**Parts of a Chemical Equation**

**Introduction**

When elements or compounds react to form something new, it is called a **chemical reaction**. We write chemical equations to show exactly what is happens when the reaction occurs. This is a sample chemical equation that shows what happens when glucose (sugar) burns:

Balanced reaction of sugar burning: C6H12O6(s) + 9O2(g) → 6CO2(g) + 6H2O(l)

The starting materials in a reaction are called the **reactants**. The elements or compounds that are formed as a result of the reaction are called **products**.

*What are the two reactants in this equation? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*What are the two products in this equation?* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The smaller numbers after some of the elements are called **subscripts**. These tell you how many atoms of that element are present in the compound. The larger numbers that come before some of the compounds and elements are called **coefficients**. These tell you how many of that specific *molecule* were reacted or produced in the equation.

Balanced reaction of sugar burning: C6H12O6(s) + 9O2(g) → 6CO2(g) + 6H2O(l)

*How many carbon atoms are present in sugar? \_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*How many hydrogen atoms are present in water? \_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*How many molecules of oxygen were reacted when the sugar was burned? \_\_\_\_\_\_\_\_\_\_\_\_\_*

*How many molecules of carbon dioxide gas were released by the reaction? \_\_\_\_\_\_\_\_\_\_\_\_*

The letters in the subscipt after each element or compound tells what state of matter it is in.

**(s)** indicates a **solid**; **(l)** indicates a **liquid;** **(g)** indicates a **gas**;

**(aq)** indicates an **aqueous solution** – something that is dissolved in water.

*What substance(s) in the sugar reaction were solid?*

*What substance(s) in the sugar reaction were liquid?*

*What substance(s) in the sugar reaction were gas?*

**Diatomic Elements**

When writing an equation, it is important to remember that some elements do not exist alone, but they pair up with other atoms of the same element. These are called **diatomic elements.** These are:

Hydrogen (H2)

Oxygen (O2)

Nitrogen (N2) **Remember these with the acronym:**

Chlorine (Cl2) **“HONCl BrIF”**

Bromine (Br2)

Iodine (I2)

Fluorine (F2)

There are two other nonmetals you should remember too:

Sulfur (S8)

Phosphorus (P4)

**Practice**

In each of the following descriptions of a chemical reaction – identify the reactants, the products, any solids, liquids, gases, or aqueous solutions.

1. Solid lithium reacts with water to produce hydrogen gas and a solution of lithium hydroxide.

*Reactants: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Products: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*Solids: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Liquids: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*Gases: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Solutions: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

1. Solid sodium reacts with gaseous chlorine to produce sodium chloride (table salt).

*Reactants: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Products: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*Solids: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Liquids: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*Gases: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Solutions: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

1. Solid calcium carbonate breaks down into carbon dioxide gas, oxygen gas, and solid calcium.

*Reactants: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Products: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*Solids: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Liquids: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*Gases: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Solutions: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

1. Solid iron sulfate and a solution of barium chloride react to form solid barium sulfate and a solution of iron chloride.

*Reactants: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Products: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*Solids: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Liquids: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*Gases: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Solutions: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

1. Solutions of hydrochloric acid and sodium hydroxide react to produce liquid water with sodium chloride dissolved in it.

*Reactants: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Products: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*Solids: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Liquids: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*Gases: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Solutions: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*