## Class Project

**Due: Friday, April 22nd**

**In this project, you will use computer simulations to determine cyclic voltammetric i-E curve shapes as a function of $k^o$, $\alpha$, analyte concentration, and redox reaction mechanism. The software you will use in DigiSim 3.1 and it is available on a computer in room 306 of the Chemistry Building.**

**You will need to save the curves you generate and eventually print them out with a short summary. You will have to determine $E_{init}$ and $E_{final}$ for the simulations.**

1. **For the redox reaction, O + e = R, and $E^o$ = 0.250 V, $C_{ox}$ = 1 mM, D = 5 x $10^{-6}$ $cm^2/s$ and $\alpha$=0.5, determine how the curve shapes change as a function of scan rate (0.1, 0.2, 0.3, 0.4 and 0.5 V/s) with $k^o$ = $10^{-2}$, $10^{-3}$, $10^{-4}$ and $10^{-5}$ cm/s. What are the $\Delta E_p$ and $i_p^{red}$ values with scan rate and rate constant? Assume that only $C_{ox}$ is present to begin with. Do not add any $R_{ohmic}$ or $C_{dl}$ values to the simulation.**
2. **For the same redox reaction and conditions, determine how the curve shapes change as a function of scan rate (0.1, 0.2, 0.3, 0.4 and 0.5 V/s) for $k^o$=$10^{-3}$ cm/s when $R_{ohmic}$ is changed from 10, 100, 500 and 1000 ohms. What are the $\Delta E_p$ and $i_p^{red}$ values with scan rate and rate constant? Assume that only $C_{ox}$ is present to begin with.**
3. **For the same redox reaction and conditions, determine how the curve shapes change as a function of scan rate (0.1, 0.2, 0.3, 0.4 and 0.5 V/s) for $k^o$=$10^{-3}$ cm/s when Cdl is changed from 10, 45, 75 and 100 $\mu F/cm^2$. What are the $\Delta E_p$ and $i_p^{red}$ values with scan rate and rate constant? Assume that only $C_{ox}$ is present to begin with.**
4. **For the redox reaction, O + e = R, and $E^o$ = 0.250 V, D = 5 x $10^{-6}$ $cm^2/s$ and $\alpha$=0.5, determine how the curve shapes change at 0.1 V/s with $k^o$ = $10^{-2}$, $10^{-3}$, $10^{-4}$ and $10^{-5}$ cm/s and $C_{ox}$ = 0.1, 0.5 and 1 mM. What are the $\Delta E_p$ and $i_p^{red}$ values with scan rate and rate constant? Assume that only $C_{ox}$ is present to begin with. Do not add any $R_{ohmic}$ or $C_{dl}$ values to the simulation.**
5. **Determine how the background voltammetric curves change shape and current magnitude with scan rate between 0.5 and -0.5 V for $C_{dl}$ = 10 $\mu F/cm^2$ and $R_{ohmic}$ = 10, 100, 500 and 1000 ohms, and for $C_{dl}$ = 100 $\mu F/cm^2$ at the same $R_{ohmic}$ values.**