Advanced Analytical Chemistry Homework

- 1) What is the potential of a cell made up of Zn/Zn^{2+} and Cu/Cu^{2+} half cells at 25 °C if $[Zn^{2+}] = 0.15$ M and $[Cu^{2+}] = 0.25$ M? Use the Nernst equation and the standard potentials given below in your calculation.
- 2) A rechargeable battery, such as a lead storage battery in a car, is an electrochemical cell that both supplies power when used and consumes power when it is recharging. Briefly (1 or 2 sentences) tell how and when this system is a galvanic cell and/or an electrolytic cell.
- 3) Calculate the potential (E) for the cells listed below. Use the Nernst equation and the list of standard potentials below.

Fe
$$| \text{Fe}^{2+} (0.050 \text{ M}) | | \text{Cu}^{2+} (0.020 \text{ M}) | \text{Cu}$$

Ag | AgI (sat'd),
$$I^{-}(2.50 \times 10^{-4} \text{ M}) \| \text{Fe}^{3+}(0.100 \text{ M}), \text{Fe}^{2+}(0.0500 \text{ M}) | \text{Pt}$$

Standard Potentials

$$Cu^{2+} + 2e^{-} \leftrightarrow Cu(s)$$
 $E^{\circ} = +0.337 \text{ v}$

$$Zn^{2+} + 2e^{-} \leftrightarrow Zn(s)$$
 $E^{\circ} = -0.763 \text{ v}$

$$Fe^{2+} + 2e^{-} \leftrightarrow Fe(s)$$
 $E^{\circ} = -0.440 \text{ v}$

$$Fe^{3+} + e^{-} \leftrightarrow Fe^{2+}$$
 $E^{\circ} = +0.771 \text{ v}$

$$AgI(s) + e^{-} \leftrightarrow Ag(s) + I^{-}$$
 $E^{\circ} = -0.151 \text{ v}$