SCH3U: Isotopes Continued - Additional Calculations Date: _____

Other isotope problem types...

Problem Type 1: Finding the average atomic mass of an element (we did this last class).

Problem Type 2: Finding the mass of ONE isotope.

- Example of Problem Type 2: Bromine has two naturally occurring isotopes. Bromine-79 has a mass of 78.918amu and is 50.69% abundant. Using the atomic mass reported in the periodic table, determine the mass of bromine-81, the other isotope of bromine.

Avg. atomic mass = (mass Br-79)(% Br-79) + (mass Br-81)(% Br-81)

$79.9\text{ amu} = (78.917\text{amu})(0.5069) + 0.4931x$

$79.9 = 40.003 + 0.4931x$

$\frac{39.897}{0.4931} = \frac{0.4931x}{0.4931}$

$x = 80.91\text{amu}$

∴ The exact mass of Br-81 is 80.91 amu.

Aside:

Let x rep. mass of Br-81

% of Br-81 = 100% - 50.69%

= 49.31%

Problem Type 3: Finding the relative abundance

- Example of Problem Type 3: Gallium consists of two naturally occuring isotopes with masses of 68.926 and 70.925 amu. The average atomic mass of Ga is 69.72 amu. Calculate the abundance of each isotope. Note - if atomic mass is not given use the mass in the periodic table.

Avg. atomic mass = (mass Ga-69)(% Ga-69) + (mass Ga-71)(% Ga-71)

$69.72 = 68.926x + 70.925(1-x)$

$69.72 = 68.926x + 70.925 - 70.925x$

$\frac{-1.205}{-1.999} = \frac{-1.999x}{-1.999}$

$x = 0.6028$ ∴ Ga-69 is 60.28% abundant and Ga-71 is 1-0.6028 = 0.3972 or 39.72% abundant.

Aside

Let x rep. % of Ga-69

Let 1-x rep % of Ga-71

Hints: when you are solving isotope problems, determine what type of problem you are solving (ask yourself what you are solving for!)

How do we know about the different isotopes that exist?