

Week #7 Homework
Activity and Activity Coefficients

For all of the problems this week you need to account for the activity of the ions when solving the problems.

On an exam I will specify that you need to either account for the ionic strength, or account for activity when you need to solve problems in this manner, otherwise you can ignore the contributions of activity/ionic strength in solving the problems.

- 1) A solution has been prepared and contains the chemicals below at their respective concentrations. What is the ionic strength of this solution?
 - 5.03 mM potassium sulfate
 - 8.72 mM potassium citrate
 - 3.13 mM disodium citrate
 - 5.18 mM sodium chloride

- 2) What is the pH of a solution that is saturated with $\text{Ni}(\text{OH})_2$, and also contains 5 mM potassium sulfate, 4.86 mM calcium nitrate?

- 3) A solution has been prepared to contain 3.78 mM calcium nitrate and 19.04 mM sodium nitrate. What is the maximum concentration of sodium fluoride that could be in this solution without causing calcium fluoride to precipitate?

- 4) What is the pH of a solution containing 23.29 mM lithium cyanide, 9.05 mM calcium nitrate, and 34.02 mM hydrogen cyanide?

- 5) What is the pH of a solution that contains 23.04 mM lithium nitrate and 9.56 mM sodium carbonate?

Note: The absolutely correct answer to question 5 is an iterative one - it would require you to solve for the pH, figure out new ionic strength, and solve it again, and again, and again, until the ionic strength and pH stopped changing. We will simplify this solution and assume that the ionic strength that we first calculate is close enough to being the right value.