

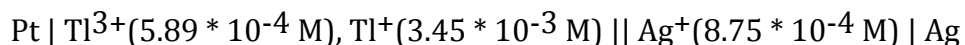
Problem Set #3

Chem M3LC - Fall 2017.

*You do not need a spreadsheet to complete any of these questions.

Question 1 – Electrochemistry

Consider the following electrochemical cell:



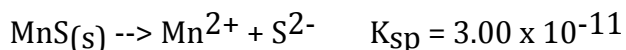
- Write down the two half cell reactions (as reductions) and the overall reaction for this electrochemical cell.
- Calculate the potential that you would expect to measure across this electrochemical cell. Assume room temperature and use $(0.0592/n) \cdot \log(x)$ for your Nernst Equations.
- Is this cell electrolytic or galvanic?

Question 2 – EDTA Titrations

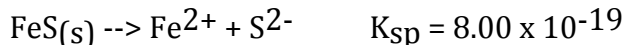
Calculate pNi ($= -\log[\text{Ni}^{2+}]$) at the equivalence point of a titration of 50.00 ml of $1.75 \times 10^{-3} \text{ M Ni}^{2+}$ by a $1.75 \times 10^{-3} \text{ M EDTA}$ solution. Both solutions are buffered to a pH of 10.0, where the alpha fraction for Y^{4-} is 0.355. For the NiY^{2-} complex, $\log K_f = 18.62$.

Question 3 – Precipitation Separation

MnS is a sparingly soluble solid in aqueous solution:



FeS is also a sparingly soluble solid in aqueous solution:



Consider a solution that has both Mn^{2+} and Fe^{2+} each at a concentration of 1.00 mM. We can separate these two varying the pH because the sulfide ion (S^{2-}) is the dianion of the diprotic acid H_2S ($\text{pK}_1 = 7.01$; $\text{pK}_2 = 13.89$). Given a total sulfide concentration of 0.100 M, find the following:

- a) At what pH will FeS(s) begin to precipitate?
- b) At what pH will MnS(s) begin to precipitate?
- c) What is the $[\text{Fe}^{2+}]$ in solution at the pH you calculate in part b? What percentage of the Fe^{2+} remains in solution at that pH?