

## Spreadsheet Problem Set #1

Chem M3LC - Fall 2016.

### Question 1 - Comparison of Means Spreadsheet

Anna and Chris were charged with determining the amount of sulfates in seawater. They both performed the same test but each tested on different seawater sample.

The following results were obtained:

Chris (mM)	Anna (mM)
2.58	2.76
3.00	2.65
2.79	2.81
2.63	2.71
2.82	

- What are the average values (with 95% C. L., of course!) that Chris and Anna will report?
- Create a spreadsheet that uses the Comparison of Means t-test to determine if these two data sets are statistically the same with a 95% C.L.

Hint: To be statistically the same, your calculated t value must be less than or equal to the corresponding d.o.f. value on the Student t table.

### Question 2 – Complexation Reaction Alpha Fractions

You are designing a lab for the Analytical Chemistry class in which students are required to determine the amount of Zinc(II) in an unknown sample.

From reading the literature you have found out that Zinc(II) complexes well with 2-carboxy-2'-hydroxy-5'-sulfoformazylbenzene (zincon) in pH 9 solutions.

- At what wavelength does this complex absorb at? (hint: you need to find this in the literature, so please cite your references).
- What is the molar ratio of Zinc to zincon in this complexation reaction?
- Given that the complexed Zinc has a  $\log(K_f)$  of 8.5, create an alpha plot spreadsheet for the alpha fractions of both the free Zinc and complexed Zinc species.

Your plot should cover a range of pZincon (where  $pZincon = -\log[Zincon]$ ) from 0 to 12.

d) Using the alpha fraction equations, determine the concentration of zincon required to ensure 95% of the Zinc is complexed in a solution of a given total Zinc concentration?

### Question 3 – Standard Addition

A lab assistant is trying to determine the concentration of quinine in tonic water. Quinine is a compound that fluoresces well in sulfuric acid (pH = 3, excitation at 350 nm, fluorescence at 450 nm). You decide that performing a series of standard additions will work best to measure quinine at concentrations in the range of  $10^{-4}M$ .

a) Design an experiment using method of standard of additions to determine the amount of quinine. You are equipped with tonic water, 0.1 M sulfuric acid, and plenty of solid quinine (MW: 324.42 g/mole) Please list the standards you will use (concentrations) and how will you make them, and then write a short Experimental Procedure that a Chem M3LC student can follow.

You can assume that the unknown quinine is in a range of  $10^{-4}$  to  $10^{-3}$  M and your spectrometer does not give accurate fluorescence readings above  $10^{-2}M$ .

b) Create a spreadsheet that will allow you to analyze your results and give a value for the quinine concentration with its 95% CI.