Isotopic Pennies
Application

Problem:

How many pre-1982 and post-1983 pennies are contained within the film canister?

Materials:

film canister of pennies
metric balance
empty film canister

Procedure:

According to Dalton's atomic hypothesis, all atoms of the same element are identical. This notion of the atoms, however, is somewhat outdated, as not all atoms of the same element possess the same number of neutrons (possess a different atomic mass). It is in this spirit, a demonic form of torture, involving pennies, has been selected for you.

Starting in 1983, pennies were no longer made of pure copper, as the cost of making a penny was becoming prohibitive. Because of this, zinc, a much cheaper metal, was used in conjunction with copper to make a penny. As a result, the newer pennies possess a different mass.

The task of this lab is to have you determine the number of pre-1982 and post-1983 pennies that are contained within a film canister **without opening it.** In order to do this, a couple of assumptions will be required. First, there are 15 pennies in each container. Second, the average mass of a pre-1982 penny is 3.10 grams and of a post-1983 is 2.51 grams. Use what you already know about how average atomic mass was calculated for isotopes!

Summing Up:

1. Explain the process you used to determine the number of each type of penny. Include your calculations in your explanation.

2. Explain how this lab relates to what has been discussed about isotopes.