

CHEM 212
Exam 3
Fall 2012

Name _____

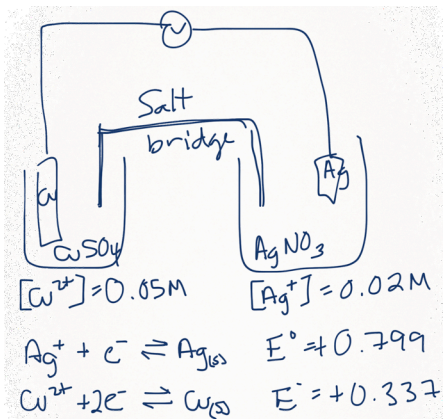
Do 5 of the following 8 questions. It is essential YOU indicate the problems you want graded. Otherwise, I will grade the first five with writing.

1 2 3 4 5 6 7 8

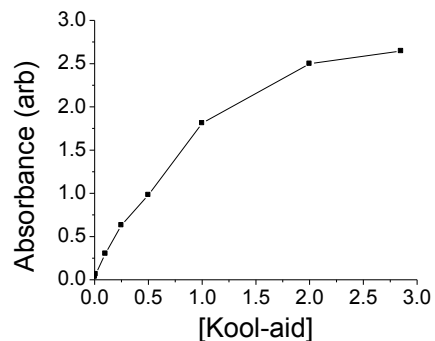
Write CLEARLY and label each part of your answer.

1. Consider a pH meter.
 - a. (10) Diagram, label, and describe the function of a pH meter.
 - b. (3 each) List and briefly describe 2 largest, least controllable factors that can affect the accuracy of pH measurements.
 - c. (2 each) List 2 more factors that can impact pH measurements.

2. Given the cell pictured,
- (2) Label the anode, cathode, and the direction of electron flow on the picture.
 - (3) Write the cell in line notation.
 - (5) Write each of the balanced half reactions in the appropriate direction with the E° .
 - (3) Write the balanced equation and calculate E° .
 - (4) Calculate the cell potential for the conditions shown in the diagram.



3. Examine the following data for the absorbance of red dye #40 (the red dye in some kool-aid).
- (8) Diagram, label, and describe the function of a single-beam UV-Vis instrument.
 - (2) What would you use for a source and detector?
 - (4) Diagram and label a monochromator.
 - (1) Estimate the concentration at $A=0.8$, given the data to the right.
 - (2) What is the apparent linear range of Beer's Law from this data? Is this consistent with your expectation?
 - (1 each) Suggest three reasons for nonlinearity of Beer's Law, at least one of which is apparent in this data.



4. Consider a UV-Vis fluorimeter.
 - a. (10) Diagram, label, and describe how it works
 - b. (2) What would be used as a source and detector?
 - c. (3) Why are fluorescence measurements always more sensitive than absorption measurements?
 - d. (1 each) State what is stationary and what is scanned in emission and excitation scans
 - e. (3) Why is the emission energy less than the excitation energy for the same transition? Draw a diagram to illustrate your point.

5. Consider an ICP instrument.
- a. (1 each) What do the acronyms ICP-MS, and ICP-OES stand for?
 - b. (10) Diagram, label, and describe how the ICP delivers a sample.
 - c. (2) What are the usual detection limits of an ICP instrument?
 - d. (3) Which instrument has the lowest detection limit for most elements?
 - e. (3) List three reasons why you might use an instrument other than an ICP-MS.

6. Consider an FT-IR spectrometer.
 - a. (10) Draw a diagram, label all the parts, and describe how it works.
 - b. (5) Why does an FT-IR not have a monochromator?
 - c. (5) Diagram, label, and describe the data processing for FT-IR data.

7. Consider an atomic spectrometer
- a. (6) Diagram a flame sample delivery system.
 - b. (2) What does the flame do to the sample?
 - c. (2) What are examples of a typical fuel and oxidant
 - d. (10) Diagram, label, and explain an atomic emission spectrometer.

8. Consider a Mass Spectrometer.

- a. (2) On what basis does a mass spectrometer measure?
- b. (1 each) List four types of mass spec INSTRUMENTS.
- c. (6) Diagram, label and explain a channeltron.
- d. (8) Diagram, label and explain a mass spectrometer of your choice.