Chemistry 3080
Physical Chemistry Laboratory I
Fall 2016

Course Name: Physical Chemistry Laboratory I

Time/Location: T 2:30-5:20 p.m. ML-350/354

Instructor: Stephen Bialkowski *Office* ML-359 *Phone*: 7-1907, email: stephen.bialkowski@usu.edu

Teaching Assistant: Abram Rajesh Bernard, email: abrambernard@gmail.com

Office Hours: During the laboratory, meeting by appointment or using email.

Text: *Experiments in Physical Chemistry 8th Edition,* C. W. Garland, J. W. Nibler and D. P. Shoemaker, McGraw-Hill (2009)

Materials: textbook, bound laboratory notebook, safety goggles; laboratory coat, pencil, pen, etc.

Course Content: This course consists of 8 laboratories. Laboratories include experiments in gas properties, thermochemistry, solution phase chemical equilibrium, phase behavior and electrochemistry.

Evaluation: Performance will be evaluated based on 8 formal laboratory reports that are written using the data obtained during the laboratory session, calculations and supporting information, laboratory notebook and digital data integrity checks, and a short final quiz.

Grading: Grades are based on scores obtained on individual laboratory reports**,** the student's laboratory notebook, and a final quiz. Each laboratory report has a maximum score of 10 points. The two laboratory notebook and data integrity checks will count 5 points each. The final quiz is 10 points**.**

Maximum Points	Task
80	8 Experiments
10	Laboratory notebook and data checks
10	Final quiz (may be waived if students agree to do course assessment)
100	**Total Points**

The maximum letter grade ranges will be: A, 90-100%; B, 80-89%; C, 70-79%; D, 60-69%. The rages may be lowered but will not be raised. Plus (+) and minus (-) grade modifier will be used. The upper 1/3 of a letter grade % range will be assigned (+), the lower 1/3 will receive a (-) modifier.

Laboratory Reports: Laboratory reports are due two weeks after the laboratory is finished. I may take off 1 out of 10 points for each late week. Read Chapter 1 in the text book for information regarding the format of these reports. Reports are typically 4-10 pages and are typed (printed). The use of a computer to prepare the reports is recommended. Each student writes their own report. All figures and data should be included in the report.

Treatment of Experimental Data: Chapter II is an overview of the statistical treatment of experimental data. Much of this is addressed in the CHEM 3000 lecture but it is good to review this all the same. New material covered in this chapter deals with the propagation of uncertainty.

Scientific Computer Software: Chapter III discusses the use of computer software for data collection and analysis. Of course we also use computers for preparing laboratory reports. Students will have the opportunity to work on spreadsheets and other scientific software with the TA or the professor if needed.

Experiments: Students will work in groups of 2 to 4 (depending on enrollment). The department has the equipment for students to perform laboratories taken from the textbook. The following is a list of possible laboratories.

IV. Gases

1. Gas Thermometry
2. Joule-Thompson Effect*
3. Heat-Capacity Ratios for Gases*

V. Transport Properties of Gases

4. Viscosity of Gases*

VI. Thermochemistry

6. Heats of Combustion*
7. Strain Energy of the Cyclopropane Ring

VII. Solutions

9. Partial Molar Volume*
10. Cryoscopic Determination of Molar Mass
12. Chemical Equilibrium in Solution

VIII. Phase Behavior

13. Vapor Pressure of Pure Liquid*
14. Binary Liquid-Vapor Phase Diagram

IX. Electrochemistry

17. Conductance of Solutions*
18. Temperature Dependence of *EMF**
19. Activity Coefficients from Cell Measurements

Laboratories marked * are currently planned.

Attendance Policy: Attendance is mandatory for successful performance in this course. Attendance is monitored through laboratory notebook checks. Students work in groups and missing a laboratory will affect everyone. Stay in communication with your group to remediate schedule problems. We all have lives.

Laboratory Rules: Students are to follow normal chemical laboratory safety measures. Laboratory coats and eye protection are required. No food or drink in the lab, etc. Please act professional and safe.

Missed Laboratory Policy: Students may be excused from a laboratory in cases of emergency. Documentation must be supplied to be excused. In cases of extended absence, grades will be assigned based on % of total score. For other absences, late assignments may be penalized. No repetition of experiments is permitted once a result is submitted.

Withdrawal Policy: This course will follow the University policy on withdrawals stated in the current Undergraduate Catalog. Drop dates are listed in the Schedule of Classes.

Student Disability Statement: Any student with a disability that requires accommodations must contact the Instructor. The disability must be documented by the Disability Resource Center. Course materials may be requested in alternative formats.

Laboratory Fee Statement: A laboratory fee is required for this course. Laboratory fees for this course are used for the purchase of equipment and supplies and to help pay teaching assistants.

Assessment Statement: The purpose of the physical chemistry laboratory is to learn laboratory procedures to measure physical properties of chemicals and to interpret these measurements with the theories describing the phenomena. Laboratory learning objective performance is evaluated through the formal written reports describing the experiments and data analysis.

Learning Objectives:

- Understand laboratory and chemical safety
- Comprehend concept of and perform chemical measurement calibration
- Relate the microscopic and macroscopic properties of matter to each other
- Use statistical methods for evaluating and interpreting data
- Assess sources of error in chemical and instrumental analysis and account for errors in data analysis
- Demonstrate competency in written and oral communication using mathematics if needed
- Comprehend the importance of stoichiometry, chemical equilibrium and kinetics
- Apply thermodynamic, kinetic and quantum methods in an integrated way in all areas of chemistry and biochemistry