

Isotopes of Pennies Inquiry-Based

PA State Standards:

- 3.4.10.A Explain concepts about the structure and properties of matter.
Know that atoms are composed of even smaller sub-atomic structures whose properties are measurable.
- 3.2.12.C Apply the elements of scientific inquiry to solve multi-step problems.
- 2.4.11.E Demonstrate mathematical solutions to problems.
- 1.2.11.A Read and understand the central content of informational texts and documents in all academic areas.

Introduction:

Isotopes of atoms may be defined in two ways. One definition is that they are atoms of the same element that have identical numbers of protons but have different numbers of neutrons. The other definition states that isotopes are atoms that have the same atomic number but different mass numbers. Most elements have two or more naturally occurring isotopes.

In this exercise, you will investigate the element “coinium.” It consists of two “isotopes.” The first “isotope” is a pre-1982 penny, which consists of 95% copper and 5% zinc. The other “isotope” is a post-1982 penny, which consists of 2.5% copper and 97.5% zinc. Knowing the total number of “atoms” and the mass of each “isotope,” the isotopic composition can be determined. Your task will be to do so without looking inside the film canister.

For more information about penny composition, visit

http://www.usmint.gov/about_the_mint/fun_facts/index.cfm?flash=yes&action=fun_facts2

Guiding Question:

Please answer the following question before beginning the lab.

Is "coinium" a good analogy or model for isotopes? Why or why not?

Equipment / Materials:

- Film canisters with 10 pennies inside
- Pre- and post-1982 pennies
- Top loader balance

Safety:

- No special safety hazards are posed by this activity.

Procedure:

Obtain a pre-1982 penny, a post-1982 penny, and a film canister with 10 pennies inside it. **Do not look inside the canister.** Note the letter on the film canister and obtain its mass from the instructor. Mass the items on a toploading balance. Determine the number of pre-1982 and post-1982 pennies in the film canister.

Questions:

1. How many pre and post 1982 pennies were in your canister?
2. What was the actual composition of the pennies in the canister? How did this compare to your results?
3. What property distinguished the pre- and post-1982 coins? Why?
4. Is "coinium" a good analogy or model for isotopes? Support your answer.
5. Name some other familiar items that could have been used in place of the pennies in this activity.