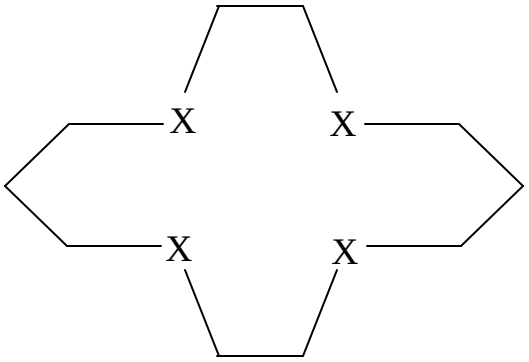
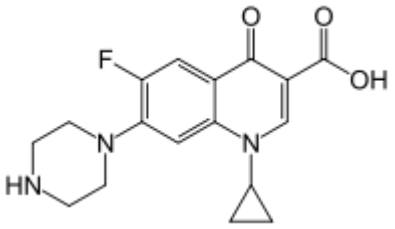
Chemistry 300 – Inorganic Chemistry Name: _____
Exam #2 – October 19, 2009, in class

1. Crown ethers, azacrown ethers, and thiocrown ethers are all used in biomedical applications to bind metal cations. Explain why these ligands form exceptionally stable complexes with metal ions and give an example of a metal ion that would have high affinity for each. Explain your answers.



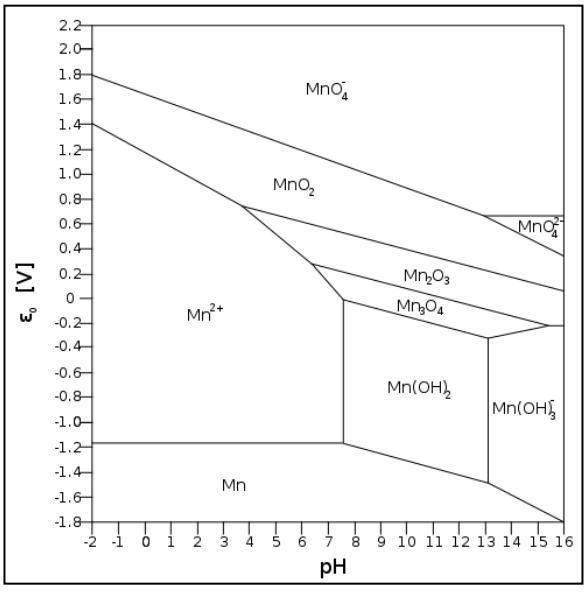
X = O, crown ether
X = NH, azacrown ether
X = S, thiocrown ether

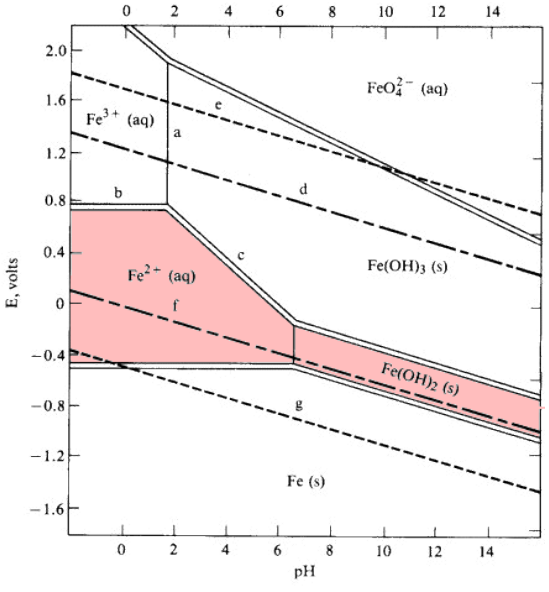


Ciprofloxacin
(image source: Wikipedia.com)

2. Ciprofloxacin is an antibiotic with the structure shown. If ciprofloxacin is taken with metal ions such as Mg^{2+} or Fe^{3+}, its bioavailablility can be severely decreased by formation of a very stable and insoluble precipitate. Explain why ciprofloxacin forms a very stable and insoluble precipitate with Mg^{2+}, but not with Pd^{2+}. When ciprofloxacin and Mg^{2+} form a precipitate, how does the entropy of the system change? Explain.

3. You have accidentally dropped a piece of manganese solid in a bucket containing FeO_4^{2-} ions in acidic aqueous solution at pH=0. As they react, you notice a black solid forming. Explain why a reaction occurs, identify the black solid, and write a correctly balanced equation for the reaction that occurs. What would change if the reaction were to take place at pH=10? Describe any changes and provide a balanced equation.





MnO_4^-	FeO_4^{2-}
+1.70V	+2.20V
MnO_2	Fe^{3+}
+1.23V	+0.77V
Mn^{2+}	Fe^{2+}
-1.18V	-0.44V
Mn	Fe

Chemistry 300 – Inorganic Chemistry Name: _____
Exam #2 – Due by October 21, 2009 at 1:30pm

4. Lead(II) forms precipitates with all of the halides. Predict the crystal lattice that would form for each $PbX_2(s)$ formula with X = F, Cl, Br, and I. Describe the occupancy of the lattice. (There are # lead ions on the corners/edges/faces, etc) Lead(II) chloride is relatively soluble in hot water while silver(I) chloride is extremely insoluble. Explain. Lead(II) iodide is significantly less soluble in hot water than lead(II) chloride. Explain. How do you expect the solubility of lead(II) fluoride to compare to lead(II) chloride?