Chemistry 146 – Van Bramer
Spring Problem Set – Week 15

1. Calculate the cell potential and free energy available for the following electrochemical systems.
    a. $Ag(s)|Ag^{1+}(aq\ 1.0\ M)||Cu^{2+}\ (aq\ 1.0\ M)|Cu(s)$
    b. $Ag(s)|Ag^{1+}(aq\ 0.1\ M)||Cu^{2+}\ (aq\ 0.1\ M)|Cu(s)$
    c. $Ag(s)|Ag^{1+}(aq\ 1.0\ M)||Cu^{2+}\ (aq\ 0.1\ M)|Cu(s)$
    d. $Ag(s)|Ag^{1+}(aq\ 1.0\ M)||Cu^{2+}\ (aq\ 0.01M)|Cu(s)$
    e. $Ag(s)|Ag^{1+}(aq\ 0.1\ M)||Cu^{2+}\ (aq\ 1.0\ M)|Cu(s)$
    f. $Cu(s|Cu^{2+}\ (aq\ 1.0\ M)||Ag^{1+}(aq\ 1.0\ M)|Ag(s))$

2. If the electrochemical cell discussed is used as a battery and begins with 10.0 g electrodes (silver and copper), and 250 mL of each 1.0 M solution.
    a. Identify the limiting reagent in the reaction.
    b. Calculate the number of moles of electrons exchanged when the reaction goes to completion.

3. Electrochemical Analysis techniques are capable of detecting very small amounts of certain metals. In one type of analysis Cd^{2+} undergoes electrolysis. In this experiment it is possible to detect a signal from 1 pA of current, lasting only 1 ms.
    a. How many moles of Cd^{2+} does this correspond to?
    b. How many atoms is this?