

Name: _____

Chem 2113

Test 4

Spring 2005

Questions are worth 25 points each. OMIT ONE QUESTION by clearly writing OMIT in the space provided for your work. If you fail to mark OMIT on a question I will omit the last question of the test. Show your work and circle your answers for full credit.

1. To determine the amount of manganese in a sample, 0.9421 g of that sample was dissolved in nitric acid and diluted to 500.0 mL in a volumetric flask. From this solution, two 50.00 mL aliquots were taken and treated as follows:

<u>Vol. 74.1 ppm Mn</u>	<u>Mass KIO₄</u>	<u>Final Volume</u>	<u>%T for the solution</u>
0.00	0.80 g	100.0	61.3%
5.00	0.80 g	100.0	19.6%

Calculate the percent manganese in the original sample.

2. A fluorimetric determination for chelates of morin and aluminum is performed by measuring the fluorescence for several standards. The following is a partial set of data was generated from the experimental data:

$$\Sigma x = 90; \Sigma y = 771.7; \Sigma x^2 = 3250; \Sigma y^2 = 229974.71; \Sigma xy = 27331; n = 5$$

What is the slope, the y-intercept, and the correlation coefficient from this data?

An unknown is prepared by dissolving 0.154 g of a compound containing aluminum and diluting the unknown to 1.000 L. 25.00 mL of this solution is obtained, chelated with the morin and diluted to 50.00 mL. This solution was determined to have an average fluorescence of 175 after five measurements. What is the concentration of aluminum and the standard deviation for the results from the calibration curve?

If the x-values obtained were in units of ppm Al, what is the percent composition of aluminum in the unknown?

3. Two species (S and U) are mixed, and the transmittance of the resulting solution was measured using a Spectronic 21. It was found that at 425 nm the solution had an absorbance of 28.4%T; while at 600 nm the reading was 21.6%T. Independent measurements for S and U show that the molar absorptivity for S was 12,500 at 425 nm and 700 at 600nm. For U, the molar absorptivity is 150 at 425 nm and 7,500 at 600 nm. Assuming all measurements are in a 1.00 cm cell, calculate the concentrations of S and U in the mixture.

4. Atomic absorption spectrophotometry (AAS) was used to determine the concentration of of an unknown containing lead. A series of lead standards gave the following absorbance values:

<u>Conc. (ppm)</u>	<u>Absorbance</u>
0.00	0.000
1.00	0.013
5.00	0.067
10.00	0.135
25.00	0.333

Calculate the slope and y-intercept for the data:

An unknown containing lead was measured using AAS, and it was determined that the absorbance for the sample was 0.201. Calculate the concentration of lead in the unknown.

5. For the following luminescence phenomena, explain a) how the molecule enters the excited state; b) what is the timescale for the observed de-excitation; and c) from a molecular level, explain the observed timescale for the luminescence.

a) Chemiluminescence

b) Phosphorescence

c) Fluorescence