Chem 1 LD
Review Session
- Evon Du
What to expect!

- 2 mini experiments derived from the experiments you have done in the course. Thus, must know the different techniques done in the labs
  - Expect a computational question
- MUST KNOW THE CALCULATIONS if given certain datas
- Know how to use the labquest device and obtain your data from it
  - Safety question (lab archive)
Experiment 1: Solubility & Miscibility

Part A: Miscible Liquids: are the volume additive?

Purpose for doing this: “In this experiment a number of solutions will be prepared from two miscible liquids. Actual solution volumes will be compared to expected volumes that are calculated from the densities of the pure liquids and the measured masses of the solutions. The conservation of mass law is obeyed: the masses of the individual liquids add up to the mass of the combined solution. But is volume conserved? In other words, when 10.00 mL of water is added to 10.00 mL of alcohol, is the volume of the resulting solution greater than, equal to, or less than 20.00 mL? Students will plot changes in volume (if any) and explain their results by taking into account type of intermolecular forces.” - From your lab manual

Example using the water - ethanol mixture

1. Weigh an empty 10 mL volumetric flask : 45.321 g
2. In an erlenmeyer flask with the solution (10 mL ethanol + 5 mL water) transfer the solution into 10 mL volumetric flask and weight it: 54.390 g

<table>
<thead>
<tr>
<th>V EtOH (mL)</th>
<th>V H2O (mL)</th>
<th>V additive (mL)</th>
<th>M flask &amp; stopper (g)</th>
<th>M flask, stopper, &amp; soln (g)</th>
<th>M Soln (g)</th>
<th>D Soln (g/mL)</th>
<th>M erlenmeyer (g)</th>
<th>V actual</th>
<th>%delta V</th>
<th>X etOH</th>
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How to get these values: LET'S DO THE MATH!

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Final Question: Is the volumes additive?
Probably more math...
Experiment 1 part B: Immiscible liquids

- How to know which solution is in what layer? For example between water and ethyl acetate. Water: 1.000 g/mL ; Ethyl acetate: 0.902 g/mL
  You can tell which layer in the sep funnel is what solution by looking at the solution’s density. The solution with the bigger density would be in the bottom layer.

- Some knowledge on intermolecular forces
In this experiment, we will be measuring the pressure of ethanol as heat is raised in an Erlenmeyer flask. By doing so we are able to calculate Enthalpy of vaporization using Clausius equation \( \ln(P) = \frac{-\Delta H_{\text{vap}}}{R} \left(\frac{1}{T}\right) + C \), \( R = 8.314 \text{ J/mol*K} \) and by plotting the data onto a graph since the Clausius equation resembles \( y=mx+b \) the slope formula and the slope is the entropy in this case.

**Question:** Calculate Entropy from the giving

![Graph showing ln(VP) vs. 1/T of Isopropanol]

\[
y = -3540.3x + 15.53 \\
R^2 = 0.9725
\]
Math ...

\[ \ln(VP) \text{ vs. } 1/T \text{ of Isopropanol} \]

\[ y = -3540.3x + 15.53 \]

\[ R^2 = 0.9725 \]

\[ 1/T \text{ (Kelvin)} \]
Equations to know in experiment 2

- \( \frac{P_1}{T_1} = \frac{P_2}{T_2} \)
- \( P_{\text{total}} = P_{\text{air}} + V P_{\text{ethanol}} \)
- \( \ln(P) = \left( -\frac{\Delta H_{\text{vap}}}{R} \right) \left( \frac{1}{T} \right) + C, \ R = 8.314 \text{ j/mol*K} \)
- \( \% \text{ Error} = \frac{\text{true} - \text{expt}}{\text{true}} \times 100 \)
- Raoult Law: \( P_{\text{theoretical}} = \left( X_{\text{solvent}} \times P_{\text{solvent}} \right) \); \( X_{\text{solvent}} = \frac{\text{Mol Solvent}}{\text{Mol Solvent} + \text{Mol solute}} \)
Experiment 3/4: Aspirin Synthesis & Analysis

In this experiment, we will use and measure the melting point of pure ASA, salicylic acid, ASA products and a crush aspirin tablet. As well as determine the numbers of impurities of different samples using thin layer chromatography. The different compounds will move up the TLC plate at different rates depending on their intermolecular interactions.

1. Fill in the blank
2. What is the TLC plate covered in? ___ Is that a polar or nonpolar compound? ___
3. Red and blue dot. Which would compounds (hexane or ethanol) would be red and which is blue?
4. Formula for Rf value:
Equations to know in experiment 3/4

- % yield = actual / theoretical * 100
- Beer’s Law Plot: A = ε * C * L

Where:

E = molar absorptivity coefficient ( L/ mol * cm)
C = concentration of absorbing species ( mol / L)
L = length (cm)

- \( M_1V_1 = M_2V_2 \)

Also know how to use the Mel temp for melting point

For the Iron test
1. Get ~4 test tube and label them corresponding to their sample
2. Put in 1 mL DI water
3. Add the crystal (only a pinch)
4. Add 1 drop FeCl3
5. Record the colors
Experiment ⅚: SYNTHESIS & ANALYSIS OF A COMPLEX IRON SALT

The main focus of experiment is to find the empirical formula for a coordination compound.

- Know how to convert compounds using mol ratios

Ex: given $2 \text{KMnO}_4 + 5 \text{Na}_2\text{C}_2\text{O}_4 + 16 \text{H}^+ \rightarrow 2 \text{K}^+ + 10 \text{Na}^+ + 2 \text{Mn}^{2+} + 10 \text{CO}_2 + 8 \text{H}_2\text{O}$

Mass of Na$_2$C$_2$O$_4$: 0.104 g

Volume of KMnO$_4$: 0.0325 L

Find concentration!
Experiment ⅝: SYNTHESIS & ANALYSIS OF A COMPLEX IRON SALT

Given mass % find the empirical formula of KxFe(y (C2O4)z * nH2O:

Mass percent of water: 12.1%
Mass percent of oxalate: 52.7%
Mass percent of Iron: 11.4%
Mass percent of potassium: 23.8%
Experiment 7/8

You might be asked to take the absorption for the blue and yellow food coloring along with green food coloring. And provide sketches on all 3 spectras

What you should do is

- Calibrate your spectrometer using a blank. What blank should you use in this case? ___ Why? ___
- Pre Rinse the cuvette with the solution your recording to remove impurities in the cuvette
- Fill the cuvette with the solution up ¾ the way.
- We want to align the cuvette with the same direction pointing toward the detector because thickness of the sides may be different which can affect light intensity as light is passed through the solution in the cuvette.
- Repeat for the yellow and 1:1 ratio yellow and blue to make green
You should hand draw something like this. REMEMBER TO LABEL THE AXIS!
The END! Good Luck Everyone! You’ll do great
*** please leave the evaluation sheets on your desk or bring it up front please!