Chemistry 220 Lab Final Exam Outline

To review for the final exam, you should review worksheets, post-lab questions, lecture material, and techniques covered in the course.

1. Review all worksheets.
2. Review assigned post-lab questions.
3. Be familiar with the techniques and theory behind each experiment.
4. Understand techniques learned in the class.
5. Understand ¹H-NMR and IR.

The following list is a list of material that you should review:

1) Lecture notes and...

1. Melting Point Theory
2. Intermolecular forces
3. Solubility
4. Crystallization
5. Extraction
   - Distribution coefficient
   - What’s better: One large volume extraction, or lots of small volume extractions?
   - Understand and be able to create a separation scheme.

6. Simple and Fractional Distillation
   - Based on what physical property?
   - Simple vs fractional
   - Theoretical plates
   - azeotropes
   - Binary Liquid-Vapor Temperature-Composition Diagrams

7. Column Chromatography
   - Retention times
   - Stationary phase, mobile phase, solvent, solute
   - Order of elution of solutes (polar versus nonpolar)

8. Thin-Layer Chromatography
   - Stationary phase, mobile phase, solvent, solute
   - Order of elution of solutes (polar versus nonpolar)
   - \( R_f \) calculations

9. Gas-Chromatography
   - Stationary phase, mobile phase, solvent, solute
   - Order of elution of solutes (polar versus nonpolar)
   - Carrier gas
   - RRF value calculation
   - Process of using RRFs to adjust data.

10. Sublimation
    - Phase diagrams
    - Effect of pressure and phase changes
11. Infrared Spectroscopy
   - Theory → see lecture notes and worksheet
     a. EM spectrum major areas
     b. What are the different types of EMR used for in science?
     c. Energy, wavelength, frequency, wavenumbers
     d. Resonance
     e. Hooke’s Law
       i. How do mass and force constant alter wavenumbers?
   - Be able to identify major peaks. See below.
   - Peaks that you should be familiar with
     1. –OH
     2. -NH₂
     3. –NH
     4. C=C
     5. Csp³-H
     6. Csp²-H
     7. Csp-H
     8. Carbonyl (C=O)

12. Nuclear Magnetic Resonance
   - Theory → see lecture notes and worksheet
     a. Shielding, deshielding
     b. Precession
     c. Upfield, downfield
     d. Splitting patterns
     e. Chemical shifts (electronegativity, hybridization, H-bonding, magnetic anisotropy (like in benzene))
     f. Absorption process
     g. CW vs FT-NMR instrumentation
     h. Spin-spin coupling
       i. n+1
       j. Coupling constant
   - Be able to deduce structures from spectra given molecular formula.

13. Aspirin
   - General reaction