

Name: \_\_\_\_\_

Chem 9, Section: \_\_\_\_\_

Lab Partner: \_\_\_\_\_

Experiment Date: \_\_\_\_\_

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### Single Replacement Reactions & Battery Lab

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#### Part A:

For each of the reactions performed:

- record your observations
- predict the names and states of the products formed
- write the balanced equation, including all physical states and
- write the individual oxidation states for each atom.

a. **Zinc metal + hydrochloric acid**

Observations:	Product Names & States (if none, why not?):
Balanced Equation with <b>Individual Oxidation Numbers</b> above elements:	

b. **Copper metal + aqueous silver nitrate**

Observations:	Product Names & States (if none, why not?):
Balanced Equation with <b>Individual Oxidation Numbers</b> above elements:	

c. **Copper metal + aqueous zinc nitrate**

Observations:	Product Names & States (if none, why not?):
Balanced Equation with <b>Individual Oxidation Numbers</b> above elements:	

d. **Zinc metal + aqueous lead(II) nitrate**

Observations:	Product Names & States (if none, why not?):
Balanced Equation with <b>Individual Oxidation Numbers</b> above elements:	

e. **Magnesium metal + sulfuric acid**

Observations:	Product Names & States (if none, why not?):
Balanced Equation with <b>Individual Oxidation Numbers</b> above elements:	

**Part B: Batteries**

1. type of citrus fruit used \_\_\_\_\_
2. citrus fruit battery measured voltage = \_\_\_\_\_ V
3. potato battery measured voltage = \_\_\_\_\_ V
4. matzo or bread measured voltage = \_\_\_\_\_ V

**Coin Battery**

Complete the following table, which represents your coin battery.

coin:	
paper towel piece	
coin:	
paper towel piece	
coin:	
paper towel piece	
coin:	

measured voltage = \_\_\_\_\_ V

## Questions

1. For reaction a (zinc metal + hydrochloric acid reactants), write the complete balanced equation, with oxidation numbers. Use to identify what is oxidized, what is reduced, oxidizing agent, and reducing agent.
2. In reactions a-e, which (if any) did not result in a reaction? Explain.
3. What acid acts as an electrolyte in the citrus fruit battery?
4. Which type of battery produced the greatest voltage? Why?
5. For the foods tested (citrus, potato, matzo/bread), which produced the least voltage? Why?
6. What happened when the salt bridge was removed from the salt bridge battery? Explain.

7. The figure shows a galvanic cell. As this cell operates, a reddish coating of copper metal begins to appear on the surface of the copper cathode.

Label the following in the figure:  
oxidation half-reaction  
reduction half-reaction  
anode  
cathode  
salt bridge  
voltmeter

