

## ISOTOPIC PENNIES

**Purpose:** To simulate the percentage of each isotope of a specific element when given the weighted average of all naturally occurring isotopes.

**Discussion:** The U.S. penny was first issued in 1909 and was composed of 95% copper and 5% zinc. All pennies were made with this composition until 1982 when the high cost of copper dictated a major change in composition. Since 1982, U.S. pennies have been produced with 97.6% zinc with a thin plating of copper. Since each metal has a different density, pre- and post-1982 pennies have different masses.

A mixture of pre- and post-1982 pennies will represent the naturally occurring mixture of two isotopes of an imaginary element. With this mix of pennies, you will simulate one way scientists can determine the relative amounts of different isotopes present in a sample of an element.

You will be given a sealed balloon with a total of 10 pre- and post-1982 pennies. You must determine the number of each type of penny in the container.

**Procedure:**

1. Obtain 10 pre-82, 10 post-82 pennies, one empty balloon, and a balloon of unknown pennies. At no time will you open your balloon.
2. Obtain and record the following data:

Number on Balloon	
Mass of 10 pre-82 pennies	
Average mass of 1 pre-82 penny	
Mass of 10 post-82 pennies	
Average mass of 1 post-82 penny	
Mass of empty balloon	
Mass of balloon and 10 pennies	

3. Calculation: Use a system of equations to determine the number of pre-82 and post-82 pennies in your balloon.

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## Isotopic Pennies

### Pre-lab Questions:

1. What is an isotope?
2. What is the difference in pre- and post-1982 pennies?
3. Suppose you have a paper bag containing only pencils and pens. The total number of items is 25. From the data given below, set up and solve a system of equations to determine the number of pens and pencils in the bag.

<b>ITEM</b>	<b>MASS</b>
One pencil	2 grams
One pen	5 grams
Empty bag	0.5 grams
Bag + mixture of pencils and pens	104.5 grams

4. What percentage of pencils and pens are in the bag?