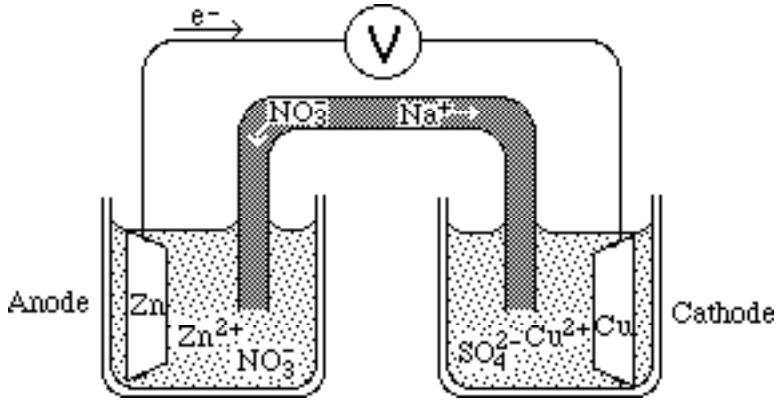
Chem 1515
During Class Invention
Spring 2007

Name_____
TA Name _____
Lab Section #_____

1. Sketch the electrochemical cell constructed in lecture. In your sketch, identify the important components of the cell, i.e. the anode and cathode electrodes, the ions in solution in the anode and cathode compartments, and the salt bridge. In addition, indicate the direction of flow of electrons in the wire, and the direction of flow of ions in the salt bridge, the anode and the cathode compartments. **See Appendix III for recommended demonstration, video, or computer resources.**



$Zn_{(s)} \rightarrow Zn^{2+}_{(aq)} + 2e^-$ **$Cu^{2+}_{(aq)} + 2e^- \rightarrow Cu_{(s)}$**

2. Describe the reaction which is occurring at the surface of the anode electrode and the cathode electrode.

The reaction which occurs at the anode is:

$$Zn_{(s)} \rightarrow Zn^{2+}_{(aq)} + 2e^-$$

At the anode, as a zinc atom is oxidized, the zinc ion enters the solution and the two electrons remain in/on the metal. The excess electrons appear on the surface of the cathode where a copper ion is located. Reduction occurs at the surface of the cathode adding a copper atom.

The reaction which occurs at the cathode is:

$$Cu^{2+}_{(aq)} + 2e^- \rightarrow Cu_{(s)}$$

3. Explain why the cations in the salt bridge migrate towards the cathode compartment and why the anions in the salt bridge migrate towards the anode compartment.

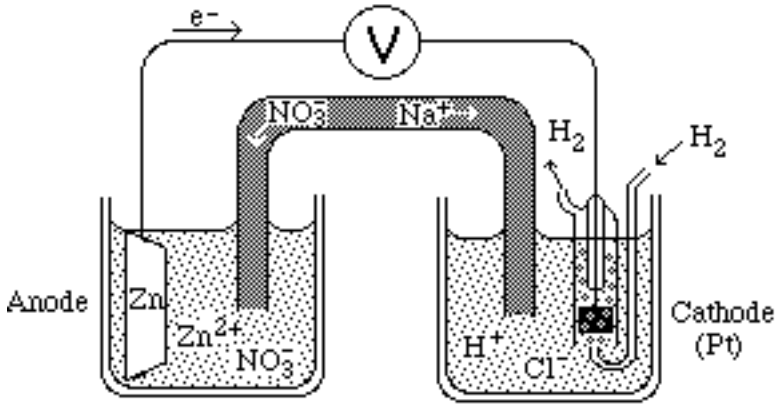
As reduction occurs in the cathode compartment, cations, in this case Cu^{2+}, are removed from solution. To maintain charge balance in the cathode compartment, cations in the salt bridge migrate towards the cathode. In the anode compartment, cations are produced by the oxidation of the anode. To maintain charge balance in the anode compartment, anions from the salt bridge migrate towards the anode.

4a. Write the shorthand cell notation for the electrochemical cell constructed in lecture.

$$\mathbf{Zn}_{(s)}|\mathbf{Zn}^{2+}_{(aq)}||\mathbf{Cu}^{2+}_{(aq)}|\mathbf{Cu}_{(s)}$$

b. Write the oxidation-reduction equation and sketch the electrochemical cell using the following electrochemical cell notation.

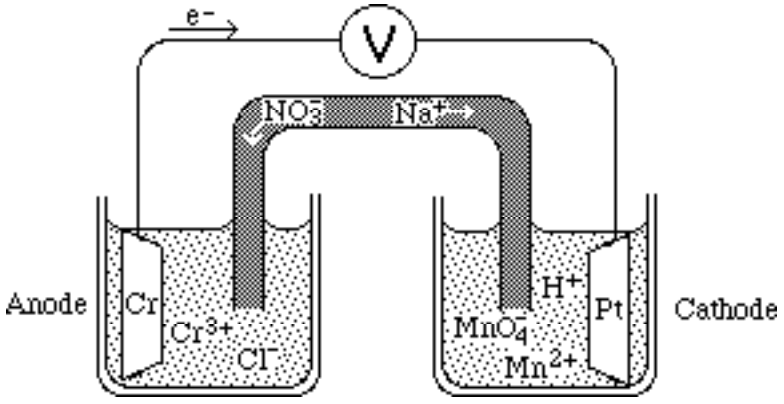
i) $Zn_{(s)}|Zn^{2+}_{(aq)}||H^{+}_{(aq)}|H_{2(g)}|Pt_{(s)}$



$$\mathbf{Zn}_{(s)} \rightarrow \mathbf{Zn}^{2+}_{(aq)} + 2e^{-} \qquad 2e^{-} + 2\mathbf{H}^{+}_{(aq)} \rightarrow \mathbf{H}_{2(g)}$$

b. Write the oxidation-reduction equation and sketch the electrochemical cell using the following electrochemical cell notation.

ii) $Cr_{(s)}|Cr^{3+}_{(aq)}||MnO_4^-{}_{(aq)}, H^+_{(aq)}, Mn^{2+}_{(aq)}|Pt_{(s)}$



$Cr_{(s)} \rightarrow Cr^{3+}_{(aq)} + 3e^-$

$5e^- + 8H^+_{(aq)} + MnO_4^-{}_{(aq)} \rightarrow Mn^{2+}_{(aq)} + 4H_2O_{(l)}$