**Dougherty Valley HS Chemistry**
**Average Atomic Mass Calculations**

# Worksheet #12

**Name:** **Period:** **Seat#:**

**AVERAGE ATOMIC MASS READING:**
Look at the atomic masses of a few different elements on your periodic table. Do you notice that very few of the elements have atomic masses that are close to being nice whole numbers? Do you know why this is? After all, for our purposes, the mass of both the proton and the neutron are almost exactly 1, and in chemistry we usually ignore the mass of the electron because it is so very small. Why then, if the mass of the atom comes mainly from the protons and neutrons it contains, don't the atomic masses of the all come out to be nice whole numbers?

The reason is this; the atomic masses given on your tables are "weighted averages" of the masses of the different naturally occurring isotopes of the element.

**Let's look at an example.**
*Approximately 75% of the chlorine atoms found in nature have a mass of 35. The other 25% have a mass of 37. What should we report as the average atomic mass for chlorine?*

What we do is to take the "weighted average" of these isotopes.

- You multiply the "relative abundance" percentage of an isotope by its specific isotope mass. Then you add to that number the next isotopes relative abundance percentage by its specific isotope mass. You keep doing that for each isotope that exists. The sum is the average atomic mass!
    - We multiply 75% times 35 and then add that to 25% times 37...

$$(0.75\ x\ 35) + (0.25\ x\ 37) = 26.25 + 9.25 = 35.5\ amu$$

- So generally speaking we end up with the following equation:

$$Average\ Atomic\ Mass = (\%_1\ x\ mass_1) + (\%_2\ x\ mass_2) \ldots$$

**GUIDED PRACTICE**
NOTE: The numbers in each of the following problems have been made up. If we used actual percentages and masses of isotopes then you could simply look up the atomic weight of the element on the periodic table!

*Suppose that there were 4 isotopes found of a new element. It was found that there was 7% of Isotope A with a mass of 93, 18% of Isotope B with a mass of 96, 34% of Isotope C with a mass of 97, and 41% of Isotope D with a mass of 99. What is the average atomic weight of this new element?*

**STUDENT PRACTICE:**

**1)** Suppose that there were two isotopes of Sodium. 28% of the naturally occurring sodium atoms had a mass of 22, and 72% atoms had a mass of 23. What would the average atomic weight of sodium be?

**2)** Suppose that there were two natural isotopes of Copper. 80% of the atoms had a mass of 63, and 20% of the atoms had a mass of 65. What would that average atomic weight of copper be?

**3)** Suppose that a new element (E) were discovered that existed as three natural isotopes. 25% of the atoms had a mass of 278, 38% had a mass of 281, and the remainder had a mass of 285. What would be listed as the atomic weight of this element?