

**PHYSICAL CHEMISTRY I (CHEM 301) LAB**  
**THERMODYNAMICS (PHYS 301) LAB**

Fall 2011

**Instructor:** Paul Johns  
Office: Sullivan 313 pjohns@francis.edu  
Office hours: Monday, Tuesday, Wednesday 9:30-10:30 a.m., or by appointment

**Schedule:** Mondays/Tuesdays. 1:10 p.m. - 5:00 p.m. Sullivan 312. Note that there is no class on September 6 (Labor day) and on October 17 (Mid-semester break). However, October 18, although a Tuesday, is considered by the university to be a Monday for schedule purposes, so we will have a lab (and a lecture) on that day.

**Text:** Experiments in Physical Chemistry, 8<sup>th</sup> edition, by Garland, Nibler and Shoemaker. McGraw Hill. (The 6<sup>th</sup> and/or 7<sup>th</sup> edition is on reserve at the library and in the ROCK room).

**Format:** The procedure I have in mind is the following:

- You will choose a partner. I will assign a number to your group.
- Before each lab session, you are expected to photocopy the corresponding section on the lab manual and be ready to start working as soon as you get to the lab.
- I will make sure that the equipment works properly, and I will be available to make sure that you can work with it, but you will be responsible for setting the experiment up.
- All safety procedures (lab goggles, no food or drink, proper clothes,...) must be followed.

**Lab grading:** Your grade will be determined by my examination of your laboratory notebook and by the grade obtained on two lab reports that you must hand in (you choose the lab).

Notebook Follow the guidelines from my lecture on lab notebooks. I will sign for your data collection after you take it. Then, you must do the calculations on the notebook before you start the next experiment. You will hand in a photocopy of the appropriate pages of your/your partner's lab notebook at the beginning of your next lab period.

At the beginning of every laboratory, I will inspect your notebook and verify that you have written an Introduction and a Experimental Setup sections. You will receive 10 points for this. I will also inspect that you have completed your write-up for your previous lab. This includes the Data/Calculations, Discussion, and Conclusion. This is worth 10 additional points.

Also at the beginning of the lab session, I will randomly select the notebook of one of the members of your group (i.e. you or your partner). Then, I'll send you to the copier to photocopy your write-up (on the department's dime). I will grade it (up to 80 points) and assign this grade to both of you. I want the two of you to work together on the calculations and on the discussion section. I think that if you do this as I intend it, you'll benefit from this. Of course, there is the risk that you just parasitize your partner, but it will all even out when you take the exams. What you learn in the lab should help you understand the material better.

Lab reports The lab reports (2) must be typed and follow the format of a professional paper. After we finish the first set of 5 experiments, you will choose one (but not the computer lab) and write a paper on it. You will write a second lab report after completion of the second set of experiments.

**Grading Scheme:** The grade for the lab will be assigned based on the following percentages:

Lab notebook:	65%	(This includes the lab notebook or other weekly assignments)
Lab reports: #1:	15%	Due on October 28, at 2:00 pm
#2:	20%	Due on November 22, at 4:45 pm

## Lab Content:

The laboratory experience will consist of three different types of activities.

On the first week of class, I will assign a computer lab to do on your own. Its aim is to make sure that you are not rusty in your ability to use Excel. You'll practice some of the skills that are needed to complete the other labs.

During the following eight weeks (excluding the days we'll dedicate to your service learning activity), we will run 8 laboratory experiments. Here is where I expect you to keep an appropriate lab notebook.

In the last three weeks of class, we will run three MatLab labs. MatLab is a mathematics program that is very useful to do complex calculations, like many involving physical chemistry. Although the problems that I will assign in the homework involve math manipulation that you can easily do, the real world requires problems that, although easy to set up, may be nearly impossible to solve by hand. In the lab, we will learn how to use MatLab to set up and solve these problems. We will use MatLab in Physical Chemistry II. The School of Sciences is working on getting MatLab on campus, although there may be a small fee associated to its use.

## Schedule for the week of:

Aug 29	Introduction. Lab Notebook Information. Computer Lab Assignment. Service Learning Session
Sep 5	Labor Day (No Class on Monday, but Tuesday lab, (Sep 6) does meet
Sep 12	Service Learning Session
Sep 19 - Sep 26	Experimental Labs
Oct 3	Service Learning Session
Oct 10 - Nov 14	Rest of Experimental Laboratories (Note: October 17 (Monday) is Fall Break. To ensure that we have equal number of class meetings, the Registrar's Office has indicated that October 18 (Tuesday) will hold Monday's classes. Thus, on October 18, Monday's section of the lab will meet
Nov 21 - Dec 5	MatLab Labs (1, 2, 3)

### EXPERIMENTS TO BE PERFORMED

#3	Heat Capacity Ratios for Gases using the <i>Adiabatic Expansion Method</i> ,	page 106
#6	Heats of Combustion,	page 152
#9	Partial Molar Volume,	page 172
#13	Vapor Pressure of a Pure Liquid,	page 199
#14	Binary Liquid-Vapor Phase Diagram,	page 207
#25	Surface Tension of Solutions,	page 299
#31	Magnetic Susceptibility,	page 361 + handout
#Y1	Mutual Solubilities of Liquids in a Binary Two-Phase system,	handout

### SCHEDULE

Week of ↓	exp. →	# 3	# 6	# 9	# 13	# 14	#25	#31	#Y1
September 5 [1]		6			1	2	3	4	5
September 19		1	2	3	4	5	6		
September 26			1	2	3	4	5	6	
October 10				1	2	3	4	5	6
October 17 [2]		6			1	2	3	4	5
October 24		5	6			1	2	3	4
October 31		4	5	6			1	2	3
November 7		3	4	5	6			1	2
November 14		2	3	4	5	6			1

[1] September 5 is Labor Day and there is no class. The Tuesday section will meet on September 6, as regularly scheduled

[2] October 17 is Fall Break and, again, there are no classes. However, in order to ensure that classes meeting on different days of the week hold the same number of sessions, the Registrar's Office has designated October 18 as a day to hold Monday's classes. Therefore, on Tuesday, October 18, students whose lab meets on Monday will attend lab and those whose lab meets on Tuesday will be off.