

Penny Isotopes

Not all pennies are alike! In 1982 the price of copper had increased so much that the penny was containing a quantity of copper worth more than 1 cent! This would not do at all. Therefore the government decided to change the make up of the penny. As a result the pennies after 1982 have a different mass than the pennies made before 1982.

Purpose: In this lab you will use pennies to represent isotopes of a new element, Coinium to use the average atomic mass of a sample of the element to determine the percent of each isotope present in the sample.

Procedure:

1. Obtain 10 pennies dated before 1982. Weigh the ten pennies in a group. Determine the average mass of a pre 1982 penny. Record this information in the data table.
2. Repeat the above procedure with pennies dated after 1982 (post 1982 pennies).
3. Obtain a sealed film container with an unknown combination of pre and post 1982 pennies. **NEVER OPEN THE FILM CONTAINER DURING THIS LAB.**
4. The mass of the film container without the pennies is recorded on the container. Record the container letter and mass in the data table.
5. Determine the mass of the film container with the pennies in it. Record this in the data table.
6. Use the information you have just recorded to determine the mass of the pennies in the film container alone. (Remember, do not open the container)
7. Assuming that there are 10 pennies in the container, determine the average mass of a penny in the container. Record this in the data table.
8. Use your algebra to determine the number of pre and post 1982 pennies in the container.

Let x = the number of pre 1982 pennies, then

$10-x$ = the number of post 1982 pennies.

Write and solve an algebraic equation that shows the total mass of the pennies in the canister will be equal to the average mass of each type of penny times the number of pennies. *Check this equation with your teacher before proceeding.*

Data Table:

| | |
|--|--|
| Mass of 10 pre 1982 pennies | |
| Average mass a of pre 1982 penny | |
| Mass of 10 post 1982 pennies | |
| Average mass of a post 1982 penny | |
| Film canister Letter | |
| Mass of film canister and pennies | |
| Mass of empty film canister (from top) | |
| Mass of pennies in the film canister | |
| Average mass of a penny in the film canister | |
| Number of pre 1982 pennies | |
| Number of post 1982 pennies | |

Show all work here:

Questions:

1. Explain how the two types of pennies are similar to isotopes of the same element.
2. Why did you weigh ten pennies at a time instead of only weighing one individual penny to determine the mass of the pre and post 1982 penny.
3. New element Z has two isotopes Z-71 is 26.6% abundant and Z-73 is 73.4% abundant. Determine the average mass of element Z. Show all work!
4. New element Q has three isotopes Q-12 is 62.10% abundant, Q-13 is 2.43% abundant, and Q-14 is 35.47% abundant. Determine the average mass of element Q. Show all work!
5. A new element was discovered on planet X. The element exists as two different isotopes, E-21 and E-23. Which isotope is more abundant if the average mass is 21.7g. Explain.
6. Identify two things that you learned from this lab.