CHE 205 -- Chemical Process Principles
STUDY GUIDE FOR TEST 1

The test will be open textbook/closed notes and workbook (and will cover Chapters 2, 3, and 4 through Section 4.6. The questions and problems listed below are intended as a guide to help you study. Note, however, that any fundamental concepts or methods in the text may show up on the test, even if they don't appear explicitly below (unit conversions, for instance). *Even though the test is open book, you are strongly advised to annotate your textbook by using tabs or other devices to highlight key equations and data. You may write anything you wish in your book (blank pages next to the title page and at the end make a great place for summarizing key equations and indexing pages where you can find any data you might need to look up) Otherwise you'll waste a lot of time hunting for those things during the test*.

- **"Test Yourself" questions**. One or more of the TY questions from Section 2.1 through Section 4.6 will be on the test (slightly modified so you can't just copy the answers from the back of the book).
- **Explanations**. Briefly and clearly explain each of the following in your own words:
  - lb_m, lb_f, and lb-mole (Besides explaining them, if you are given any one for a species, you should be able to calculate the others.)
  - density and specific gravity
  - "The pressure of a fluid is 850 mm Hg." (Relate that statement to the fact that by definition pressure = force/area.)
  - P_{abs}, P_{atm}, *and* P_{gauge}
  - ten degrees Celsius and ten Celsius degrees (and given either, convert it to a different temperature unit)
  - continuous, batch, semibatch, and steady-state processes
  - the five terms in the general balance equation and when you can neglect each one
  - what it means for a stream on a flow chart to be completely labeled
  - basis of calculation
- **Curve-fitting.**
  - Given a linear plot of a function *f(x,y)* vs. another function *g(x,y)* on rectangular, semilog, or log paper and the coordinates of two points on the line, determine the relationship between *x* and *y*. (See Problem 2.28 for examples.)
  - Given a mathematical relationship between two variables, *x* and *y*, that involves two parameters, *a* and *b*, state what you would plot vs. what on rectangular coordinate paper (or if appropriate, semilog or log paper) to get a straight line, and how you would determine *a* and *b* from the slope and intercept if the plot is indeed linear. (See Problem 2.29 for examples.)
- **Mass/mole/volume conversions**. Given the mass composition of a mixture (mass fractions or weight percentages), calculate the molar composition and/or average molecular weight. Given a molar composition, calculate the mass composition and average molecular weight. Given either a mass, molar, or volumetric flow rate and density and composition information, calculate the other two flow rates.
- **Manometer problems**. Given a U-tube and information about the heights and densities of the fluids in both arms, calculate the pressure difference between the two ends in any units. Convert open-ended and closed-ended manometer readings into absolute and gauge pressures in any units. (See Problems 3.27-3.30 and 3.33).

- **Material balance calculations for non-reactive processes**. Given a process description, carry out the procedure outlined on pp. 105 and 106 of your text to determine specified quantities. In particular, you should be able to
    1. Specify a basis of calculation and draw and *completely* label a flow chart. Write expressions for any quantity the problem statement asks you to calculate in terms of variables labeled on the chart.
    2. For a multiple unit process (with or without recycle), identify the systems on which balances might be written (overall process, individual process units or combinations, mixing and splitting points).
    3. Do the degree-of-freedom analysis: for each system or (multiple units) subsystem, count unknown variables, identify equations relating them (starting with balances), and show that either $n_{unknowns} = n_{variables}$ or state how many additional variable specifications or equations are needed to solve for all unknown variables.
    4. Formulate a solution procedure: Identify the systems and subsystems you would analyze, and for each one write the equations you would use to determine unknown flow chart variables and any other quantities asked for in the problem statement (no algebra or arithmetic).
    5. Complete the calculations (i.e., do all the algebra and arithmetic).

You may not be asked to do the last step, in which case you will waste a lot of time if you insist on crunching numbers. We recommend that you study for this part of the test by doing all but the last step for as many Chapter 4 problems as you can.