

# Zinc Replacement in a Penny Lab 40 minutes

name: \_\_\_\_\_

Objective: to make measurements, calculations & predictions about the chemistry of pennies minted after 1982, and to make observations of a single replacement chemical reaction in progress.

## Procedure:

Get a penny dated after 1982, make sure it's shiny and clean.  
Mass the penny, place in an  $\text{HCl}_{(AQ)}$  bath for 2 days.

In 2 DAYS: remove pennies from acid, rinse, dry, and mass.



rows	Data Table	Your penny	Average penny for class
A	Mass of clean new penny	grams	grams
B	Mass of penny after you filed the edges in 3 places	grams	grams
C	Difference between these: the mass of the filed away copper ( $A - B =$ )	grams	grams
D	Mass of copper left over after zinc is chemically removed from penny	grams	grams
E	Corrected copper mass add mass of filed copper to mass of copper left over ( $C + D =$ )	grams	grams
F	Mass of missing zinc ( $A - E =$ )	grams	grams
G	Mass of an old penny made of pure copper	grams	grams

PROBLEMS to be done on loose-leaf paper neatly... (one point each)

Please use class average data for questions 1 - 10.

1. What's the value of the copper in an average old penny? (copper is 0.94 cents/gram on 12/5/2017).
2. The government made  $9.365 \times 10^9$  pennies in 2015. What would it cost in dollars, to buy enough copper to make that many pennies in pure copper, like when your teacher was your age?
3. Write the balanced chemical reaction between the hydrochloric acid and the zinc. Use phase symbols.
4. What is the % composition by mass of copper and zinc in the average new penny?
5. After calculating the average mass of zinc of the new pennies, determine the value of the zinc metal in the average new penny. (zinc sells for 0.31 cents per gram as of 12/5/2017)
6. After calculating the average corrected mass of the copper in the new pennies, what is the value of the copper metal in an average new penny? (copper sells for 0.94 cents per gram as of 12/5/2017).
7. What is the value of the metals in an average new penny be worth?
8. Is it cheaper for our government to make these new pennies or copper ones?
9. Write a balanced chemical reaction showing what happens when lithium metal is added into phosphoric acid (the formula for all acids you may need are in table K)
10. Write a balanced chemical reaction showing what happens when sodium metal is added into nitric acid.

## Lab Conclusion

Explain what a single replacement reaction is. Explain why this is a cation replacement, and tell what an anion replacement reaction would be. How do you use table J in single replacement reactions? Give a chemical equation with symbols that will not undergo a single replacement reaction.

Tell what you measured, calculated, and learned by doing this lab. Why did we use only the class average data for our calculations instead of just your own data? End the lab conclusion the right way.

Grading Rubric:      Cover = 2 points (title, your name and class period)  
                            Lab Questions = 20 points (show math, use lots of paper)  
                            Conclusion = 3 points (on the back, separate sheet of paper)

