Name____

$$E = E^0 + \frac{0.059\,V}{n} log\frac{[Ox]}{[Red]} = E^o + \frac{2.303RT}{nF} log\frac{[Ox]}{[Red]} \quad \Delta G_{rxn} = -RTlnK_{eq} = -nFE_{cell}$$

R = 8.314 J/mol-K T= 298 K F = 96,500 coulombs/mol V = J/C

$$aA + bB = cC + dD \qquad E_{cell} = (E^0_{cathode} - E^0_{anode}) + \frac{0.059\,V}{n}\, log\frac{[A]^a[B]^b}{[C]^c[D]^d}$$

Quiz 9 (10 pts)
CEM 434
Fall 2016

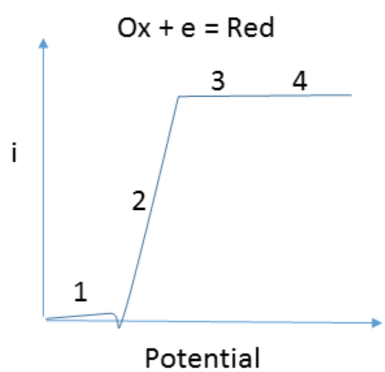
1. (4 pts). Explain the method - anodic stripping voltammetry. Show the perturbation signal and the measured signal. What kind of analytes is this method good for?

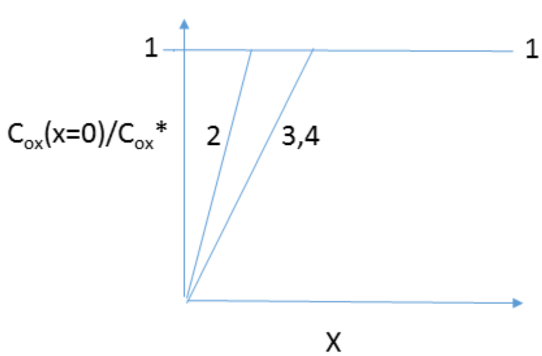
There are two steps in the measurement. (i) a deposition step during which a constant, very negative potential is applied for several minutes to deposit metal phases on the electrode surface. (ii) a follow-up potential sweep from the very negative deposition potential toward more positive values to selectivel oxidize the metal phases. The deposition potential is ca. -1.0 V vs. Ag/AgCl – far negative of the E^o values for any of the metal ions to be detected. Therefore, there is a deposition or preconcentration step and an oxidation or stripping step.

Metal ions are detected by this method (Cu(II), Cd(II), Pb(II), Zn(II), e.g.). Excellent method for trace analysis of these toxic metal ions in water samples. Stripping currents measured during the oxidation step are related to the solution concentrations through appropriate response curves.

2. (4 pts). Describe the three principal modes of mass transfer. Sketch out a steady-state linear sweep voltammetric curve. For points at the foot of the wave, on the rising part of the wave and in the limiting current region, sketch out representative concentration-distance profiles.

Three modes of mass transfer are (i) diffusion – movement of species from high concentration to low concentration region, (ii) convection – physical movement of solution and (iii) migration – movement of charged species in an electric field.





3. (3 pts). In a potentiometric measurement, a **Cu** indicator electrode was placed in contact with a solution of $[Cu^{+2}] = 2.6 \times 10^{-4}$ M. ($E^o = 0.340$ V vs. NHE). What would be the calculated potential of the **Cu** electrode vs. NHE?

$$E = 0.340\ V + \frac{0.0592\ V}{2} \log[2.6\ x\ 10^{-4}] = 0.234\ V\ vs. NHE$$