# UNIT 13
## ASSIGNMENT

___/47

Name: _____

1. Indicate whether the following balanced equations involve oxidation-reduction processes and **if they do** show what is being oxidized and reduced. **Write oxidation numbers on all elements**. [8 pts]
**Circle elements involved in reduction in RED & elements involved in oxidation in BLUE**

(a) $PBr_3(l) + 3H_2O(l) \rightarrow H_3PO_3(aq) + 3HBr\ (aq)$

(b) $NaI(aq) + 3HOCl(aq) \rightarrow NaIO_3(aq) + 3HCl(aq)$

(c) $3SO_2(g) + 2HNO_3(aq) + H_2O(l) \rightarrow 3H_2SO_4(aq) + 2NO(g)$

(d) $2H_2SO_4(aq) + 2NaBr(s) \rightarrow Br_2(l) + SO_2(g) + Na_2SO_4(aq) + 2H_2O(l)$

2. Balance the following redox equations: [2 x 3pt] = [6 pt]

(a) $Pb(OH)_4^{2-}(aq) + ClO^{-1}(aq) \rightarrow PbO_2(s) + Cl_2(aq)$ **[basic solution]**

2. (b) $Cr_2O_7^{2-}(aq) + CH_3OH(aq) \rightarrow HCO_2H(aq) + Cr^{3+}(aq)$ (acidic solution)

3. A voltaic cell is created by placing a strip of copper metal into a solution of 1.0 M copper sulfate and a piece of Tin in a solution of Tin (II) chloride (1 mol/L).

   (a) Draw the above cell clearly identifying what is the **anode, cathode, direction of $e^{-1}$ flow, salt bridge, ion movement, charge on electrons** [5 pts]

3. (b) Write the two half reactions of the chemical reaction **and** show the $E°_{cell}$ for this process. [2 pts]

   oxidation _____

   reduction _____

4. Calculate the standard EMF and $\Delta G°$ for each of the following reactions: **Write the half reactions.** [9 pts]

   (a) $H_2(g) + F_2(g) \rightarrow 2H^{+1}(aq) + 2F^{-1}(aq)$

   $E°_{cell}$

   $\Delta G°$ (in kJ)

   (b) $Cu^{+2}(aq) + Ca(s) \rightarrow Cu(s) + Ca^{+2}(aq)$

   $E°_{cell}$

   $\Delta G°$(in kJ)

   (c) $3Fe^{2+}(aq) \rightarrow Fe(s) + 2Fe^{+3}$

   $E°_{cell}$

   $\Delta G°$ (in kJ)

5. A voltaic cell utilizes the following reaction:

   $2Fe^{+3}(aq) + H_2(g) \rightarrow 2Fe^{2+}(aq) + 2H^{+1}(aq)$

   (a) Calculate $E°_{cell}$ for this reaction [2 pts]

   (b) What is the emf for this cell when $[Fe^{+3}]$ is 2.50M, $P_{H2}$ = 0.85atm, $[Fe^{2+}]$ 0.0010M and the pH in both compartments is 5.00? [4 pts]

6. A voltaic cell is condtructed with two $Zn^{2+}$-Zn electrodes. The two cell compartments have $[Zn^{2+}]$ = 2.8M and $[Zn^{2+}] = 1.00 \times 10^{-2}$mol/L respectively. [4 pts]

   (a) Which electrode is the anode of the cell? _____

   (b) What is the standard emf of this cell, $E°_{cell}$? _____

   (c) What is the nonstandard emf for this cell?

7. Calculate the mass of Li formed by electrolysis of molten LiCl by a current of $7.5 \times 10^4$ A flowing for a period of 48.00 hrs. Assume that 85% of this current actually does chemical work (it is 85% efficient). [3 pts] **Answer in kg!**

8. The $K_{sp}$ value for PbS(s) is $8.0 \times 10^{-28}$. By using this value together with an electrode potential from appendix E, determine the value of the standard reduction potential ($E°_{red,overall}$) for the reaction: [4 pts]

$PbS(s) + 2e^{-1} \rightarrow Pb(s) + S^{2-}$

This reaction can be written as sum of 2 steps:

$Pb^{+2}(aq) + 2e^{-1} \rightarrow Pb(s)$ $\quad E°_{red1} =$ _____

$PbS(s) \rightarrow Pb^{+2}(aq) + S^{2-}(aq)$ $\quad E°_{red2} =$ _____?_____

$PbS(s) + 2e^{-1} \rightarrow Pb(s) + S^{2-}$ $\quad E°_{red,overall} = E°_{red1} + E°_{red2}$