**Name**

**electrochemistry: Equilibrium Calculations**

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log K = nE°/0.0592

(R = 8.31  T = 298K)

$\Delta G° = -nFE°$    $\Delta G° = -RT\ln K$

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1. Calculate $\Delta G°$ for the following reaction, given that its standard cell potential is 0.320V at 25C.

   $NiO_2(s) + 2Cl^-(aq) + 4H^+(aq) \Rightarrow Cl_2(g) + Ni^{2+}(aq) + 2H_2O(l)$

   $\Delta G° = -nFE$

   $-2 \cdot 96500 \cdot 0.32 = -617$

2. Calculate Kc for this reaction:

   $3Cu^{2+}(aq) + 2Al(s) \Rightarrow 3Cu(s) + 2Al^{3+}(aq)$ E = 2.00V

2 options

$\Delta G° = -nFE$

$-6 \cdot 96500 \cdot 2$

$= -1,158,000\,J$

$\Delta G° = -RT\ln K$

$-1158 = -8.31(298)\ln K$

solve

$\log K = \frac{nE}{0.0592}$

$\log K = \frac{6 \cdot 2}{.0592}$

4. As this reaction proceeds over time explain the following:

   $Cu + Ag^+ \Leftrightarrow Cu^{2+} + Ag$    E° = .46V

   a) As this reaction proceed the $[Cu^{2+}]$ (increases or decreases)

   b) As this reaction proceed the $[Ag^+]$ (increases or decreases)

   c) If you were to increase the concentration of the $[Ag^+]$ to 2M the V will (increase or decrease)

   d) If you were to decrease the concentration of the $[Cu^{2+}]$ to .01M the V will (increase or decrease)

   e) By the E° = .46V, this reaction will proceed in which direction to get to products?

   E is + so $\longrightarrow$

5. In the drawing below label the following items for the given reaction:

   Reaction: $Zn + Cu^{2+} \Leftrightarrow Zn^{2+} + Cu$   E° = 1.1V

   *** Use arrows on your drawing and label the tops of the arrows to indicate location of item.

   Label:

   E°

   E when conditions are $[Cu^{2+}]$ = .1M  $[Zn^{2+}]$ = 1M $\longrightarrow$

   $\Delta G°$

   K

   $\Delta G°$ at equilibrium