

**PHYSICAL CHEMISTRY
LABORATORY MANUAL
CHEM 3080
FALL SEMESTER 2005
UTAH STATE UNIVERSITY
Dr. William M. Moore**

CHEM 3080 -- 2005
Experimental Physical Chemistry

Instructor: Dr. William Moore

Section 1 meets on Tuesday 1:30 - 5:20 p.m.

Section 2 meets on Thursday 1:30 - 5:20 p.m.

Assistant: Nate Maeser

Expt. 1	Gas Thermometry
Expt. 2	The Adiabatic Expansion of Gases
Expt. 3	The Heat of Combustion of a Liquid
Expt. 4	The Vapor Pressure of a Pure Liquid
Expt. 5	The Thermodynamics of a Rubber Band
Expt. 6	Binary solid-liquid phase diagram
Expt. 7	Homogeneous gas equilibrium
Expt. 8	Temperature dependence of EMF
Expt. 9	Library report on thermodynamics.

Date of Expt.	Group	A	B	C	D	E	F	Report due
Aug 30&Sep 1	Meeting for discussion of the Lab experiments							
Sep 6 & 8	Expt.	1	2	3	1	2	3	Sep 20 & 22
Sep 13 & 15	Meeting for discussion of the Lab experiments							
Sep 20 & 22	Expt.	3	1	2	3	1	2	Oct 4 & 6
Sep 27 & 29	Expt.	2	3	1	2	3	1	Oct 11 & 13
Oct 4 & 6	Expt.	4	5	6	7	8	9	Oct 18 & 20
Oct 11 & 13	Expt.	9	4	5	6	7	8	Oct 25 & 27
Oct 18 & 20	Expt.	8	9	4	5	6	7	Nov 1 & 3
Oct 25 & 27	Expt.	7	8	9	4	5	6	Nov. 8 & 10
Nov 1 & 3	Expt.	6	7	8	9	4	5	Nov 15 & 17
Nov. 8 & 10	Expt.	5	6	7	8	9	4	Nov29&Dec1

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| Nov 15 & 17 | Mandatory meeting for critique of the experiments 1 - 3 |
| Nov 22 & 24 | Thanksgiving break |
| Nov 29&Dec 1 | Mandatory meeting for critique of the experiments 4 - 6 |
| Dec 6 & 8 | Mandatory meeting for critique of the experiments 7 - 9 |

All experiments must be performed, and a report written to achieve a passing grade. Before the first lab you are expected to read the description of your experiment. Come prepared to enter your raw data into MICROSOFT EXCEL while the experiment is in progress. Process the data with suitable equations and make a graph if appropriate. Copy your spreadsheet onto one of your disks. **ALWAYS CHECK YOUR DISK FOR VIRUSES.**

It is important that you be familiar with the written material and the equipment for each experiment before you come to class. You cannot work in the laboratory at times when there is no supervision. Make sure to come in and familiarize yourself with the equipment. This is an important practice in working efficiently in a lab. Also, read the handouts carefully before the lab period. If you don't do this, you may not have sufficient time to complete the lab. There are references listed at the end of the handouts that will be helpful to you in writing lab reports.

You are required to follow all safety rules—especially the wearing of **safety glasses**. You are also expected to utilize techniques learned in previous lab courses (e.g., proper use of the analytical balance). Under no circumstances are you allowed to do experiments in the lab at any time other than your regular class period without approval from your T.A. Clean up any messes or spills that may occur. Do not place chemicals directly on the pans of the balances!

This course differs in several important ways from previous lab courses you have taken. Simply coming into the lab and performing the experiments is not enough. After the experiment is completed, there are calculations and graphs to prepare. You must ask questions and think about the labs before you do them, and before reports are due. Some of you may find this stressful—at least in the beginning. This course is intended to prepare you for science in the real world! One of the first things you will have to do is learn how to surmount the "initial paralysis" usually experienced in new and unfamiliar situations. We are here to provide you with guidance. You pay for this guidance when you pay tuition, so take advantage of it. We won't necessarily give you specific answers to questions, but we will generally tell you where to find answers or how to start looking.

The experiments will be done with two students to an experiment. The instructor on a random basis will do the pairing. All reports should be done on the spreadsheet. Modern spreadsheets have most of the versatility of word processors, including the use of Greek symbols, subscripts and superscripts.

Each report should be enclosed in an inexpensive three-hole binder. A description of the experiment can be taken from the handout. The experimental data, processing of the data, and applicable graphs can be done neatly and logically on the newest spreadsheets. Your name and the title of the experiment should be visible on the front cover. A copy of the report should also be sent by E-mail to wmmoore@cc.usu.edu. The E-mail subject title should contain your last name and number of the experiment (Example: Moore #7)

Each student group may develop the initial spreadsheet together during the period that the experiment is performed. A hardcopy of this initial work is handed to the instructor and signed by both students. **The remaining calculations and preparation of the report must be done separately.**

Your grade in this course is determined by your lab reports, lab performance, and quizzes given at the end of the semester. It is therefore very important to spend time thinking about and writing the lab reports. **You must complete all of the reports to pass the course.** An incomplete will be given only for medical reasons. You should not write your lab report with your lab partner.

Include references in all reports. It is essential to acknowledge any printed source you use in preparing for the lab and the report.

Lab reports must be turned in no later than the beginning of class on the day specified. **Five points will be deducted for each day after the deadline (not including Sat & Sun), or 25 points per week.** It is possible for an excellent late report to receive a grade of zero, but it must be accomplished. Almost every year, one or more students have performed every experiment and yet fail the class. In some cases only one report has been missing.

Grading:

Nine reports @ 100 pts	900
Three quizzes @ 33 pts	100
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Total points	1000

Grade:

A	930 to 1000
A-	900 to 929
B+	870 to 899
B	840 to 869
B-	810 to 839
C+	780 to 809
C	750 to 779
C-	720 to 749
F	One or more missing reports

Purposes to be accomplished in the Physical Chemistry Laboratory

- 1. Every experimental apparatus should work every lab period.**
- 2. Obtain experimental data of the quality equal to the limitations of the equipment**
- 3. Analyze the data correctly.**
- 4. Correlate the results with theory and known accepted values if possible.**
- 5. Learn to present the results in a manner understood by other chemists. This includes presentation of figures, data and graphs**
- 6. Understand the errors involved in performing the experiment.**
- 7. Learn to write a paper that contains the elements required for original work.**