AP Chemistry

*Modification due to lab restriction due to COVID
→Stay at desk. One member of group handles equipment (wear gloves)
All wear goggles

Experiment 1: Percent Composition of a Copper Penny

Purpose – To determine the percent copper in a post 1982 penny. Use data collected to perform several stoichiometric calculations.

Background – Before 1982 the US penny was made of pure copper. Because of the high cost of copper, the US government changed the composition of the penny in 1982, to copper coated zinc. The zinc can be chemically removed leaving the copper "shell". Percentages of Cu and Zn are easily determined as well as other calculations.

Materials: 6M HCl, 50 mL beaker, metal file, tweezer/tongs, distilled water, pre/post 1982 penny, electronic balance watch glass, Goggles, Gloves, Covering

Pre-lab Questions: (Answer in your lab notebook)
1. Write the complete balanced equation for the reaction of zinc and hydrochloric acid.

2. Why doesn't copper react with the hydrochloric acid?

3. Look up the prices of copper and zinc online (usually they're listed per lb)

Procedure:

DAY ONE;
1. Determine the mass of a PRE-1982 penny.
2. Obtain a POST 1982 penny. Record its date.
3. Use a metal file to scratch at least four deep marks (at 3,6,9 and 12 o clock.) into the edges of the POST 1982 penny.
4. If steel wool or sandpaper is available, clean off the penny until shiny.
5. Take the mass of this filed penny as accurately as possible.
6. Place the penny in the beaker and add about 20 mL of 6M HCl. (Be careful)
7. Cover with a watch glass and observe.
8. Leave the beaker under the hood for 24 hours on a paper towel with your names on it.

DAY TWO
1. Record observations. Then carefully remove the penny with tweezers or tongs and wash it with distilled water. Pour the contents of the beaker down the sink WITH THE WATER RUNNING!
2. Rinse the penny again only this time use ethanol. Place on a paper towel. Allow it to dry for 10 minutes.
3. Weigh the copper "shell" and record the mass as accurately as possible.

Data: Ensure that you have listed the masses of the pre1982 penny, post 1982 penny before reaction, and post 1982 penny after reaction.

Calculations – SHOW WORK in your lab notebook!!

1. What is the percent, by mass, of copper in the POST 1982 penny?

2. Use the prices you looked up in the pre-lab, determine the cost of a PRE-1982 penny. Assume its 100% copper. (Recall 1 lb = 454 g).

3. Calculate the cost of the copper in the POST 1982 penny.

4. Determine the cost of the zinc in the POST 1982 penny.

5. Sum up the answers to 3 and 4 to get the cost of materials in a POST 1982 penny.

6. Determine the savings for the production of 1 million pennies.

7. Calculate the MOLES of zinc that reacted.

8. Using your balanced equation from the prelab, determine the VOLUME of hydrogen released. (Assume STP)

9. Calculate the MOLECULES of hydrogen given off.

10. The zinc present was the limiting reactant. The HCl was present in excess. Using your balanced equation, how many MOLES of HCl were actually needed?

11. If you used 20 MILLIliters of 6.0M HCl, how many MOLES of HCl did you actually use? (Recall, Molarity = moles solute/liters of solution).

12. Using your answers to questions 10 and 11, calculate the MASS of excess HCl present.

Post-Lab Questions– Again, do these in the LAB NOTEBOOK!!

1. Explain the term "reaction rate". What are 2 ways to make this reaction occur at a greater rate?

2. What was the purpose of rinsing the penny with ethanol on day 2? (Acetone would have also been good)

3. Write the net ionic equation for the reaction between the zinc and hydrochloric acid.

Data Analysis
Summarize and discuss your results from the laboratory. Give sources of error that may have had an effect on your results and HOW it affected your results.

Conclusion
Write a short conclusion about whether you achieved your purpose. (Remember to answer: What was the purpose of this lab? Was it fulfilled? Why or why not?)