The Bean Lab

Name:_____

The concept of the mole can be daunting. It is difficult to imagine 6.022×10^{23} items. It is also difficult to imaging working with atoms, because they are too small to see. By working with a visible manipulative, beans, the concept of working with moles can be made more tangible.

Materials:

electronic balance 12 small paper cups 6 types of dried beans goggles

Procedure:

Part 1. Determining Relative Mass

1. Create a data table to record the data you collect during the lab.

   Suggested headings: type of bean, mass of 50 beans, relative mass, number in a "pot"

2. Determine the mass of 50 beans for each type. (be sure to take out the weight of the cup and do not use atypical beans)
3. Save the weighed beans for later.
4. Calculate the relative mass of each bean type. This is accomplished by dividing the "mass of 50 beans" of each type by the "mass of 50 beans" of the lightest bean. The relative mass of the lightest bean should be 1. Complete all calculations in step 4 before continuing to part 2.

Part 2. Determining Number of Beans in a "Pot" (analogous to a mole)

1. For each type of bean weigh out a mass in grams equal to the relative mass that you calculated in step 4 of part 1. (example: lightest bean has relative mass of 1 so you will weigh out 1 gram of this bean type) You may not be able to reach your exact weight, get as close as you can.
2. Once step 1 has been completed for all bean types, count how many beans you have in each cup. This is how many beans are in a "Pot". We define a "pot" as the number of beans that has a mass in grams equal to the relative mass of that bean type.
3. Record this data in your chart. Note: only whole numbers may be recorded.
4. Return all beans to the proper containers and return the cups to the stack.

Questions:

1. Calculate the average number of beans in a pot.
2. Calculate the following for EACH type of bean in the lab.
   a. The number of "pots" in 250 grams.
   b. The number of beans in 250 grams.
   c. The number of "pots" in 250 beans.
   d. The number of beans in 3.17 "pots".
   e. The number of grams in 3.17 "pots".
3. When determining the number of beans in a "pot" in the second part, only whole numbers were used. Explain why and how this relates to our atom analogy.
4. Explain, **in a paragraph**, how this lab simulated the calculation of relative masses of atoms on the periodic table and how the "pot" can be used as an analogy to the mole.
5. In a few sentences, describe how this lab helped you understand or further confused you with respect to atomic masses and the concept of the mole.