Average Atomic Mass

Chemistry Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_

**Average Atomic Mass**

According to the *Periodic Table,* carbon has a mass of 12.0111 *amu*. The mass of an atom comes from its protons and neutrons. Carbon has 6 protons. Subtracting the number of protons from the mass to get the number of neutrons gives 6.0111. This result is impossible! There are no fractions of neutrons!! Nonsensical numbers such as these exist elsewhere. For example, the U.S. Census reports 2.59 people per household in 2000. You can count on the fact that there is no household with 2.59 people. This number is an average. Likewise, there is no such thing as a carbon atom with a mass of 12.0111 *amu*. The atomic mass listed on the *Periodic Table* is the average mass of the isotopes of carbon. Carbon has two naturally occurring stable isotopes. The large majority of carbon atoms, 98.89%, are 12C, while only 1.108% are 13C. That is why the average mass is so close to 12. The average mass is determined by the procedure illustrated in the box to the right. The mass of each isotope is multiplied by its percentage. Then these products are added to find the average.

Atomic Mass Calculation

*m*avg = p1*m*1 + p2*m*2 + ... p*nmn*

*m*avg – average mass; p1 – percentage of isotope 1;

*m*1 – mass of isotope 1; p2 – percentage of isotope 2;

*m*2 – mass of isotope 2; p*n* – percentage of isotope *n*;

*mn* – mass of isotope *n*; *n* – the number of isotopes

**Example**

What is the average mass of chlorine if a sample consists of 77.35% Cl–35 and 22.65% Cl-37?

**Use this procedure to find the average mass for each of the examples below.**

1. An element recently discovered in Littleton High School called “littletonium” occurs in the following proportions:

81.75% Lt–500 and 18.25% Lt–502

2. A new element, “schoolium,” found only in schools occurs in the following proportions: 9.750% Sl–750 and 90.25%

Sl–752

3. A new element “newium” has been discovered which occurs in the following proportions: 25.25% Nw–300; 15.25%

Nw–301; and 59.50% Nw–302

4. A new element found in the science department office called “departmentium” is found in the following proportions:

11.78% Dt–800; 1.850% Dt–801; and 86.37% Dt–803