

## Redox Reactions Worksheet

As you work through the steps in the lab procedures, record your experimental values and the results on this worksheet.

**Table A:** Reactions of Oxidizing Agents

	$\text{Cu}^{2+}$	$\text{Mg}^{2+}$	$\text{MnO}_4^{1-}$
$\text{H}_2\text{O}_2$			
KI			

**Question 1:** List the oxidizing agents in order, from weakest to strongest.

**Question 2:** Write half-reactions for the oxidizing agents in order, from weakest to strongest. (*Hint: Remember that oxidizing agents get reduced.*)

**Table A2:** Reactions of Reducing Agents

	Cu	Mg	Zn
$\text{H}_2\text{O}_2$			
KI			

**Question 3:** List the reducing agents in order, from strongest to weakest.

**Question 4:** Write the half-reactions for the reducing agents in order, from weakest to strongest.  
(*Hint: Remember that reducing agents get oxidized.*)

**Question 5:** The strongest oxidizing agent is said to have the most positive potential and the strongest reducing agent has the most negative potential. Based on your observations, list all the half-reactions (as reductions) in order from most negative to most positive.

**Question 6:** Consider the reaction involving magnesium metal.

- a. With what compound, element or ion did magnesium react?
  
- b. Write a half-reaction for what happened to this chemical. You may use a Table of standard Reduction Potentials<sup>1</sup> for help.
  
- c. Write the balanced equation for the reaction that occurred between magnesium metal and this chemical.

**Question 7:** You also observed a reaction with zinc metal.

- a. With what compound, element or ion did zinc react?

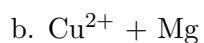
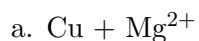
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<sup>1</sup>../tables/tables.pdf

b. Write a half-reaction for what happened to this chemical. You may use a Table of standard Reduction Potentials<sup>2</sup> for help.

c. Write the balanced equation for the reaction that occurred between zinc metal and this chemical.

**Question 8:** Based on your answers to Question 5, will either of these combinations produce a reaction?



**Table B1:** Cell Potentials vs a  $\text{Cu}^{2+}/\text{Cu}$  Couple

Electrochemical Cell	Half-Cell Being Studied	Measured Potential Difference vs $\text{Cu}^{2+}/\text{Cu}$ in mV	Measured Potential Difference vs $\text{Cu}^{2+}/\text{Cu}$ in V
Copper-Copper	$\text{Cu}^{2+}/\text{Cu}$		
Silver-Copper	$\text{Ag}^{1+}/\text{Ag}$		
Lead - Copper	$\text{Pb}^{2+}/\text{Pb}$		
Zinc-Copper	$\text{Zn}^{2+}/\text{Zn}$		

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<sup>2</sup>../tables/tables.pdf

**Table B2:** Cell Potentials in Order, with Half-Reactions

Half-Cell	Measured Cell Potential (Most negative to most positive)	Calculated Cell Potential vs SHE (Add +0.34 V)	Standard Reduction Potential vs SHE from table
/	V	V	V
/	V	V	V
/	V	V	V
/	V	V	V

**Question 9:** Based on the order obtained by experiment,

- Which species has the highest energy filled or partially filled orbitals?
- Which species has the lowest energy unfilled or partially filled orbitals?
- Which species is the strongest reducing agent?
- Which species is the strongest oxidizing agent?

**Question 10:** Using the order you found in Data Table B2 for the cell potentials, write the half-reaction for each half-cell. Write the reactions as reductions.

**Question 11:** The  $\text{Mg}^{2+}/\text{Mg}$  couple was not tested when measuring half-cell potentials. Based on its behavior in Part A, where would you place it in Data Table B2? (If you are doing Part B first, return to this question after completing both parts of the lab.)