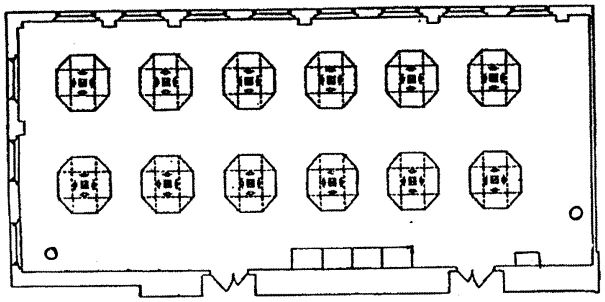
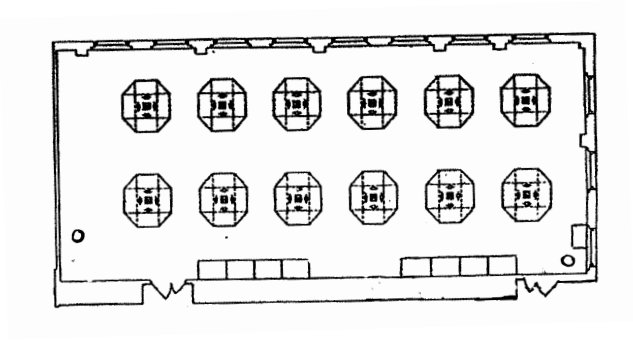
Final Review Chem 1319 – WS15

1. **MSDS, Safety, etc.**
   a. Read over **Safety Practices** in the first book pp. 1-14.
   b. Know **MSDS Information** for the chemicals used in the experiments below (to include):
      Equilibrium/Beer's Law: $Fe(NO_3)_3$, HNO_3, KSCN
      Heat of Neutralization: HCl, NaOH, ice
      Antacid Analysis: Phenolphthalein, $CaCO_3$, $Al(OH)_3$, $MgCO_3$, HCl & NaOH
      Spectrophotometry &Colorimetry: water ☺
      Atomic Spectra: N/A
      Radiochemistry: α-, β-, γ- and *n* radiation
      Gas Laws: Acetic acid (CH_3COOH), Baking soda ($NaHCO_3$), Butane
   c. **Room Diagram** – Be able to label equipment in your room.
      Balances, Distilled Water, Exits, Fire Extinguishers, Hoods,
      Safety Blankets, Safety Showers, Waste Containers



Room 201



Room 212

2. **Nomenclature**
   a. Know the names of all of the chemicals that we used in the experiments from the Lab Packet.

3. **Equilibrium/Beer's Law**
   a. Read over Lab Packet pp: 177-192.
   b. Know how to determine K_{eq} from a graph.
      $\mathbf{K_{eq} = m}$ for y = mx +b, when
      $\mathbf{x = A([Fe^*] + [SCN^*]) / ([Fe^*][SCN^*])}$ $\mathbf{y = A / [Fe^*][SCN^*]}$
   c. Know how to calculate the concentration of an unknown solution given the %T.
      $\mathbf{A = \log(100 / \%T)}$ $\mathbf{A = abc}$

4. **Heat of Neutralization / Heat of Fusion**
   a. Read over Lab Packet pages 79-102.
   b. Be able to balance an acid base reaction equation.
   c. Be able to determine the limiting reagent, given the molarity of the acid/base and the number of ml of each.
   d. Be able to determine the enthalpy of a reaction given the heat capacity.
      $\mathbf{\Delta H = (-\text{total } C_p * \Delta T)/(\text{moles reacted})}$

5. **Antacid Analysis**
   a. Read over the Lab Packet pp 103-118.
   b. Know how to balance equations for antacids reacting with HCl.
   c. Given concentrations and volumes of HCl and NAOH, know how to determine how much acid was neutralized by the antacid. (*Actual*)
      Note: mole/L = mmole/ml
   d. Be able to determine how much acid the antacid should have been able to neutralize. (*Theoretical*)

6. **Spectrophotometry and Colorimetry**
   a. Read over Lab Packet pp. 137-150.
   b. Know the equation for Absorbance and how to convert from transmittance to absorbance.
      $\mathbf{A = \log(100 / \%T)}$
   c. Know how to find the maximum absorbance for individual unknowns and for a mixture of colors.
   d. Be able to calculate the absorbance ratio of an unknown vs. a standard.
   e. Be able to calculate the concentration of the unknowns if given the concentration of the standards: $\mathbf{C_1V_1=C_2V_2}$

7. Atomic Spectra

a. Read over Lab Packet pp. 151-176.

b. Know the Rydberg equation and thus how to calculate **frequency, υ**.

$$\nu = R(\frac{1}{n_1^2} - \frac{1}{n_2^2})$$

c. Know how to convert to **wavelength, λ**, from frequency, **υ**, using the speed of light, **C**.

$$\mathbf{C = \lambda\upsilon}$$

d. Know which wavelengths correspond to the **Balmer series** (visible) and which ones correspond to the **Lyman series** (ultraviolet).

8. Radiochemistry

a. Read over the Lab Packet pp 119-136.

b. Be able to balance nuclear decay equations for α-emission, β-emission, and neutron emission.

c. If given the time and counts, be able to find the natural log of the counts (ln counts).

d. Be able to determine the specific decay constant, k, by finding the slope of a line.
(Note: it is always best to use data points furthest apart to determine the slope of a line.)
The slope of a line:

$$\mathbf{m = (y_2 - y_1) / (x_2 - x_1)}$$

e. Having calculated the slope and using any data point, be able to find the y intercept, b, of a line:

$$\mathbf{y = mx + b}$$

$$\mathbf{b = y - mx}$$

f. Having found the y-intercept, b, be able to convert the answer from ln counts to counts in order to find A_o.

g. Having calculated k, be able to determine the half-life of the compound.

h. Be able to calculate the percent error (percent difference) of the calculated half-life vs. a given theoretical half-life.

9. Gas Laws and Buoyancy Effects

a. Read over Lab Packet pp. 193-210.

b. Know the equation for the Ideal Gas Law: **PV = nRT**

c. Realize that given the gas law constants that individual data must correspond for units to cancel. For example, if R is in units atm · L / mole · K then T must be in K not °C.

Pressure: 760 torr = 1 atm **Volume:** 1000ml = 1 L
Temperature: °C + 273.15 = K **Moles:** MW = g / mole

d. Know how to set up an equilibrium in order to convert from one set of conditions to another, if one condition (pressure, volume, temperature or number of moles) is altered,
For the Ideal Gas Law

$$\mathbf{P_1V_1 / n_1T_1 = P_2V_2 / n_2T_2}$$

e. Know the equation for density (**d = m / v**) and how to use it to convert from mass to volume or volume to mass.

10. Statistical Analysis

a. Read over Statistical Analysis – first book pp. 53-72.

b. Know how to calculate the mean (average) of a set of data.

1. Average or mean: $\mathbf{x = \Sigma x_i / n}$

c. Know how to calculate the standard deviation or estimate, if given the equation:

2. Standard Deviation: $\mathbf{\sigma = [\Sigma (x_i - x)^2 / n]^{1/2}}$
3. Estimate of the Standard Deviation: $\mathbf{s = [\Sigma (x_i - x)^2 / (n-1)]^{1/2}}$

d. Know the differences between equations 2 & 3 and when each of these equations is applicable.

11. Dimensional Analysis & Scientific Notation

a. Read over Dimensional Analysis – first book pp. 15-52.

b. Be able to evaluate problems similar to those in each of the following sections.

1. Problem Set 1 – conversion of units.
2. Problem Set 2 – conversion of grams to moles, moles to grams, atoms to moles, moles to atoms
3. Problem Set 4 – determine the limiting reagent and the theoretical yield
4. Problem Set 5 – determine the concentration of a solution and the concentration or a dilution

c. Know and be able to apply the rules for significant figures.

1. All non-zero digits are significant.
2. Zeros between non-zero digits are significant.
3. Zeros to the left of the first non-zero digit are not significant.
4. If a number ends in zeros to the right of the decimal point, those zeros are significant.