Name:

Period:

LAB 13 – MODELING ATOMIC MASS

BACKGROUND

Atoms are extremely small. They are so small, in fact, that a single drop of water contains more atoms than you could count in a lifetime! Measuring the masses of atoms to discover the patterns in the periodic table was not an easy task for scientists in the past. You will get some sense of how scientists determined the mass of atoms. In this investigation you will

- compare the masses of different film can “atoms”
- predict the number of pennies in each film can “atom”

MATERIALS

- Empty Film Canister (Shared from supply station)
- Film Canisters labeled A, B, C, D (Shared from supply station)
- Triple-Beam Balance

PROCEDURE

<u>NOTE: DO NOT OPEN THE FILM CANISTERS AT ANY TIME</u>

1. Collect one of the four film cans labeled A, B, C, and D. Each can contains a different number of pennies. Each can represents a different atom. *The pennies represent the protons and neutrons in the nucleus* (most of the mass) of the atom.

2. Measure the mass of the film canister and pennies. Record your results in table 13-1.

3. Repeat steps 1 & 2 for each of the other film canisters labeled A, B, C & D.

NOTE: DO NOT OPEN THE FILM CANISTERS AT ANY TIME

4. Obtain the empty film canister and measure its mass. Record your results in table 13-1.

5. Subtract out the mass of the empty film canister from the mass of canisters A, B, C & D. Record your results in table 13-1. The resulting numbers represent the **mass of the nuclei** *noo-klee-eye* (plural of nucleus) of the atoms.

6. Share your data on the mass of nuclei with two other lab groups so that you have a total of three sets of data.

7. Calculate the average mass of each nucleus and record the results in your table.

DATA

Table 13-1: Masses of Film Canister Atoms

	Film Can. A	Film Can. B	Film Can. C	Film Can. D	Empty
Total Mass (g)					
Mass of Pennies Only (g)					
2nd group's mass of Pennies Only (g)					
3rd group's mass of Pennies Only (g)					
Average Mass (g)					

SUMMARY

1. Keep in mind that each penny has the same mass as other pennies. What relationship do you see in the values of the average masses of the pennies?

____

____

____

____

2. Use your data on the average mass to predict the **number** of pennies in each film canister. You may have to make an assumption about the number of pennies in canister A. Record your predictions below.

	Film Can. A	Film Can. B	Film Can. C	Film Can. D	Empty
Predicted # of Pennies					X

3. How did you make your predictions for question 2?

____

____

____

____

4. Graph the masses (in grams) of the pennies in the film can atoms on the *y*-axis and the predicted number of pennies in each can on the *x*-axis.

5. Compare the masses of your film can atoms with the masses of the first four elements on the periodic table. Which canister represents which element?

A ______________________________

B ______________________________

C ______________________________

D ______________________________

CHALLENGE

1. What can't this investigation tell you about the identity of your film can atoms? (**Hint:** Protons and neutrons in real atoms have about the same mass.)

2. Hydrogen has only a single proton in its nucleus. If your film can atoms represent the first four elements in the periodic table, what are the numbers of protons and neutrons in each atom?

3. Single atoms are far too small to place on a balance. How do you think scientists determine the masses of real atoms?

4. Use a periodic table to find the masses of the next two atoms (boron and carbon). How many pennies would you need to make film can atom models for each?