***Beanium Isotope Lab Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

All elements on the periodic table exist in at least two isotopic forms. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are atoms with the same \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ but with different \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ due to varying numbers of neutrons. The atomic mass shown on the Periodic Table for each element is actually a \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of all the isotopes of that element, weighted by the percentage of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in which they occur.

***NEWS FLASH!!!! A NEW ELEMENT HAS BEEN DISCOVERED!!!***

Shaker Heights Ohio—Nuclear Chemists, performing basic research on food products at Shaker Quality Foods have discovered what is believed to be a new element! Mr. Kuehnle, the store’s owner, says “We have tentatively named the element Beanium.” Dr. Spurrier, assistant to Mr. Kuehnle adds, “We derived the element from the protein nodules we put into our chili.”

Further research of the new element will be conducted in more suitable surroundings, namely laboratories in a nearby school. Since apparently it was too far to go to the university nearby, research work has been contracted to neighboring Shaker Heights High School. “Student excitement regarding this discovery is explosive!” says Tina Belcher, a student. Many physical science students have generously volunteered their time and expertise to help with the experiments involving the new element.

Ms. Perry says the first follow-up experiments conducted at Shaker Heights High School will determine how many isotopes of this element exist. The second experiment will determine the mass of each isotope. The third experiment will determine the percent abundance of each isotope. The final calculations will discover the average atomic mass of the new element.

“One unique property of Beanium should make these experiments particularly easy—unlike normal atoms, Beanium atoms are very large,” says Ms. Perry “They can be easily seen, and different isotopes can be sorted by hand.”

Scientists are expecting a complete, comprehensive summary of this new element within three days, including diagrams, data tables, and post-lab questions.

“This is the most exciting discovery this century!” exclaimed Tina Belcher.

***Beanium Isotope Lab***

PURPOSE: 1. Identify the number of Beanium isotopes.

2. Determine the mass of each isotope

3. Find the percent abundance of each isotope

4. Calculate the average atomic mass of Beanium

EQUIPMENT: Balance

Sample of Beanium

Calculator

PROCEDURE:

1. Sort the Beanium sample into the different isotopes (by color). Diagram each below.

|  |  |  |
| --- | --- | --- |
| Isotope #1 | Isotope #2 | Isotope #3 |

1. Pick one of the isotopes to be #1. Record the MASS OF ALL isotopes #1 together on a scale.
2. Count the number of atoms of isotope #1. Record in the data table. Verify this number by having your lab partner count again. If you do not agree on the number, count them again together.
3. Calculate the average mass of one isotope #1 using the formula provided in the data table.

This is the MASS of ONE atom of isotope #1. When you are through with isotope #1, put it back into the zip-lock baggie. Be careful not to spill any atoms on the floor!

1. Repeat the same procedures for isotopes #2 and #3. Return all isotopes to the zip-lock baggie.
2. Now you will calculate the **percent abundance** of each isotope. Find the total number of atoms present (all the kinds of isotopes together) by adding the total of each isotope together.
3. Calculate the average atomic mass of Beanium to be added to the Periodic Table.

|  |  |  |
| --- | --- | --- |
| Total Mass of Isotope #1 sample (*A1)* | Number of atoms of Isotope #1 (*B1*) |  |
| Total Mass of Isotope #2 sample (A2) | Number of atoms of Isotope #2 (B2) |  |
| Total Mass of Isotope #3 sample (A3) | Number of atoms of Isotope #3 (B3) |  |
| Total mass of ALL atoms(C) | Total number of ALL atoms (D) |  |

1. Percent abundance of isotope #1
2. Percent abundance of isotope #2
3. Percent abundance of isotope #3
4. Average atomic mass of Beanium:

***Beanium Isotope Lab***

POST-LAB Questions:

1. Why isn’t the atomic mass of most of the elements on the Periodic Table a whole number?
2. If the heaviest isotope of Beanium was more abundant, and the other two were less abundant, what would happen to the atomic mass of Beanium? Why?
3. Can you think a real world example that a weighted average would be useful? Justify.

***If time complete the… EXTENSION ACTIVITY!!!! (+3)***

BUT WAIT, WHAT’S THIS!? One final isotope of Beanium has been discovered! (In the blue baggie.) Record the data on this isotope #4 below!

|  |  |  |
| --- | --- | --- |
| Total Mass of Isotope #4 sample (*A4)* | Number of atoms of Isotope #4 (*B4*) |  |

What is the new average atomic mass of Beanium??

You and your colleagues find that this is a very *unstable* isotope of Beanium. What could happen?

Based on its differences from the other isotopes, WHY do you think it is unstable?