Chemistry Lecture #45: Creating Balanced Equations from Sentences

To create balanced equations from sentences, you need to be knowledgeable and proficient in several topics that have already been covered. You need to have the names and formulas of common polyatomic ions memorized (lecture #34). You need to be able to write the formula of an ionic compound from its name (lecture #35). And you need to be able to write the formula of a covalent compound from its name (lecture #38). I encourage you to review these lectures before you proceed with lecture #45.

You'll need to be able to convert a sentence into a balanced equation. To illustrate, we'll convert the following sentence: Solid iron and chlorine gas react to form iron (III) chloride.

How do you change the words into chemical formulas? Here are some guidelines to help you write balanced equations from sentences.

1. Br I N Cl H O F: These elements exist as diatomic molecules. Thus, bromine exists as Br_2, iodine exists as I_2 and so on. If you see the word "bromine," you'd write "Br_2."

2. For solid metal elements, such as iron, sodium, chromium and gold, just write the symbol. Thus, iron is written as "Fe," gold is written as "Au," and so on.

3. Words describing non-ionic compounds, or molecules, have the number of each atom written in prefixes. Thus, carbon dioxide is CO_2. Review lecture #38 for more details.

4. Some formulas of common molecules need to be memorized, such as benzene (C_6H_6) and hydrogen peroxide (H_2O_2). Review lecture #38 for more details.

5. Write the formulas for ionic compounds from the information given in lectures #34 and #35.

Here's the sentence with the formulas written below the words.

Solid iron and chlorine gas form iron (III) chloride

$Fe + Cl_2 \rightarrow FeCl_3$

The balanced equation is

$2Fe + 3Cl_2 \rightarrow 2FeCl_3$

Let's do some for practice. Write balanced equations for the following reactions:

A. Sulfuric acid decomposes to form water and sulfur trioxide.

B. Calcium reacts with water to produce calcium hydroxide and hydrogen gas.

C. Chromium reacts with hydrochloric acid to make chromium (III) chloride and hydrogen.

D. Aluminum carbonate decomposes to form aluminum oxide and carbon dioxide.

ANSWERS

A. sulfuric acid → water and sulfur trioxide

$H_2SO_4 \rightarrow H_2O + SO_3$

B. calcium + water → calcium hydroxide + hydrogen

$Ca + H_2O \rightarrow Ca(OH)_2 + H_2$

$Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$

C.

Chromium +hydrochloric acid → chromium (III) chloride + hydrogen

$Cr + HCl \rightarrow CrCl_3 + H_2$

$2Cr + 6HCl \rightarrow 2CrCl_3 + 3H_2$

D.

Aluminum carbonate → aluminum oxide + carbon dioxide

$Al_2(CO_3)_3 \rightarrow Al_2O_3 + CO_2$

$Al_2(CO_3)_3 \rightarrow Al_2O_3 + 3CO_2$