

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 stripping voltammetry? How?
 - What analytes are measured by electrogravimetric analysis? How?
 - Fast-scan cyclic voltammetry is used to measure dopamine *in vivo*. How?