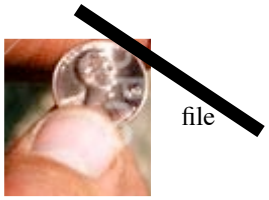
LAD G2 (pg 1 of 2) **Reactivity of Cu Compared to Zn**
% of Copper in the Penny

Name_____Per____

Introduction

US pennies changed in 1982. Before 1982, pennies were made of solid copper. The government discovered that because the value of copper metal had increased, some people had decided they could make money by "buying" pennies (for 1 cent each) and then melting them down and selling the copper to a metal dealer for more money than the original pennies cost them. So the US government decided to lower the value of the metal that the penny was made out of. After 1982, pennies were (and still are) made of zinc (a far less valuable metal) and coated with copper.



Procedure − Goggles are not optional after procedure D

A. *To avoid making a mess on the desk, get out a piece of scrap paper to do all your rubbing over.* Obtain a metal file and vigorously rub the **edge** (NOT the face) of the penny as shown in the picture above. Do you detect any color (other than copper-color) on the penny? Make a note with a conclusion in the observation box below

B. Rub ALL the copper off the **edge** of the POST-82 penny so that the zinc is completely exposed ALL the way around.

C. **Measure** the **mass of the penny** after sanding it. Be sure and brush off any dust before weighing.

D. Put your penny into a small beaker labeled with your name. Write directly on the glass − no tape.

E. STOP put on goggles, come and get your acid from the teacher.

F. Make observations and conclusions from the observations in the data table below. After finishing your observations, place the beaker on the class tray on the cart.

G. After leaving the penny in the acid overnight on the class tray, pour off most of the remaining liquid into the sink. Rinse tap water into the beaker to wash off what's left of the penny. Only after washing 2-3 times, pick the penny out of the fresh water and place it onto a paper towel. Dry off the penny parts by patting it with a paper towel or tissue.

H. The penny is delicate and can be difficult to dry, be sure the penny is completely dry by using tweezers to dunk the penny parts into the acetone, then waving in the air to dry. **Measure** the **mass of the penny (all of what's left) after the reaction**.

	mass of penny (g)			**% copper**	**% zinc**
	before doing anything	**after filing the edge, but before acid**	**parts left after reaction with acid**		
POST '82 Penny					
Observations	Filing edge: observation & conclusion? Dropping in HCl, evidence of chemical reaction?				

Processing the Data *(Remember that % is just part out of total.)*

1. Calculate the percent of the penny that you rubbed off with the file. Record you answer here: _____

2. Calculate the percentage of copper in the POST-82 penny and record your result in the table above.

3. Since you just calculated the part of the POST-82 penny that is copper, what percentage of that penny is zinc? Record your result in the table above.

 Reactivity of Copper Compared to Zinc% of Copper in the Penny

Pre-LAD Question

1. Pre-1982 pennies weigh approximately 3.1 g, and post-1982 pennies weigh approximately 2.5 g. Without looking up the density value, just looking at the starting masses of the two pennies, is zinc more or less dense than copper. Explain how you made your conclusion. *(Your answer should include the words: mass, volume, density, and more)*

Post-LAD Questions

2. Certainly it must cost more money to make a penny with a coating of copper than just mint it out of zinc. Since the change to the new and improved pennies in 1982, what would be two different reasons why the government bothers to coat the zinc pennies with copper.

   (i)

   (ii)

3. What can you conclude about the acid reactivity of copper compared to zinc? Explain how you made your conclusion.

4. The chemical formula for hydrochloric acid is HCl. The bubbles that form during the reaction are hydrogen gas (a diatomic molecule). The other product formed is zinc(II) chloride, which is dissolved in the acid solution.
   Write, and then *balance* a chemical equation that represents the reaction that occurred.