"Beanium" Isotope Lab

Introduction:

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

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

Springfield USA—Nuclear Chemists, performing basic research on food products at Springfield Power Plant, have discovered what is believed to be a new element. Mr. Burns, the plant's owner, says, "We have tentatively named this element Beanium." Mr. Smithers, assistant to Mr. Burns adds, "We derived this element from the protein nodules we put into our chili."
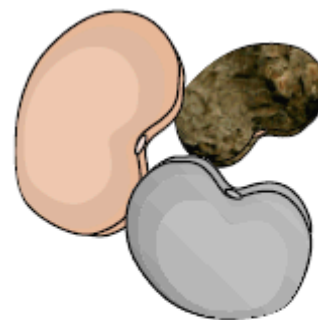

"Beanium atoms" look strangely like bean seeds

Further research of the new element will be conducted in more suitable surroundings, namely laboratories in a nearby school. Because Springfield apparently only has an elementary school, research work has been contracted to neighboring Vista Murrieta High School. "Student excitement regarding this discovery is running at a fever pitch!" says Lisa Simpson, student. Many chemistry students have generously volunteered their time and expertise to help with the follow-up experiments involving the new element.

Dr. Julius Hibbert says the first follow-up experiments conducted at Vista Murrieta 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 Mr. Smithers. "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 two days, including diagrams and collected data tables.

"This is the most exciting Chemistry discovery this century!" exclaimed Mr. Burns.

"Beanium" Isotope Lab   **Class Set!**

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 isotope.

Isotope #1	Isotope #2	Isotope #3

2. Pick one of the isotopes to be #1. Record the **MASS of all isotopes #1 together on a scale.**

3. Count the number of atoms of isotope #1 and 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.

4. Calculate the **average mass of one isotope** #1 using the following formula and record:

Total mass of all #1 / # atoms of isotope #1

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!

5. Repeat the same procedures for isotopes #2, and #3. Be sure to record the mass of each isotope and the exact number of each isotope. Record the average mass of each isotope. Be sure to return all isotopes to the zip-lock baggie.

6. Now you will calculate the **percentage abundance** of each of the isotopes. Find the total number of atoms present (all the kinds of isotopes together) by adding the total number of isotope together.

7. Calculate the **average atomic mass** of Beanium to be placed on the Periodic Table.

Data:

(Total Mass /# Atoms)

Total Mass isotope #1:	# atoms #1:	Avg Mass #1:
Total Mass isotope #2:	# atoms #2:	avg mass #2:
Total Mass isotope #3:	# atoms #3:	avg mass #3:
Total Mass of **ALL** Atoms:	Total # of atoms:	

a) Percent Abundance of Isotope #1: _____

        % isotope #1 = (count of #1 isotope / count of ALL isotopes) X 100

b) Percent Abundance of Isotope #2: _____

        % isotope #2 = (count of #2 isotope / count of ALL isotopes) X 100

c) Percent Abundance of Isotope #3: _____

        % isotope #3 = (count of #3 isotope / count of ALL isotopes) X 100

d) AVERAGE ATOMIC MASS OF BEANIUM: _____

Post-Lab Questions:

1. Why isn't the atomic mass of most of the elements on the *Periodic Table* a whole number?

2. If heaviest isotope was more abundant, and the other two isotopes were less abundant, what would happen to the atomic weight of beanium? Why?

Data Sheet: Beanium Isotope Lab
Diagram of each isotope:

Isotope #1	Isotope #2	Isotope #3

Data:

(Total Mass /# Atoms)

Total Mass isotope #1:	# atoms #1:	Avg Mass #1:
Total Mass isotope #2:	# atoms #2:	avg mass #2:
Total Mass isotope #3:	# atoms #3:	avg mass #3:
Total Mass of **ALL** Atoms:	Total # of atoms:	

a) Percent Abundance of Isotope #1: _____
          % isotope #1 = (count of #1 isotope / count of ALL isotopes) X 100

b) Percent Abundance of Isotope #2: _____
          % isotope #2 = (count of #2 isotope / count of ALL isotopes) X 100

c) Percent Abundance of Isotope #3: _____
          % isotope #3 = (count of #3 isotope / count of ALL isotopes) X 100

d) AVERAGE ATOMIC MASS OF BEANIUM: _____