These moles aren't brown and furry or Counting by Weighing

When a chemical reaction takes place, individual atoms and molecules collide and combine or recombine to form new substances. Atoms and molecules are so small that you cannot see them easily, nor can you measure their diameter with a meter stick or measure their mass with a balance. Yet, chemists need to keep track of the number of atoms and molecules, or at least the relationship between the number of atoms and molecules in a chemical reaction. What method has been devised to count the many billions of atoms that are involved in a chemical reaction? Let's find out.

Record all required information and calculations on this handout . Be sure to include units. (PLEASE SEE THE GRADING CRITERIA ON THE BACK OF THIS HANDOUT). This assignment is due at the end of class today.

1. Select 20 **small** paper clips. Measure their mass on the balance. Record this mass. **Calculate** the average mass of 1 paper clip.

   Mass of 20 paper clips_____

   Average mass of 1 paper clip _____

   WORK:

2. **Calculate** the mass of 100 **small** paper clips. Add **small** paper clips to the balance until you have a sample, which is approximately equal to this mass. Count the paper clips you just massed. Record the number of paper clips.

   Predicted mass of 100 paper clips _____

   WORK:

   Actual number of paper clips _____

3. Select 20 **large** paper clips. Measure their mass on the balance. Record this mass. **Calculate** the average mass of 1 paper clip.

   Mass of 20 paper clips_____

   Average mass of 1 paper clip _____

   WORK:

4. **Calculate** the mass of 100 **large** paper clips. Add **large** paper clips to the balance until you have a sample, which is approximately equal to this mass. Count the paper clips you just massed. Record the number of paper clips.

Predicted mass of 100 paper clips _____

WORK:

Actual number of paper clips _____

5. In the space below- describe a method to obtain 1000 **small** paper clips **without counting** them.

6. **Calculate** the expected mass of 12,000 **large** paper clips -**Show your work.**

7. Obtain a sealed envelop of **small** paper clips. A code number and the mass of the empty envelop is written on the sealed envelop. Determine the number of small paper clips in the envelop-**without opening it, of course**.

Code #_____ Mass of envelop_____

Predicted number of small paper clips_____

WORK:

8. Describe how you would use this method to determine how many atoms or molecules you have in a given sample. What information would you need to know about the atom or molecule to complete this task?

9. Chemists actually do count by weighing. Look at the labeled bags on the teacher's desk. List the substances and their masses in the space below.

10. Which does there seem to be the most of? The least?

Actually they all contain the same amount, well at least the same number of particles. **Explain why they could have the same number of particles, but different masses and volumes.**

The bags on the teacher's desk all contain 1 **mole** of the various substances. The mass number on the periodic table tells us what 1 mole of any substance would have a mass of in grams.

What is the mass of 1 mole of Carbon? Helium? Uranium?

Molar mass of Carbon_____

Molar mass of Helium _____

Molar mass of Uranium _____

STAY TUNED FOR MORE ABOUT THE MOLE