Review Guide for Final Exam (250 points, Monday, August 27, 2007, 8-10:30 am.)

The final exam will be cumulative and cover up to the last lecture. Approximately 40+% of the final exam will be material covered since the last midterm exam: electrochemistry, nuclear chemistry and coordination chemistry . For the earlier material, refer to past review guides. For all material previous to the 2nd midterm concentrate of problem solving. Start by going over previous midterm tests.

The following topics are mentioned to help focus your review only in relation to the material since the last midterm. Go over the review guides for the first 2 midterms also. The questions mentioned here are by no means guaranteed to be inclusive of all the material that may be asked in the test.

1) Electrochemistry: Electrolysis, corrosion, batteries. Explain cathodic protection & sacrificial anode. Be able to describe any of the following batteries (complete with equations): lead battery, Ni-Cad battery and Hg battery.

Examples: a) Use the electrolysis of water as an example of electrolysis. Write down the half reactions and the balanced equation (not memorized but from basic principles). How many minutes would it take to evolve 32.0 grams of $O2$ gas if you apply 8 V and 2.0 amps to the electrolytic cell? Try also: Problems 21-52, 58,62.

b) Given: $E°_{Fe2+/Fe}$ = -0.44V and $E°_{Sn2+/Sn}$ = -0.14 V. Which one would be protected if they were in contact and were free to corrode? Note that tin cans (Fe coated with Sn) corrode quickly after they scratched. Try also: Problem 21-74.

c) From memory, write down the half reactions and the balanced equation for the operation of a lead car battery. Explain why the acidity of the battery decreases when it gets used up?

How does the potential vary with time when the battery is running down compared to that of a NiCad battery?

2) Nuclear Chemistry

Know the types of radiation and nuclear particles. Balance nuclear equations. Be able to explain (and calculate when appropriate): decay series, half life, belt of stability, binding energy, fusion, fission,units of radiation, radiochemical dating, carbon dating.

3) Main Group elements: Understand very well chapt 21.1 and how it relates to the processes found in the core of stars.

4) Coordination chemistry: Name ligands, complexes, etc. Predict presence of isomers. Predict the magnetic properties of coordination complexes under strong field and weak field interactions. Determine hybrid orbitals of bonding electrons. Use VBT (valence bond theory) and CFT (crystal field theory) in analyzing coordination complexes.

Try these:

1) In the following reaction, which is the Lewis acid? $Mn^{2+} + 6\ CN^{-}$ ---> $Mn(CO)_6^{-4}$

How many electrons are in the $d_{x^2-y^2}$ orbital for Mn? Explain with clear labelled diagrams of the energy levels.

2) Write the chemical formula for: sodium trans-diaquadioxalatoferrate(III).

3) Identify and Draw its possible isomers 2) a) Using crystal field theory (CFT) , predict the net spin in the complex ion, $[Cr(en)_2(C0)_6]^{4-}$. (n.b. treat en and CO as strong field ligands) How many isomers and what kinds of isomers do you expect to find for this complex? b) Using crystal field theory, predict net spin for

hexaaquochromium(II). (n.b. H_2O is a weak ligand). c) $Ni(CN)_4^{2-}$ is diamagnetic. Is it square planar or tetrahedral?

4) What are the various nuclear decay processes. Discuss the belt of stability. Predict how a radioisotope which is "above" or "below" the belt of stability may decay. Balance nuclear equations. Do calculations predicting radioactivity after a time t. Be able to do carbon-dating type problems.. Discuss effect of radioactivity on living tissue. (Similar to the homework problems).