

Zinc Replacement from a Penny Lab

name: _____ 40 minutes

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 as shown in data table, place in an $\text{HCl}_{(\text{AQ})}$ bath for 2 days.

Retrieve, dry off, mass again.
Do math, show all work.



*In 2 DAYS: remove pennies from acid, rinse, then dry, and mass on scales.

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 one 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 metal in an average old penny? (data row G)
(copper sells for 0.77 cents per gram as of 11/15/2011).
2. Is it worth going into the penny melting business? Explain.
3. The government makes 1.045×10^8 pennies every year. What would it cost in dollars, to buy enough copper to make that many copper only pennies?
4. Write the word equation for the reaction happening between the hydrochloric acid and the zinc in the beakers. Use phase symbols.
5. Write the balanced chemical reaction for this reaction with phase symbols.
6. What is the % composition by mass of copper and zinc in the average new penny?
7. After calculating the average mass of zinc of the new pennies, determine the value of the zinc metal in the average new penny. (data row F)
(zinc sells for 0.19 cents per gram as of 11/15/2011)
8. 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? (data row E)
(copper sells for 0.77 cents per gram as of 11/15/2011).
9. Sum the cash values for zinc and copper: what would the value of the metals in an average new penny be worth? (add answers #7 plus #8)
10. Is it cheaper for our government to make these new pennies or copper ones?
(compare answers from #1 and #9)
11. Write a balanced chemical reaction showing what happens when lithium metal is added into phosphoric acid (the formula for this is on table K)
12. Write a balanced chemical reaction showing what happens when sodium metal is added into nitric acid (the formula for this is on table K)

Lab Writing Assignment: write a few paragraphs about the synthesis & the decomposition reactions, give examples of each. Add info and examples for single replacement reactions, double replacement reactions, and combustion reactions. Discuss Table J and give at least one more example where the anions change places. Give one example of a "no reaction", that Table J shows you that will not happen. Write a few sentences about what you measured, calculated, determined with the pennies. Show off how much you know. (11 points—work hard!)

The lab cover page and intro are worth 2 points as well.