I. General Information:

Instructor: Robert K. Szilagyi, Assistant Professor
Gaines 223, Phone: 4263, Email: Szilagyi@Montana.EDU
Website: WEBCT – course CHEM30201f07

Teaching Assistant: Linda Barr, 2nd year graduate student
Gaines 226, Phone: 4071, Email: lbarr@chemistry.montana.edu

Lab times: Wednesdays 2:10 to 5:00 pm in Gaines 228

Office hours: Instructor's Mondays 3 pm – 5 pm or every evening on WebCT
Teaching assistant's Thursday 4 pm – 5 pm

Lab Manual: Individual experiment chapters will be made available electronically on WebCT. Please read it and come prepared with questions to the lab. There will be a quick quiz before every lab followed by a brief discussion.

II. Course Policies and Procedures

● Grading
  ➔ 90% of the final grade will be based on six equally weighted lab reports (15% each) and 10% will be from the pre-lab quizzes. Additional percentage up to 5 % can be obtained by contributing to the WebCT materials with on-line resources.
  ➔ The familiar 90%-80%-70%-60% scale will be used to determine your grade.
  ➔ Lab reports are graded on an absolute standard of: accurate data, a demonstrated understanding of the relevant chemical principles, and the clarity and completeness of presentation.
  ➔ Lab reports in PDF format may be emailed to the instructor or the TA, or preferably uploaded to WebCT. For electronic preparation please use the scanner in the lab.
  ➔ Contribution to online materials will be rewarded by extra credit. See above.
  ➔ Every effort will be made to be consistent in grading throughout the semester. All the graded lab reports will be made available on WebCT.

● Deadlines
  All lab reports are due in two weeks after the date of measurements. There will be a penalty for late lab reports. The normal penalty will be 2 percentage points per day late up to a maximum of 50 percent. Requests for deviation from this penalty must be discussed with the instructor in advance of the measurements.

● Makeup labs
  Makeup labs are permitted only when the lab was missed because of serious illness, field trips, and other legitimate reasons and shall be arranged with the instructor in advance.

● Absences
  Avoid being absent; should a lab partner be absent, the individual present will do the experiment on his/her own. The absent partner will have to do the experiment in a makeup session.
● **Lab Notebook**

Students are expected to keep a lab notebook, which may be shared between two partners or kept individually. Lab procedures, the flow of events during each experiment, raw data obtained, and observations made shall be recorded in the notebook. The relevant notebook pages that need to be considered for the evaluation must be scanned and attached to the electronic lab report. Much raw data will; however, be collected and stored on disk.

● **Floppy Disk/CDRW/USB key**

Each student should have a floppy disk/CD-R/W/USB key dedicated to storing data for this Lab.

● **Lab Reports**

  ➔ Lab reports need to be submitted electronically either by email or via WebCT.
  ➔ Data collected jointly by lab partners may be shared between the partners, but each individual is responsible for preparing his/her own lab report. Discussions among fellow students to enhance understanding is highly encouraged; however, group lab reports will not be accepted. Copying/plagiarism will be rewarded by zero credit.
  ➔ General outline (see below for additional information):

  1. Introduction - precise subject, scope, purpose/objectives
  2. Experiment - description of what was done, equipment used, data collected
  3. Results and Analysis - description of analysis done and presentation of reduced data, be specific about what calculations were done
  4. Discussion - significance of results, comparison with other's results or with literature, comments on accuracy and/or precision of results, enough discussion/analysis to show understanding of results and of most significant error(s) in experiment.
  5. Conclusions - convictions based on evidence provided by data and analysis, linked with objectives of experiment. The conclusion will be evaluated seriously and should show that the student understood the key concepts of the lab experiment. Merely restating the results of calculations is not enough. Students should avoid fluffy comments, such as: “I liked this lab. Everything worked fine. I learned that accurate data can be obtained when one is careful. The experimental procedure yielded fairly accurate results with high precision.”
  6. References - attach literature citations if applicable
  7. Tables - attach tables if applicable
  8. Graphs - attach graphs if applicable
  9. Lab notes – scanned pages of lab notebook containing record of experiment done for this report.
  10. Appendix - often unnecessary - supplementary material needed for completeness, but which would detract from orderly and logical presentation if inserted into report e.g., derivation of equations, detailed description of physical principles, descriptions of failed runs.
• **Safety**
  1. Safety glasses are to be worn at all times. Some of the experiments involve slightly corrosive chemicals and/or evacuated containers, which pose a possible hazard to all in the lab.
  2. For the same reasons shorts and open toed shoes are not to be worn in the lab.
  3. Bring no food or drink into the lab.
  4. **Do not use or add to any substance in an unlabeled bottle. Dispose waste chemicals ONLY in bottles specifically labeled for the type of chemical to be disposed. Ask your instructor if you have the slightest uncertainty!**

### III. Course Schedule:

**August**
- 29  Introduction, Overview – organize into groups

**September**
- 5  Group A: Errors, Standard Deviations, and Data Collection
- 12 Group B: Errors, Standard Deviations, and Data Collection
- 19 Group A: Thermodynamics of Hydrophobic Interactions
- 26 Group B: Thermodynamics of Hydrophobic Interactions

**October**
- 3  No lab – Instructor and the TA will be out of town
- 10 Group A: Electrochemistry
- 17 Group B: Electrochemistry
- 24 Group A: Infrared and Raman Spectroscopy
- 31 Group B: Infrared and Raman Spectroscopy

**November**
- 7  Group A: Enzyme Kinetics
- 14 Group B: Enzyme Kinetics
- 21 No lab – available for make-up on the 20th (Tuesday)
- 28 Group A: Mass-spectrometry

**December**
- 5  Group B: Mass-spectrometry
- 14 All reports are due by noon (final grades will be assigned by Mon 18th at noon)

The instructor and the TA will make every effort possible to accommodate requests for an additional make-up lab during the last week of classes.
SUPPLEMENT on lab report expectations: (by Angela Frandsen, former TA)

1. When writing your lab report, make sure that you put your ideas, information, and data in the correct sections outlined in the syllabus. In other words, do not put data and analysis in the experiment section, no experimental procedure in the introduction. More specifically...

   **Introduction** — Short and concise. Include only what the lab is about, the purpose, and the principle(s) being explored. Do not give experimental details. This can typically be done in a short paragraph.

   **Experiment** — Concise summary of the experiment without quoting the lab manual. Includes materials, programs, procedure, deviations from the manual, how you collected data, etc. This should also be written in complete sentences and paragraphs, not in list or recipe form. Also write in past tense - you did the experiment in the past. Do not include any data analysis or calculations.

   **Results/Analysis** — 1. Present your experimental data in a readable form. 2. Do the appropriate calculations and describe how you did them. Be sure to show your work so you can get partial credit and so that the grader knows that you actually knew how to do the calculations. Make sure you include everything the lab asks for.

   **Discussion** — Look at your data and calculations and comment on them. Do they make sense, are they way off, do you see any trends? How are they relevant to the principles being explored in the lab? This is an important section and it is different than the conclusion. This section can be combined with the results and analysis section (i.e. present a calculation and then discuss its relevance immediately afterwards) but then it needs to be called Results, Analysis, and Discussion.

   **Conclusion** — You need to show the grader that you understand the lab - that you understand how the experiment works and that you understand the CHEMISTRY behind the lab. Included in this you need to relate YOUR experimental data to the principles outlined in the lab (which you should have outlined in the introduction). In other words, did your data support these principles or not and why?

   **References** — You must include a reference if you looked to any source outside of the lab manual for information or literature values. Write up the citations as you would for any formal report.

   **Lab notes** — You must take notes during your experiment. The computers will take a lot of data for you but you should make your own observations as well. These should be added on at the end of the report. Any data in the lab notes should be transferred in a readable format to the data and analysis section. However, if you are particularly neat in taking your lab notes, you may refer to data in the lab notes in the data and analysis section. However, without a referral, credit could be lost.

2. Data presentation needs to be readable and neat. The grader should not have to hunt through your lab notes to find your data. Lab notes are NOTES; they are what the report is based on. As stated before, you can, however, refer to your lab notes in your report. (You do not have to reproduce data tables or graphs that you printed out on the spreadsheet.)
3. **TITLE and LABEL your graphs and tables.** This means that the graph has a title and both axes are labeled with the appropriate UNITS. (For example, the x-axis may be concentration, but without units it might be mol/L, mg/L, etc.) Make sure the titles describe the graph. **Also, when the manual says “graph something vs. something else”, the convention is ALWAYS y vs. x.**

4. **Include UNITS on your numbers.** A number is meaningless without units to describe it.

5. **Write your lab reports in complete sentences and readable English.** No, it will not be graded like an English paper; however, it is important to write clearly enough to get your ideas across. If you cannot get your ideas across, then you risk losing credit because the grader might not understand your point and you won’t have shown that you understand the principles.

6. When writing the reports, write them so that anyone could understand what you did and repeat your experiment. Pretend that your TA (who knows everything about every experiment) is not the one reading your papers. Thus, they need to be thorough. For example, the TA will know that your graph of P vs. T that you did not put units on was in torr vs. Celsius but some other scientist will have no clue!