

Name\_\_\_\_\_

**Chemistry: Isotopes and Average Atomic Mass Activity** Hr\_\_\_\_ Date\_\_\_\_\_

In this lab, you will investigate isotopes. Remember, isotopes of an element are atoms that have the same number of protons, but have different numbers of neutrons, and thus have different masses.

**Pre-Lab**

We can liken the different masses of an atom's isotopes to the different ages of students in this class. First, we need to figure out the ages of each student in the class:

Age	14	15	16	17
# of students				
% abundance				

In order to find the average age... **avg. age = % of 14 yr x (14) + % of 15 yr x (15) + % of 16 yr x (16) ...**

1. Calculate the average age of the students in your class. Show your work!
2. Are there any students in this class that are exactly that average age (for the simplicity of this analogy, we are NOT factoring in fractions of a year in terms of age)? Why or why not?

**"Pennium"**

Obtain a container of pennies. Using a balance, find the mass of each of the pennies in the container and round the result to the nearest 0.1 g. Record this mass (again, only to the 0.1 g) and the year of each penny in the table below. You might not use all of the spaces.

Year	Mass (g)		Year	Mass (g)		Year	Mass (g)

**Summary of Data**

Isotope	Description	Number of "Atoms"	Percent Abundance (show work)
1	Approx. Mass =		
2	Approx. Mass =		

Much like the formula we used for calculating the average age, we can use a similar formula to calculate average atomic mass of an element.

$$\text{Average atomic mass (AAM)} = \text{mass A (\%A)} + \text{mass B (\%B)} \dots$$

Calculate the average atomic mass of “pennium”. Be sure to show all work.

### **ANALYSIS QUESTIONS**

Refer back to your “pennium” data and answer the following questions. You do not need to use full sentences.

1. What do the pennies represent in this investigation? What do the different masses of the pennies represent?
2. What information do you need to calculate the average atomic mass of an element?
3. If you picked 20 pennies at random, would the actual mass of 20 pennies be equal to 20 times the mass of one penny? Explain.
4. The atomic mass of carbon is 12.011 g/mol. How many atoms of carbon have that exact mass? Why?
5. Why are most atomic masses listed on the periodic table NOT whole numbers?
6. Why are the masses of some listed as whole numbers in parentheses?
7. How are the 3 isotopes of hydrogen (H-1, H-2, and H-3)...

#### **ALIKE**

#### **DIFFERENT**

8. The element Christophersonium (Ch) has three isotopes. Isotope A has a mass of 34.22 amu and a % abundance of 25.1%. Isotope B has a mass of 36.4 amu and a % abundance of 58.6 %. Isotope C has a mass of 37.5 amu and a % abundance of 16.3 %. Find the atomic mass of Ch.
9. The element Normalium (Nm) has an average atomic mass of 85.468 amu. Normalium has two common isotopes,  $^{85}\text{Nm}$  and  $^{87}\text{Nm}$ . If the mass of  $^{85}\text{Nm}$  is 85.00 amu and the abundance is 72.2%, what is the mass of  $^{87}\text{Nm}$ ?