Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**What is a Penny Worth?**

Objective: The purpose of this laboratory procedure is (1) to determine the percent composition of a copper-zinc penny and (2) to determine the value of a penny.

Procedure:

1. Use a penny that was minted in 1983 or later. Holding the penny between your finger and thumb, file three small grooves with a triangular file. The goal of this task is to cut through the copper and expose the zinc core. Turn the penny and continue filing so that a gray line appears all the way around the circumference of the penny.
2. Determine the mass of your penny after making the grooves. This measurement should be written to two decimal places.
3. Measure out 15 mL of 6 M hydrochloric acid in a graduated cylinder and pour it into a 100 mL or 150 mL beaker. **Caution:** Hydrochloric acid is highly toxic by inhalation or ingestion and is severely corrosive to skin and eyes. Carefully add the penny to the acid. Allow the penny and acid to react until no more bubbles are seen. This may take overnight. In the space next to the data table below, write a description of the reaction you see.
4. After the reaction has finished, use forceps to remove the penny and thoroughly rinse with water. Separate the two halves if they are still connected. If any zinc remains inside, try to wipe it off, rinse it off, or return to the acid until the bubbling stops.
5. After rinsing the penny “skin” thoroughly, dry completely. Determine the mass of the copper remaining in the penny. The acid solution can be then rinsed down the drain with lots of running water.

Data\*:

|  |  |
| --- | --- |
| mass of whole penny |  |
| mint date of penny |  |
| mass of “skin” = mass Cu |  |
| mass of penny “missing” = mass Zn |  |
| % Cu |  |
| % Zn |  |
| selling price of Cu |  |
| selling price of Zn |  |
| price of Cu in penny |  |
| price of Zn in penny |  |
| TOTAL VALUE OF PENNY |  |

\* Show all calculations clearly on an additional piece of paper!

Conclusion:

1. Make a statement about the value of a penny.
2. Why is it acceptable that a penny is worth < $0.01?
3. Using a reliable reference source, look up the actual percent composition of a penny. Explain two reasons why your experimental value is not the same as the actual value.
4. Calculate the percent error in your experimental values.

Post-Lab Questions:

1. What is the mass of copper on one side of a penny?
2. What is the density of copper (look it up!)?
3. Calculate the volume of copper on one side of a penny. (D = m/v)
4. What is the radius of a penny is the diameter is 1.89 cm?
5. What is the area of a penny? (A = π r2)
6. What is the thickness (height) of a penny skin? (Volume of a cylinder = π r2 h)
7. The density of Zn is 7.14 g/cm3 and the volume of an entire penny is 0.360 cm3. Calculate the mass of a penny if it were made of 100% Zn.
8. Compare the total mass of your penny to the hypothetical mass of a 100% Zn penny. Explain.

