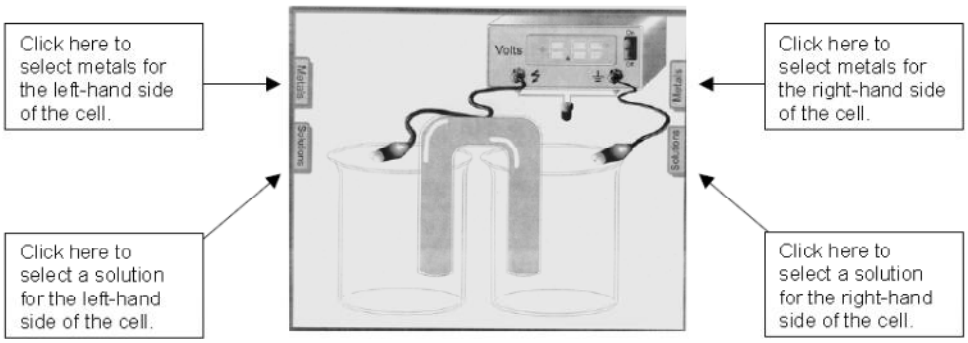
Name: _____ **Electrochemical Cells**

Electrochemical cells involve the transfer of electrons from one species to another. In these chemical systems, the species that loses electrons is said to be "oxidized" and the species that gain electrons is said to be "reduced". Oxidation and reduction go hand in hand. There are two major types of electrochemical cells: voltaic (also galled galvanic) and electrolytic. Voltaic cells produce electricity by harnessing the energy present in the flowing electrons. These reactions are *spontaneous*.



Standard Cell Potentials (Voltaic Cells)

Go to http://www.kentchemistry.com/moviesfiles/Units/Redox/voltaiccelll20.htm or goo.gl/jrBKbm

1. Make the following voltaic cells. Use Table J to determine which metal should be the anode (attached to the black wire) and which should be the cathode (attached to the red wire):
   #1: Zn/Zn^{+2} | | Ag^{+1}/Ag #2: Cu/Cu^{+2}| | Ag^{+1}/Ag #3: Zn/Zn^{2+} | | Cu^{2+}/Cu

2. For each of the above, **place the metal in a solution of its own ions**. For the hydrogen electrode (nonmetal), place it in an acid solution. Make sure the cells are set up so that the cell potential is a **positive value**, indicating that the voltaic cell is set up correctly and the redox reaction is spontaneous. *(Hint: In this simulation, the anode is black and the cathode is red.)*

3. For each of the three voltaic cells, record the direction of electron flow, determine which electrode is the anode and which is the cathode, and record the cell voltage in the table on the next page.

4. For each electrode, determine whether oxidation or reduction is taking place. Record this in the table.

5. For each electrode, determine whether the electrode is *dissolving away* (becoming an ion and going in to solution) OR *gaining mass* (ions in solution are becoming neutral atoms that are deposited on the electrode). Record this in the table.

6. You must click the "Off" switch to reset for the next voltaic cell.

Voltaic Cell #	Electrodes	Direction of electron flow	Anode	Cathode	E^o_{cell} (Volts)
Ex	H_2/Zn				
	Oxidation or Reduction?				
	Dissolving into solution or gaining mass?				
1	Ag/Zn				
	Oxidation or Reduction?				
	Dissolving into solution or gaining mass?				
2	Ag/Cu				
	Oxidation or Reduction?				
	Dissolving into solution or gaining mass?				
3	Cu/Zn				
	Oxidation or Reduction?				
	Dissolving into solution or gaining mass?				

Analysis Questions:

Ex) H_2 and Zn

Oxidation: $Zn \rightarrow Zn^{+2} + 2e^-$ **Reduction: $2\,[H^{+1} + 1e^- \rightarrow H]$**

Balanced Redox Reaction: $Zn + 2H^{+1} \rightarrow Zn^{+2} + H_2$

1) Ag and Zn

Oxidation: _____ Reduction: _____

Balanced Redox Reaction: _____

2) Ag and Cu

Oxidation: _____ Reduction: _____

Balanced Redox Reaction: _____

3) Cu and Zn

Oxidation: _____ Reduction: _____

Balanced Redox Reaction: _____

4) Which battery releases the most power? _____