Analytical Exam
Electroanalytical Chemistry
October 5, 2017

Please answer all of the following questions completely and concisely. Explanations or descriptions should be in the form of complete sentences. **Diagrams must be clearly labeled for full credit.**

1. The standard experimental set up for coulometric and voltammetric measurements is the three electrode potentiostat.
   a. Draw schematic diagram of the three electrode potentiostat. (5 pts.)
   b. Explain what is being varied in cyclic voltammetric experiment. (5 pts.)
   c. What is measured with cyclic voltammetry? (10 pts.)
   d. What role does diffusion play in a cyclic voltammetric experiment? (5 pts.)

2. Amperometric or conductivity detection has been used with capillary electrophoresis. Draw a diagram or describe either detection method. (5 pts.) What are the challenges of electrochemical detection for CE? (10 pts.)

3. Describe a pH detection probe that involves encoding (or transducing) pH into differing amounts of current to measure pH. Hint: device does not utilize a glass electrode. (10 pts.)

4. A significant factor in many spectroscopies is the value of kT. Is this significant for a redox titration? Support your answer with a calculation. (10 pts.)

5. Ion chromatography utilizes what type of electrochemical detector? Explain how this could be used in a “reagent free” format. (10 pts.)

6. What is meant when it is said that the electrode displays a Nernstian response? (5 pts.)

7. Electrochemistry is often used to study surfaces. Explain why. Include an example. (10 pts.)

8. Describe an electroanalytical device to measure blood glucose. Please include a thorough description and a diagram. (10 pts.)

9. Answer one of the following: (10 pts.)
   - What analytes are measured by anodic striping voltammetry? How?
   - What analytes are measured by electrogravimetric analysis? How?
   - Fast-scan cyclic voltammetry is used to measure dopamine *in vivo*. How?