Redox Reactions Worksheet

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

Data Table A1: Reactions of Oxidizing Agents

	Cu^{2+}	$Mg^{2}+$	MnO_4^{1-}
H_2O			
H_3O^{1+}			

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.)*

Data Table A2: Reactions of Reducing Agents

	Cu	Mg	Zn
H_2O_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[1] for help.

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

[1] ../tables/tables.pdf

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

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

b. Write a half-reaction for what happened to this chemical. You may use a Table of standard Reduction Potentials[2] 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?

a. $Cu + Mg^{2+}$

b. $Cu^{2+} + Mg$

Data Table B1: Cell Potentials vs a Cu^{2+}/Cu Couple

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

[2] ../tables/tables.pdf

Data 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,

a. Which species has the highest energy filled or partially filled orbitals?

b. Which species has the lowest energy unfilled or partially filled orbitals?

c. Which species is the strongest reducing agent?

d. 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 Mg^{2+}/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.