***AP Chemistry
Nernst Equation***

State the Nernst equation:

1. (a) Under what circumstances is the Nernst equation applicable?

 (b) What is the value of the reaction quotient, Q, under standard conditions?

 (c) i) What happens to the value of Q if the concentration(s) of the reactants are greater than the concentration(s) of the product(s)?

 ii) What effect does this change have on the cell voltage?

 (d) i) What happens to the value of Q if the concentration(s) of the product(s) are greater than the concentration(s) of the reactants?

 ii) What effect does this change have on the cell voltage?

2. A voltaic cell is constructed that uses the following reaction and operates at 298K:

 Zn(s) + Cd2+(aq) → Zn2+(aq) + Cd(s)

1. What is the maximum voltage of this cell under standard conditions?

A student constructs a non-standard voltaic cell with [Cd2+] = 1.50M and [Zn2+] = 0.150M

1. Will the voltage of the non-standard cell be greater than, less than, or equal to the standard cell voltage? Justify your answer.
2. Calculate the voltage of this cell when [Cd2+] = 1.50M and [Zn2+] = 0.150M.

A student constructs a second non-standard voltaic cell with [Cd2+] = 0.075M and [Zn2+] = 0.950M.

1. Will the voltage of this second non-standard cell be greater than, less than, or equal to the standard cell voltage? Justify your answer.

(e) Calculate the voltage of this cell when [Cd2+] = 0.075M and [Zn2+] = 0.950M.

3. A voltaic cell uses the following reaction and operates at 298K:

 4Fe2+(aq) + O2(g) + 4H+(aq) → 4Fe3+(aq) + 2H2O(l)

1. What is the standard cell voltage of this cell under standard conditions?
2. Calculate the cell voltage of this cell when [Fe2+] = 2.0M, [Fe3+] = 0.0010M, PO2 = 0.50 atm, and the pH of the solution in the cathode is 3.00. (Hint: write out an expression for Q before proceeding...and yes, we can combine pressure and concentrations to find Q!)

Going further (find these equations on your formula sheet!)

State the relationship between cell EMF and Gibb’s free energy:

State the relationship between Gibb’s free energy and the equilibrium constant:

4. A voltaic cell exhibits a standard emf of +0.217V at 298K. What is the value of the equilibrium constant for the overall reaction:

 (a) If n = 1?

1. If n = 2?

 (c) If n = 3?