Due: Thursday, 15-April-2004 by the beginning of class. Remember, this is to be your own work!!

1) An aqueous solution of an unknown salt of rhenium is electrolyzed by a current of 2.75 amps for 2.15 hours. The electroplating is carried out with an efficiency of 95.0%, resulting in a deposit of 19.51 g of rhenium.
   a) How many faradays are required to deposit the rhenium?
   b) What is the charge on rhenium (based on your calculations)?

2a) Calculate the $\Delta G^\circ$ for the following cell reaction:

$$ Ce|Ce^{3+}(aq)||Ni^{2+}(aq)|Ni $$

The $\Delta G^\circ_f$ for $Ce^{3+}$ = -671.95 kJ/mol

b) From this calculated $\Delta G^\circ$, calculate the standard emf for the cell reaction. Using this standard emf, calculate the standard half-cell potential for $Ce^{3+}(aq) + 3e^- \rightarrow Ce(s)$

3) Calculate the $K_f$ of $Ag(NH_3)_2^+$ from:

$$ Ag^+(aq) + e^- \leftrightarrow Ag(s) \quad E^\circ = 0.80 \text{ V} $$
$$ Ag(NH_3)_2^+(aq) + e^- \leftrightarrow Ag(s) + 2 NH_3(aq) \quad E^\circ = 0.37 \text{ V} $$

4) An electrode is prepared from liquid mercury in contact with a saturated solution of mercury(I) chloride, $Hg_2Cl_2$, containing 1.00 $M$ $Cl^-$. The emf of the voltaic cell constructed by connecting this electrode as the cathode to the standard hydrogen half-cell as the anode is 0.268 V. What is the solubility product of mercury(I) chloride?