CHEM 212
Practice exam 3

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

	Atomic/ Molecular Transitions	Instruments	Common Source	Dispersive element	Common Detector
Microwave	Rotational	Doplar radar	---	---	---
Infra red					
Visible		UV-Vis, fluorimeter			
Ultra violet					
X-ray	Ejection of core electrons	synchrotron	synchrotron	Double Si crystal mono	Ion chamber, Si drift vortex, Ge detector
Gamma ray	Nuclear	---	---	---	---