Due: **Wednesday, 23-April-2003** by the beginning of class. Remember, this is to be your own work!!

1) An aqueous solution of an unknown salt of vanadium 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 3.558 g of vanadium.
   a) How many faradays are required to deposit the vanadium?
   b) What is the charge on vanadium (based on your calculations)?

2a) Calculate the ΔG° for the following cell reaction:
   \[ \text{Rb}||\text{Rb}^+(aq)||\text{Pb}^{2+}(aq)||\text{Pb} \]
   The ΔG° for Rb⁺ = -282.2 kJ/mol

   b) From this calculated ΔG°, calculate the standard emf for the cell reaction. Using this standard emf, calculate the standard half-cell potential for Rb⁺(aq) + e⁻ → Rb(s)

3) Under standard conditions for all concentrations, the following reaction is spontaneous at 25°C.
   \[ \text{O}_3(g) + 2\text{H}^+(aq) + 2\text{Co}^{2+} \rightarrow \text{O}_2(g) + \text{H}_2\text{O}(l) + 2\text{Co}^{3+}(aq) \]
   If [H⁺] is adjusted by a buffer of 0.10 M NaClO and 0.15 M HClO (Kₐ = 3.5 x 10⁻⁸) what value will E₉ cell have, and will the reaction be spontaneous at this [H⁺]?

4) An electrode is prepared from liquid mercury in contact with a saturated solution of mercury(I) chloride, Hg₂Cl₂, 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?