**Isotopes of “Pennium”** Name:

**PROBLEM**

What are the masses and relative abundances of isotopes of pennium and what is the atomic mass of the element?

**MATERIALS**

# 30 pennies Lab balance

**PROCEDURE**

1. Count the pennies them to make sure that there are 30. Determine and record the combined mass of your 30 pennies.
2. Find the mass of each penny separately. In the Data Table, record the year the penny was minted and its mass to the nearest 0.01 g.
3. Return the pennies back to where you got them. Clean up your work area and wash your hands before leaving the laboratory.

**OBSERVATIONS**

Combined mass (to nearest 0.01 g) of 30 pennies \_\_\_\_\_\_\_\_\_\_\_ g

## Data Table

|  |  |  |
| --- | --- | --- |
| Penny | Year | Mass (g) |
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |
| 6 |  |  |
| 7 |  |  |
| 8 |  |  |
| 9 |  |  |
| 10 |  |  |
| 11 |  |  |
| 12 |  |  |
| 13 |  |  |
| 14 |  |  |
| 15 |  |  |
| Penny | Year | Mass (g) |
| 16 |  |  |
| 17 |  |  |
| 18 |  |  |
| 19 |  |  |
| 20 |  |  |
| 21 |  |  |
| 22 |  |  |
| 23 |  |  |
| 24 |  |  |
| 25 |  |  |
| 26 |  |  |
| 27 |  |  |
| 28 |  |  |
| 29 |  |  |
| 30 |  |  |

**CALCULATIONS**

1. Inspect your data carefully. Determine the number of isotopes of Pe that are present. Do this by looking at the masses. Look for **big** differences in mass. \*Talk to your teacher before you move forward.
2. Calculate the abundance of each isotope in your sample. ***Abundance = # of pennies for each isotope***

# ***total # of pennies***

|  |  |
| --- | --- |
| Isotope 1 | Isotope 2 |
|  |  |

1. Calculate the average atomic mass of each isotope.

***Avg. Atomic Mass of isotope = total mass of pennies for each isotope***

***# of pennies of that isotope***

|  |  |
| --- | --- |
| Isotope 1 | Isotope 2 |
|  |  |

1. Using the abundance and the average atomic mass of each isotope, calculate the atomic mass of Pe.

***Average atomic mass of Pe =***

***(abundance of isotope1)(ave. atomic mass of isotope1) + (abundance of isotope2)(ave. atomic mass of isotope2)***

#### **DATA ANALYSIS**

1. Was the mass of 30 pennies equal to 30 times the mass of one penny? Explain.
2. In what year(s) did the mass of Pe change? How could you tell?
3. Why are the atomic masses for most elements not whole numbers?
4. How are the three isotopes of hydrogen (hydrogen-1, hydrogen-2, and hydrogen-3) alike? How are they different?
5. Copper has two isotopes, copper-63 and copper-65. The abundance of copper-63 is 69.1% and copper-65, 30.9%. Calculate the average atomic mass of copper.