M&M-ium

One of the greatest achievements for a chemist is to discover a new element or learn more information about an element which was previously discovered. You are about to undertake an experiment to ascertain the atomic mass of the recently discovered element, M&M-ium. Research has verified the existence of three isotopes of M&M-ium which will be called: mini-M&M-ium, plain-M&M-ium, and peanut-M&M-ium. These isotopes are found in nature in the same relative abundance as in the sample with which you will be provided.

It is your task to calculate the average mass of each of these isotopes, the relative abundance (%) of each of the three isotopes, and to use these facts to determine the average atomic mass of M&M-ium. The average atomic mass that you calculate will reported to other scientists of the world and included in the M&M-ium square on the periodic table. Remember, an atomic mass is a WEIGHTED AVERAGE of all of the isotopes for a particular element.

For example, the atomic mass of carbon on the periodic table is 12.011 atomic mass units. The two isotopes of carbon found in greatest abundance are carbon-12, 98.892% occurrence, and carbon-13, 1.108% occurrence. Change the % into decimal form and multiply each percent by the mass of the isotope which occurs at that percent. Add the two numbers together and you should get 12.011 atomic mass units. Try it on your calculator!

You see, if all elements occurred in one form only and did not have isotopes, all of the atomic masses on the periodic table would simply be whole numbers. Atomic mass is essentially the sum of the protons and neutrons in an element with each proton or neutron weighing 1 atomic mass unit (electrons are so light, we don't count them). But, since many elements have isotopic forms found in nature, we use the WEIGHTED AVERAGE of all the isotopes of an element when reporting its atomic mass.

DIRECTIONS

1. Divide your M&M isotopes into the three categories and calculate the % of each type of isotope found in your sample.

Total # of M&Ms in the sample . . . . . _____

# of mini- M&M-iums. . . . . _____

# of plain- M&M-iums. . . . . _____

# of peanut- M&M-iums. . . . . _____

% of mini- M&M-iums (relative abundance) . . . . . _____

% of plain- M&M-iums (relative abundance) . . . . . _____

% of peanut- M&M-iums (relative abundance) . . . . . _____

2. Calculate the average mass of each isotope:

Total mass of all mini M&Ms . . . . . _____

Average mass of one mini- M&M-ium. . . . . _____

Total mass of all plain M&Ms . . . . . _____

Average mass of one plain- M&M-ium. . . . . _____

Total mass of all peanut M&Ms . . . . . _____

Average mass of one peanut- M&M-ium. . . . . _____

3. Show calculation set-up below for determining the atomic mass of M&M-ium using the relative abundance and the average mass of each isotope.

Atomic mass of M&M-ium to be reported to the world (TA-DA!) . . . . _____