Homework 4 due 10-15-10 Eh-pH diagrams GEOL 135

1. Let’s construct a line on a simple Eh-pH diagram for Fe at conditions relevant to the Ely Mine groundwater. Let’s say the dissolved (Fe2+) iron concentration is 20 mg/l and the activity coefficient Fe2+=0.74.

Consider the following reactions for your diagram:

Fe2+ + 3 H2O 🡪 Fe(OH)3(ppd) + e- + 3 H+ E0= +0.975 V

For this reaction, write out the Nernst equation (Eh = E0 + 2.303RT/nF\*logQ) and rearrange to solve for Eh and pH to plot on a diagram (Make this in excel – should be 1 line).



2. If the Eh starts at -0.01 V at pH 6, ferrihydrite (Fe(OH)3(ppd)) could precipitate by 2 different mechanisms – what are they, trace them on the diagram and explain how each might occur..

3. On Mars, iron may exist as Fe4+ - if the standard state electropotential for the reaction: Fe4+ + e- = Fe3+ is +1.25 V, where would it be on the diagram above and what might happen if liquid water were to mix with Fe4+ salts?