Exam IV Review Sheet  (December 3rd)

Chapters 16 and 17 – Applications of IR Spectroscopy
1. What happens to a molecule when it absorbs IR light? What region of the electromagnetic spectrum is IR spectroscopy in? Which are more energetic, vibrations (stretches and bends) or rotations? What is the requirement for IR light to be absorbed?
2. Basic design and operation of an FT instrument as compared to an older dispersive instrument.
3. Be able to interpret IR spectra to identify molecular structure
4. Understand the different ways of sampling to record IR spectra (transmission, diffuse reflectance, ATR)

Chapter 20 – Mass Spectrometry
1. The basic design of a mass spectrometer: ion source, mass analyzer and ion transducer
2. Understand the different ionization sources: EI, CI, MALDI
3. Understand the different ionization sources used for LC-MS: ESI and APCI
4. How do electron multiplier and faraday cup detectors work (Chapter 11)?
5. Understand the basic operating principles of quadrupole, ToF and double sector analyzers.
6. Use mass spectra along with IR spectral data to identify the structure of molecules.

Chapter 22 – Introduction of Electroanalytical Chemistry (work the problems)
1. Basic design of electrochemical cells, know what an anode and cathode are, be able to determine from a cell configuration which electrode is the anode and which is the cathode.
2. Be able to use the table of standard reduction potentials to predict reaction tendencies to occur and to calculate electrode potentials using the Nernst Equation.
3. Know the short-hand notation for electrochemical cells
4. Be able to calculate $E_{\text{cell}}, \Delta G_{\text{cell}}$ and $K_{eq}$

Chapter 23 – Potentiometry (work the problems)
1. Basic design of the cell needed for a potentiometric measurement.
2. Know electrodes of a first- and second-kind. How does one calculate the electrode potential.
3. Know the basic design of ion selective electrodes using membrane based indicator electrodes
4. $E_{\text{meas}} = E_{\text{ind}} - E_{\text{ref}} + E_{j} \quad E_{\text{ind}} = \text{constant} + (0.050/z) \log [x]$
5. What are the operating principles behind how a potential (charge separation) develops across a membrane of an ISE? Understand how the pH and F⁻ ISEs work
6. What kind of information do potentiometric measurements provide? What is the sensitivity of the measurement for $H^+$, $F^-$ and $Ca^{++}$?

Chapter 25 – Voltammetry
1. What is a voltammetric measurement? Basic design of the cell needed for a measurement.
2. Understand how to analyze a cyclic voltammetric curve for the case of peak-shaped curves when semi-infinite linear diffusion is operative and the case of a limiting or steady-state current when steady-state diffusion is operative.