Electrochemistry/SS **Name:**

For complete credit show all the work for the calculations and give the answers in the correct significant figures. You may need to find the Ecells for some problems from the text book or power point presentation.

1) Which of the following elements is getting oxidized and which is getting reduced? Also indicate the elements is an oxidizing and which is a reducing agents the above reactions?

   a) $Fe^{2+} + NO_3^- + H^+ \longrightarrow Fe^{3+} + H_2O + NO$

   b) $IO_4^- + I^- + H^+ \longrightarrow I_2 + H_2O$

2) Balance the following redox reactions in an acidic medium.

   a) $Fe^{2+}(aq) + Cr_2O_7^{2-}(aq) \longrightarrow Fe^{3+}(aq) + Cr^{3+}(aq)$

   b) $S_8(s) + O_2(g) \longrightarrow SO_4^{2-}(aq)$

3) Balance the following redox reactions in a basic medium.

a) $CrI_3(s) + H_2O_2(l) \longrightarrow CrO_4^{2-}(aq) + IO_4^-(aq)$

b) $CrO_4^{2-}(aq) + AsH_3(g) \longrightarrow Cr(OH)_3(s) + As(s)$

4) Calculate the E^o for the reactions as indicated.

$2CuI(s) + Cd(s) \longrightarrow Cd^{2+}(aq) + 2I^-(aq) + 2Cu(s) \quad E^o_{cell} = +0.23V$

If $E^o\ Cd^{2+}_{(aq)}/Cd_{(s)} = -0.403V$, what is the E^o_{cell} for the reaction below?

$2CuI(s) + 2e^- \longrightarrow 2Cu(s) + 2I^-(aq) \quad E^o_{cell} = ?$

5) Write the equation for the half reactions and overall cell reaction and calculate the E^{o}_{cell} for each of the voltaic cells shown below.

a) $Pt \mid Fe^{2+}(aq), Fe^{3+}(aq) \parallel Cr_2O_7^{2-}(aq), Cr^{3+}(aq) \mid Pt$ (ans: 0.56V)

b) $Pt \mid NO(g) \mid NO_3^{-}(aq), H^{+}(aq) \parallel H^{+}(aq), H_2O_2\,(l) \mid Pt$ (ans: 2.719V)

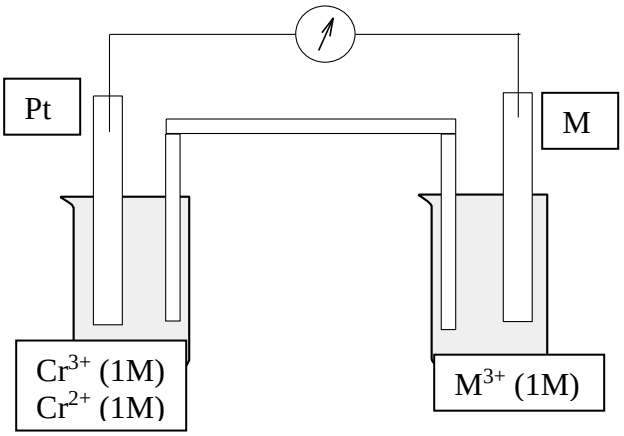
6) Write the half reactions for the following redox equations and show it in a voltaic cell representation.

a) $Zn(s) + Ag^{+}(aq) \longrightarrow Ag(s) + Zn^{2+}(aq)$

b) $Fe^{2+}(s) + H^{+}(aq) + O_2(g) \longrightarrow Fe^{3+}(aq) + H_2O(l)$

Bonus Page

7) From the indicated voltages for the voltaic cell shown below, determine the standard electrode potential $E_{M^{3+}/M}$, if the metal M is a) In , E^{o}_{cell} = 0.086 V and b) Cr, E^{o}_{cell} = -0.32 V.



8) Predict whether the following reactions will occur as written or no, i.e. if they are spontaneous.

a) $Sn(s) + Co^{2+}(aq) \longrightarrow Sn^{2+}(aq) + Co(s)$

b) $6Br^{-}(aq) + Cr_2O_7^{2-}(aq) + 14H^{+}(aq) \longrightarrow 2Cr^{3+}(aq) + 7H_2O(l) + 3Br_2(l)$

9) Are the following reactions possible – yes or no?

a) Silver metal gets oxidized by HCl.

b) Reduction of $Sn^{4+}(aq)$ to $Sn^{2+}(aq)$ by Cu(s).