**Final Review Chem 002 – WS07**

1. **MSDS, Safety, Etc.**
    a. Know **MSDS Information** for the chemicals used in the experiments below (to include):
        **Antacid:** Phenolphthalein, $CaCO_3$, $Al(OH)_3$, $MgCO_3$, HCl & NaOH
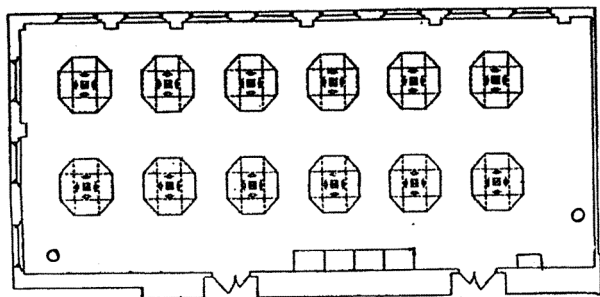        **R:** α-, β-, and γ- radiation
        **S&C:** water ☺
        **AS:** $K_2Cr_2O_7$, $NiCl_2$, $CuSO_4$, LiCl, KCl, $CuCl_2$, $CH_2Cl_2$
        **GL:** Acetic acid ($CH_3COOH$), Baking soda ($NaHCO_3$), Butane
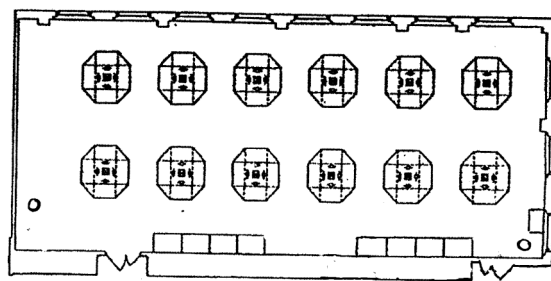        **GC:** $CH_3Cl$, $CH_2Cl_2$
    b. **Room Diagram** – Be able to label equipment in your room.
        Balances, Distilled Water, Exits, Fire Extinguishers, Hoods,
        Safety Blankets, Safety Showers, Waste Containers



Room 201                                        Room 212

2. **Antacid Analysis**
    a. Read over the green book 6-1 to 6-5.
    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.
    d. Be able to determine how much acid the antacid should have been able to theoretically neutralize.

3. **Radiochemistry**
    a. Read over the green book 7-1 to 7-3.
    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:

$$m = (y_2 - y_1) / (x_2 - x_1)$$

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

$$y = mx + b$$

$$b = y - mx$$

    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.

## 4. Spectrophotometry and Colorimetry
   a. Read over green book 8-1 to 8-5.
   b. Know the equation for Absorbance and how to convert from transmittance to absorbance.
$$A = \log (100 \, / \, \%T)$$
   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.

## 5. Atomic Spectra
   a. Read over green book 9-1 to 9-6.
   b. Know the Rydberg equation and thus how to calculate frequency, $\upsilon$.

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

   c. Know how to convert from frequency, $\upsilon$, to wavelength, $\lambda$, using the speed of light, C.
$$C = \lambda\upsilon$$
   d. Know which wavelengths correspond to the Balmer series (visible) and which ones correspond to the Lyman series (ultraviolet).

## 6. Gas Laws and Buoyancy Effects
   a. Read over green book p. 10-1.
   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 $\cdot$ L / mole $\cdot$ K then T must be in K not $^{\circ}$C.

| | |
|---|---|
| **Pressure:** 760 torr = 1 atm | **Volume:** 1000ml = 1 L |
| **Temperature:** $^{\circ}$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
$$P_1V_1 \, / \, n_1T_1 = P_2V_2 \, / \, n_2T_2$$
   e. Know the equation for density (d = m / v) and how to use it to convert from mass to volume or volume to mass.

## 7. Gas Chromatography
   a. Read over green book pp. 11.1-11.5.
   b. Know how to calculate theoretical plates:
$$N = 16 \, (t_R \, / \, w_B)^2$$
   c. Know how to calculate the area of a curve, using the area of a triangle as an estimate.
$$A = \tfrac{1}{2} \, (\text{base x height}) = \tfrac{1}{2} \, (w_B \text{ x ht})$$

## 8. Statistical Analysis
   a. Read over Statistical Analysis of Experimental Data (PROP 353) – purple book pp. 1-8.
   b. Know how to calculate the mean (average) of a set of data.
       1. Average or mean:
$$x = \Sigma x_i \, / \, n$$
   c. Know how to calculate the standard deviation or estimate, if given the equation:
       2. Standard Deviation:
$$\sigma = \sqrt{\Sigma \, (x_i - x)^2 \, / \, n}$$
       3. Estimate of the Standard Deviation:
$$s = \sqrt{\Sigma \, (x_i - x)^2 \, / \, (n\text{-}1)}$$
   d. Know the differences between equations 2 & 3 and when each of these equations is applicable.