Concepts and calculations related to Exam #1 (Winter 2007)

Chapters 0 and 28.

Quantitative vs. qualitative analyses. Analytical figures of merit. Wet chemical analysis vs. instrumental analysis. General steps in sampling, sample pretreatment, and analysis. Master the calculations related to solution preparations (e.g., calculating molarity from ppm or ppb and vice versa, calculating morality from weight percent. calculations related to dilutions, etc.)

Chapters 3 and 4.

Rules for significant figures. Precision vs. accuracy. Random error vs. systematic error. Calculations related to propagation of random errors for addition/subtraction, multiplication/division, and logarithms and antilogarithms (formulas will be provided).

Mean vs. median values. Standard deviation (formula provided) calculations. The meaning of Guassian distribution or curve. Calculating confidence interval (formula provided) and use it to compare a measured result with a "known" value. Student's t tests and their applications (formulas provided).

Chapter 27.

Important steps in a typical gravimatic analysis. Weight percent calculation. Gravimetric factor. Knowing how to calculate the wt% values of a mixture containing two components or the volume needed for a precipitation reaction. Relative supersaturation. How to control relative supersaturation to get quality crystals (precipitates) for more accurate results.

Chapter 18 and Chapter 19-1.

Fundamental properties of light. The relationship between the molecular processes and the light frequencies. What happens to a molecule when UV-visible light is absorbed? The different terms in Beer's law and how to enhance the sensitivity using different cuvettes. The applications of Beer's law in chemical analysis (e.g., from absorbance value calculating unknown concentration and vice versa. Or from absorbance values at two different wavelengths calculating the concentrations of two species in a mixture). The differences between an atomic spectrum and a molecular spectrum. Energy diagram depicting the various physical processes after an electronic transition has taken place (e.g., emission, ISC, internal conversion, and radiationless relaxation).

Chapter 20.

Components of a typical spectrophotometer. What constitutes a monochromator? Constructive interferences vs. destructive interferences. How does a grating work? The working principle behind a photomultiplier tube.

Chapter 20-1 and flame atomic absorption (part of Ch. 20-2)

The three possible measurements that can be carried out with flame atomization. The construct of a premix burner. The basic components of an atomic absorption spectrometer. What happens when droplets (aerosols) get into the flame?