CHEM 212
Practice exam 3

1. Given the following cell, Pt | Fe^{3+}_{aq} | Fe^{2+}_{aq} | I^{-}_{aq} | I_{2aq} | Pt
   Draw and label the cell, write the half reactions, balance the full reaction, calculate $E^\circ$.

2. Calculate the cell potential and equilibrium constant for the cell above given that
   $[Fe]=0.03$ M, $[Fe^{2+}]=0.02$ M, $[I^-]=0.034$ M, $[I_2]=0.014$ M

3. Diagram, label, and describe a pH meter. List the common errors associated with a pH meter and their magnitude.

4. State Beer’s Law and the typical range of linearity. List and describe the limitations of Beer’s Law (e.g., too little absorption)

5. Draw a Jablonski diagram and label excitation, emission, nonradiative decay, intersystem crossing, internal conversion, excited state singlet, ground state singlet, excited state triplet, fluorescence and phosphorescence.

6. Why is a luminescence measurement always more sensitive than an absorption measurement?

7. Describe why a fluorescence emission measurement is at a lower energy than the same excitation transition. Draw a diagram of this.

8. Diagram, label, describe, and make a bulleted list of everything you know about the function of the following instruments:
   a. Single beam UV-Vis spectrometer
   b. Double beam UV-Vis spectrometer
   c. Photodiode array UV-Vis spectrometer
   d. Fluorimeter
   e. FT-IR
   f. Atomic emission, atomic fluorescence
   g. Atomic absorption spectrometers
   h. ICP-OES

9. Diagram, label and explain how the following work:
   a. Monochromator
   b. Photomultiplier tube

On a separate piece of paper

10. Write 3 good questions you would like to see on the exam. You will turn this in to me.

11. List equations you would like to be provided on this exam.
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