

## Word & Formula Equations

A properly written chemical equation can summarize any chemical change. To have a properly written chemical equation all reactants and products must be identified and known to be true from lab studies or references. The chemical equation must contain the correct formulas for reactants and products. Lastly, the law of conservation of mass must be upheld. This law states that atoms are neither created nor destroyed in a chemical reaction. (More on the law of conservation of mass later!)

**Word equations** are qualitative equations where the reactants and products in a chemical reaction are represented by words. Word equations do not give us the quantities of reactants or products formed; however, they are the first step to correctly identifying the known facts of a chemical equation - the reactants and the products.

**Formula equations** represent the reactants and products by their symbols or formulas. These equations should include symbols for physical states (g, l, s, aq).

**Example:** Solid sodium combines with chlorine gas to produce solid sodium chloride.

Word Eqn: sodium + chlorine gas  $\rightarrow$  sodium chloride

Formula Eqn:  $\text{Na}_{(s)} + \text{Cl}_{2(g)} \rightarrow \text{NaCl}_{(s)}$

**Directions:** Write the word equation and the formula equation for each question below.

1. Solid sodium oxide is added to water at room temperature and forms sodium hydroxide.

Word Eqn: sodium oxide + water  $\rightarrow$  sodium hydroxide

Formula Eqn:  $\text{Na}_2\text{O}_{(s)} + \text{H}_2\text{O}_{(l)} \rightarrow \text{NaOH}_{(aq)}$

2. Solid aluminum metal reacts with aqueous zinc chloride to produce solid zinc metal and aqueous aluminum chloride.

Word Eqn: aluminum + zinc chloride  $\rightarrow$  zinc + aluminum

Formula Eqn:  $\text{Al}_{(s)} + \text{ZnCl}_{2(aq)} \rightarrow \text{Zn}_{(s)} + \text{AlCl}_{3(aq)}$  chloride

3. Zinc reacts with aqueous hydrochloric acid to produce a solution of zinc chloride and hydrogen gas.

Word Eqn: zinc + hydrochloric acid  $\rightarrow$  zinc chloride + hydrogen

Formula Eqn:  $\text{Zn}_{(s)} + \text{HCl}_{(aq)} \rightarrow \text{ZnCl}_{2(aq)} + \text{H}_2(g)$

4. Solid iron (III) oxide and carbon monoxide produce solid iron and carbon dioxide gas.

Word Eqn: Iron(III) oxide + carbon monoxide  $\rightarrow$  IRON + carbon dioxide

Formula Eqn:  $\text{Fe}_2\text{O}_3_{(s)} + \text{CO}_{(g)} \rightarrow \text{Fe}_{(s)} + \text{CO}_2(g)$

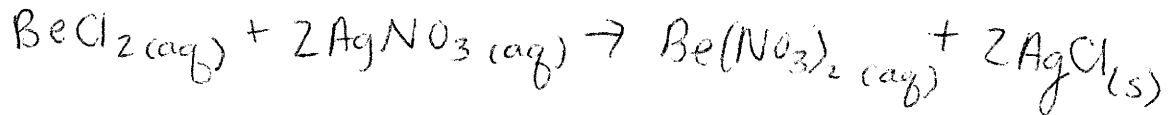
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Word Equations Worksheet

Write the **word equation** and **formula equation** for each of the following chemical reactions:

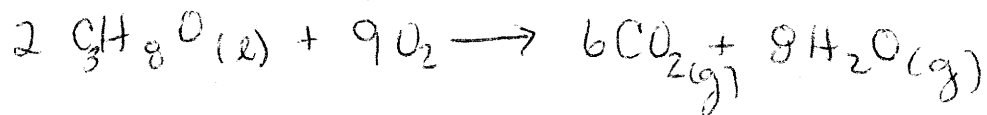
- 1) When dissolved beryllium chloride reacts with dissolved silver nitrate in water, aqueous beryllium nitrate and silver chloride powder are made.

Beryllium chloride + silver nitrate  $\rightarrow$  beryllium nitrate + silver chloride



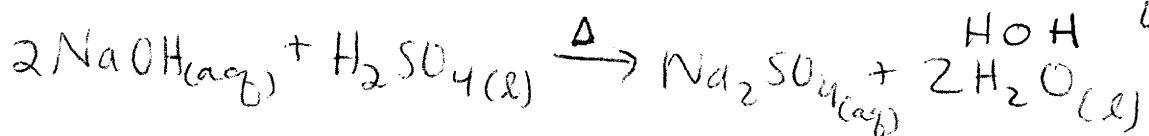
- 2) When isopropanol ( $\text{C}_3\text{H}_8\text{O}$ ) burns in oxygen, carbon dioxide, water, and heat are produced.

isopropanol + oxygen  $\rightarrow$  carbon dioxide + water



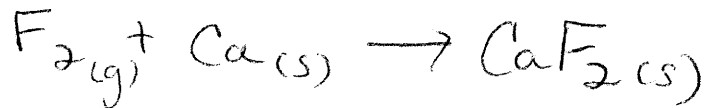
- 3) When dissolved sodium hydroxide reacts with sulfuric acid ( $\text{H}_2\text{SO}_4$ ), aqueous sodium sulfate, water, and heat are formed.

sodium hydroxide + sulfuric acid  $\rightarrow$  sodium sulfate + water



- 4) When fluorine gas is put into contact with calcium metal at high temperatures, calcium fluoride powder is created in an exothermic reaction.

Fluorine + calcium  $\rightarrow$  calcium fluoride



- 5) When sodium metal reacts with iron (II) chloride, iron metal and sodium chloride are formed.

Sodium + iron(II) chloride  $\rightarrow$  iron + sodium chloride

