Counting Atoms Worksheet

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Part 1: Building a Foundation

What does the subscript '2' indicate in the chemical formula H_2O?

Hint: Think about what the subscript represents in a chemical formula.

- ◯ A) Two molecules of water
- ◯ B) Two atoms of hydrogen
- ◯ C) Two atoms of oxygen
- ◯ D) Two moles of water

Which of the following are polyatomic ions?

Hint: Recall the definitions of polyatomic ions.

- ☐ A) NO_3^-
- ☐ B) Cl^-
- ☐ C) SO_4^{2-}
- ☐ D) H_2O

Explain the role of coefficients in a chemical equation and how they differ from subscripts.

Hint: Consider how coefficients affect the number of molecules in a reaction.

List the chemical symbols for the following elements:

Hint: Think about the periodic table.

1. Oxygen

2. Sodium

3. Carbon

4. Iron

Part 2: Understanding and Interpretation

In the formula $Ca(OH)_2$, how many oxygen atoms are present?

Hint: Consider how the parentheses affect the count of atoms.

- ◯ A) 1
- ◯ B) 2
- ◯ C) 3
- ◯ D) 4

Which statements are true about the formula $2H_2O$?

Hint: Think about what the coefficients and subscripts indicate.

- ☐ A) It contains two molecules of water.
- ☐ B) It contains four hydrogen atoms in total.
- ☐ C) It contains two oxygen atoms in total.
- ☐ D) It represents two moles of water.

Describe how parentheses are used in chemical formulas and provide an example.

Hint: Consider how parentheses group atoms in a formula.

Part 3: Application and Analysis

If you have 3 moles of $Al_2(SO_4)_3$, how many sulfur atoms do you have in total?

Hint: Consider how to calculate the total number of sulfur atoms from the formula.

- ◯ A) 3
- ◯ B) 6
- ◯ C) 9
- ◯ D) 12

Given the reaction: $2H_2 + O_2 \rightarrow 2H_2O$, which of the following are true?

Hint: Analyze the reactants and products in the reaction.

- ☐ A) The reaction produces two molecules of water.
- ☐ B) Four hydrogen atoms are consumed.
- ☐ C) Two oxygen atoms are consumed.
- ☐ D) The total number of oxygen atoms remains the same.

Calculate the total number of atoms in one molecule of $C_6H_{12}O_6$ and explain your process.

Hint: Consider how to count the atoms based on the subscripts.

Which of the following correctly describes the composition of $(NH_4)_2CO_3$?

Hint: Analyze the subscripts and coefficients in the formula.

- ◯ A) 2 nitrogen, 8 hydrogen, 1 carbon, 3 oxygen
- ◯ B) 1 nitrogen, 4 hydrogen, 1 carbon, 3 oxygen
- ◯ C) 2 nitrogen, 4 hydrogen, 1 carbon, 3 oxygen
- ◯ D) 2 nitrogen, 8 hydrogen, 2 carbon, 3 oxygen

Part 4: Evaluation and Creation

Evaluate the following statements about chemical reactions. Which are true?

Hint: Consider the principles of chemical reactions.

- ☐ A) Atoms are rearranged during a chemical reaction.
- ☐ B) The total mass of reactants equals the total mass of products.
- ☐ C) New atoms are created in a chemical reaction.
- ☐ D) Chemical reactions can change the type of atoms present.

Explain how the law of conservation of mass applies to the chemical equation: $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$.

Hint: Consider the number of atoms on both sides of the equation.

Design a simple experiment to demonstrate the conservation of mass using household materials. Describe the materials, procedure, and expected outcome.

Hint: Think about a reaction that can be easily observed.