MP - Mr. Nicastro Name_______________________________
Lab Activity _______________________________
Block_____ Date_________________ _______________________________

EXPERIMENT 1: CONSTANT COMPOSITION -
The Law of Constant Proportions

Discussion:

When elements react to form (synthesize) compounds, they combine only in a definite ratio. The characteristics of this new compound can be quite different from those of the reacting elements. THIS IS VERY DIFFERENT FROM THE COMPOSTION OF MIXTURES, WHICH CAN BE FORMED IN MANY DIFFERENT WAYS.

Objective:

Since we cannot see atoms directly, the atomic model of matter may not be readily understood since it cannot be directly visualized. This experiment is designed to help you illustrate, both qualitatively and quantitatively, some aspects of it.

Materials/Equipment:

A balance.
You will be using two "elements":
You will either be given a supply of element Fs (the "atoms" of Fs are paper fasteners), and a supply of element R (the "atoms" of R are rubber rings); or,
a supply of element Nu (the "atoms" of Nu are metal nuts), and a supply of element B (the "atoms" of B are metal bolts).

Rules:

We will assume that Fs and R do not react with B or Nu.
We will assume that all "atoms" of an element are alike.

We can fit rings on fasteners, or nuts on bolts to "synthesize" a "compound" of two elements. When we do this, the number of "atoms" do not change, and their individual masses do not change. (This agrees with the atomic model.)

The prevailing rule in this activity is simply this: **you are NOT allowed to weigh or mass a <u>single</u> "atom" or "molecule"**. In future experiments that you may do in the chemistry lab, you will work with large numbers of atoms and molecules that you will not be able to see individually. In this experiment, you will illustrate the process by using many atoms at a time to make a large group of molecules. Large groups of atoms and molecules MAY be weighed (massed) on a balance.
The number (quantity) of atoms supplied and molecules synthesized *may* be determined by <u>counting</u>. This is in accordance with Avogadro's Number.

Procedure:

1. Count and record the number of "atoms" your group has been given. (This is done for inventory purposes only - please do not lose any of the "atoms" that you have been given to work with. Every group will be given a different quantity.)

2. Measure and record the mass of all the Fs (or B) that you have been given.

3. Make as much of the compound FsR (or NuB) as your supply of atoms allows by putting one ring on each fastener (or one nut on one bolt). When we write FsR (or NuB), we mean a compound made up of one atom of Fs (or B) for every atom of R (or Nu).
4. Measure and record the mass of product (either FsR or NuB) that you have synthesized. DO NOT include any "unreacted" atoms left over.

5. If you have an EXCESS of Fs (or B), find and record its mass. If none is left, its excess mass is 0.

6. How much Fs (or B) reacted with R (or Nu)?

7. Determine the ratio of the mass of "reacted" R (or Nu) to the mass of product formed in your sample of the compound. In other words:

$$\frac{\text{mass of reacted R (or Nu)}}{\text{mass of product formed}}$$

8. Compare your results (of #7) with those of your classmates who had similar elements.

9. Does the ratio of the mass of "reacted" R (or Nu) to the mass of product formed depend on the mass of the materials you were given to work with? Explain.

10. Does this model agree with the Law of Constant Proportions? Explain.

11. Would the ratio have been the same if the rings or bolts were heavier? Explain.

12. Now "decompose" the compound you made into two stacks of different atoms. (Do not include any "unreacted" atoms.) Would the mass of these atoms differ from the original mass of the elements before they reacted? What law does this demonstrate?

EXPERIMENT 2: SOME OTHER COMPOUNDS OF Fs AND R (OR Nu and B)

PART 1:
The compound FsR (or NuB) is only one of many that we can form from the elements Fs and R (or Nu and B). An entirely different compound can be made from these elements by using two atoms of R for every atom of Fs (or two atoms of Nu for every B). This new compound has the formula FsR_2. The "$_2$" in the formula means that there are two atoms of R for every atom of Fs (or two atoms of Nu for every atom of B).

1. Using your supply of atoms, make as many FsR_2 (or Nu_2B) as you can. Put aside any unreacted atoms.

2. Measure and record the mass of the product you made.

3. Now, decompose it, measure and record the total mass of Fs (or B) that combined with the total mass of R (or Nu).

4. What mass of R (or Nu) would have combined with 100 g of Fs (or 100 g of B)?

5. Using the data from Experiment 1, what mass of R (or Nu) would have combined with 100 g of Fs (or B) in FsR (or NuB)?

6. How do the quantities of R (or Nu) that combined with 100 g of Fs (or B) in the compounds FsR and FsR_2 (NuB and Nu_2B) compare? (Make a ratio of the masses of FsR_2 to FsR, or Nu_2B to NuB)

7. Does this ratio depend on the mass of the compound you made? Explain.

PART 2: (Use the original supply of atoms you started with.)
Now, follow the <u>same</u> procedure as in part 1, except make FsR_3 (or Nu_3B) instead.
After answering #'s 1 - 5, continue with the following question.

6. Compare this mass of R (or Nu) in FsR_3 (or Nu_3B) with the masses of R (or Nu) in FsR (NuB) and FsR_2 (Nu_2B).