

In this reaction, copper is oxidized and silver is reduced, indicating a redox reaction.

Compare and contrast single and double replacement reactions, focusing on the differences in their processes and outcomes.

Single replacement reactions involve one element replacing another, while double replacement reactions involve the exchange of ions between two compounds.

Part 4: Evaluation and Creation

Which reaction type is most efficient for producing large quantities of a compound in industry?

undefined. A) Synthesis ✓

undefined. A) Decomposition

undefined. A) Single Replacement

undefined. A) Combustions

Synthesis reactions are typically the most efficient for producing large quantities of compounds in industry.

Evaluate the following scenarios and determine which involve a redox reaction. (Select all that apply)

undefined. A) Rust of iron ✓

undefined. A) Dissolving sugar in water

undefined. A) Burning of natural gas ✓

undefined. A) Photosynthesis in plants ✓

Redox reactions involve the transfer of electrons, such as in rust formation, combustion, and photosynthesis.

Design an experiment to demonstrate a decomposition reaction, detailing the materials, procedure, and expected results.

An experiment could involve heating calcium carbonate to produce calcium oxide and carbon dioxide, demonstrating a decomposition reaction.

Propose a balanced chemical equation for the following scenarios:

1. The reaction of magnesium with hydrochloric acid.

$Mg + 2HCl \rightarrow MgCl_2 + H_2$

2. The combustion of propane in oxygen.

$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

The balanced equations are: $Mg + 2HCl \rightarrow MgCl_2 + H_2$ for magnesium with hydrochloric acid; $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$ for the combustion of propane.