PS Chemistry

Making Models of Chemical Reactions Lab Name _____Period ___

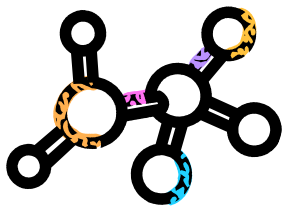
Problem: How do atoms and molecules of elements and compounds combine in chemical reactions?

Materials: Molecular Model Set, Colored Pencils

Directions: Separate the atoms by color. Each color will represent a different element. (Refer to the Data Table below). Each of the holes represents a place where the atom will bond with another atom. Bonds are formed with the wooden pegs.

Data Table:

Type of Atom	Atomic Symbol	Color of Sphere
Hydrogen	H	Yellow
Carbon	C	Black
Nitrogen	N	Blue
Oxygen	O	Red
Chlorine	Cl	Green
Copper	Cu	Purple



Procedure A:

1. Build a molecule of H_2. **How** many atoms of hydrogen do you need? ____
   Draw a diagram (with color) to show what you just made.

2. Build a molecule of Cl_2. **How** many atoms of chlorine do you need? ____
   Draw a diagram (with color) to show what you just made.

3. Using ONLY these atoms (the H_2 and Cl_2), disconnect the atoms in the molecule and produce the molecule "HCl". **Draw** this molecule.

4. If you were given one H_2 and one Cl_2, **what** is the maximum number of "HCl" molecules that could be built with these atoms? _____

5. In this "recombination" of atoms, **were** any of the atoms not used or did you need to add any extra atoms in order to make the "HCl" molecules? **Explain** how this modeling of the reaction between H_2 and Cl_2 in order to produce HCl either obeyed or did not obey the law of the conservation of matter.

   In chemistry scientists view atoms, molecules and reactions a little bit like the letters, words and sentences of a story. In this case, the atoms themselves represent the letters, the molecules (like H_2, Cl_2 and HCl) represent the words.

6. If you were going to write the "sentence" that told the story of the reaction that you just modeled in # 1-4, **what** would that sentence look like? ***(Write the equation**. Be sure to include subscripts and coefficients to show all atoms present.)*

   Draw a diagram to represent the entire reaction (be sure to include reactants and products).

Procedure B:

1. Build a molecule of N_2. How many atoms of nitrogen do you need? ____
   Draw a diagram (with color) to show what you just made.

2. Build a molecule of H_2. How many atoms of hydrogen do you need? ____
   Draw a diagram (with color) to show what you just made.

3. Ammonia (NH_3) is used in cleaning solutions and in the manufacture of fertilizers. A molecule of ammonia contains 1 nitrogen atom and 3 hydrogen atoms. Using your above molecules ONLY (the N_2 and H_2), rearrange your molecules to form a molecule of ammonia (NH_3). **Can** you make a molecule of ammonia yet? _____

   What do you need in order to complete an ammonia molecule?_____ **Where** do you think this atom is going to come from?_____

4. Make another molecule of H_2. **Draw** a diagram (with color) to show what you just made. Disconnect the atoms you just made and use them to complete your ammonia molecule. **Draw** a diagram of that as well. **Do** you have anything left over?____ If so, **what**? ____

5. A reaction is not complete unless ALL atoms have been used. (Reactions must ALWAYS obey the law of the conservation of matter—in other words, the same # of atoms on the reactant side must be on the product side.) Your goal is to complete the reaction by making another ammonia molecule. In order to make another ammonia (NH_3) and use all of your atoms, construct another molecule of H_2. **Has** every atom been used? _____

   Draw a diagram to represent the entire reaction (be sure to include reactants and products).

   Write the equation to show the reaction.

   What are the reactants? _____**What** is the product? _____

Procedure C:

(Basically you will be repeating the same procedure again for the following reaction $Cu_2O + C \rightarrow Cu + CO_2$.)

1. Build a molecule of Cu_2O. **How** many atoms of Cu do you need? ____**How** many of oxygen do you need? ____ **Draw** a diagram (with color) to show what you just made.

2. Build a molecule of C. **How** many atoms of carbon do you need? ____ **Draw** a diagram (with color) to show what you just made.

3. When the reaction occurs, the bonds break and the atoms are rearranged so that you have the copper atom by itself and the carbon is bonded to two oxygen atoms. Do you have enough atoms to make a molecule of CO_2?____ What do you need?_____

4. Build another molecule of Cu_2O. Now do you have enough atoms to make a molecule of CO_2? ____ If so, build it (CO_2). What do you have left over?_____

5. **Draw** a diagram to represent the entire reaction (be sure to include reactants and products).

   Complete the equation to show the reaction (needs coefficients). ___Cu_2O + ___C → ___Cu + ___CO_2

Analysis:

1. If you had to make 5 molecules of sulfuric acid, H_2SO_4 how many atoms of each atom do you need?
   H= _____ S=_____ O=_____

2. Balance the following equations.
   _____Xe + _____ F_2 ⟶ _____XeF_6

   _____Al_2O_3 + _____ HCl ⟶ _____$AlCl_3$ + _____H_2O