

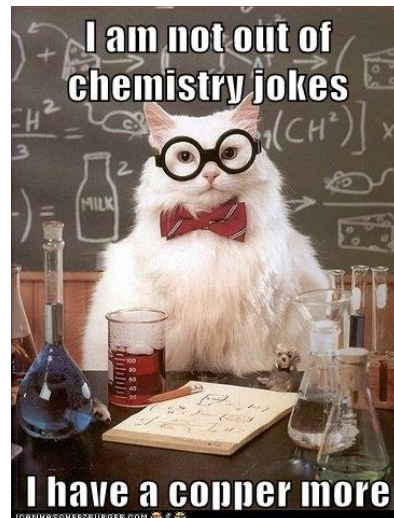
Density Lab

Name: _____

During the late 1970s and early 1980s the value of the copper in a penny became greater than 1 cent. It cost the government more money to mint pennies than their value. People began melting pennies for copper and profit. Before 1982 pennies were minted from an alloy of copper. After 1983 pennies were minted with an inner core of a different metal and an outer coating of copper ore. In this experiment you will determine and compare the densities of pennies minted before 1982 and after 1983.

Objectives:

- Determine the densities of pennies minted before 1982 and after 1983
- Determine the metal in the cores of pennies minted after 1982



Materials: 25 pre 1982 pennies, 25 post 1983 pennies, balance, water, 100 mL graduated cylinder, paper towels

Procedure:

1. Work with one set of pennies at a time. Find the mass of 5 pennies. Record on data table. Add 5 more pennies and record until you have the mass of 25 pennies.
2. Fill a 100 mL graduated cylinder to 30 mL of water. Add pennies 5 at a time to complete the data table. Use the bottom of the meniscus to measure the water level. Add 5 more pennies and record the volume. Continue until you have the volume of 25 pennies.
3. Discard water. Dry the pennies and share them with another group.
4. Continue steps 1 – 3 with the other set of pennies.

Data:

Pennies Minted Before 1982

Number of Pennies	Mass (g)	Total Volume (mL)	Net Volume (mL)
0			
5			
10			
15			
20			
25			

Pennies Minted After 1983

Number of Pennies	Mass (g)	Total Volume (mL)	Net Volume (mL)
0			
5			
10			
15			
20			
25			

Calculations:

1. Construct a line graph of your results. Let the y axis reflect the mass of the pennies. Plot the data for the pre 1982 pennies first. Then draw a best fit straight line.
2. On the same graph, plot the data for the pennies minted after 1983. Draw the best fitting straight line.
3. Calculate the slope of both lines. (You MUST show your work with UNITS.)
Pre 1982: Pick two points on the line (x, y) (,) and (,)

$$\text{Calculate } \frac{y_2 - y_1}{x_2 - x_1} = \text{slope}$$

_____ Slope

The slope is the density for the pre 1982 pennies.

Post 1982: Pick two points on the line (x, y) (,) and (,)

$$\text{Calculate } \frac{y_2 - y_1}{x_2 - x_1} = \text{slope}$$

_____ Slope

The slope is the density for the pre 1982 pennies.

4. Find the density of copper on the reference packet - _____. Calculate a % error for both of your density values.

Conclusions:

Be sure to answer the purpose of the lab. Report the results you obtained. What is the density of the pennies minted after 1983? How does it compare with the density of the pennies minted before 1982? (Is it more or less dense?) Based on the density values, what metal do you think makes up most of the mass of the post 1983 pennies? Explain.

Sources of Error:

What are three errors that could have caused your calculated value for the density to be inaccurate? Does this error cause your value to be too high or too low? Explain.

Questions:

1. Describe the similarities AND the differences between both of the graphs you plotted.
2. How does the density calculated for the pre 1982 pennies compare to the density of copper from the reference packet?

Chemistry Joke:

Which President was the least guilty?