

principles and theory involved in that week's scheduled experiment and will include minimal detailed instructions concerning the experiment itself.

Attendance: Students are expected to attend the lecture and lab each week. Attendance will not be taken in the lecture class, but students will be responsible for any information presented during the lecture.

Students are responsible for making up any labs they miss, regardless of the reason for the absence. A valid reason for missing the scheduled lab will not excuse the student from performing the lab. If a student is aware of a conflict in advance, he/she should contact the professor and attempt to attend another section, if possible.

Experiments (held in Disque 404):

- Week of Apr. 2 (1) Measurement of Liquid Density/Statistics and Data Treatment
- Week of Apr. 9 (2) Viscosity of Liquids: Low Viscosities
- Week of Apr. 16 (3) Review of Viscosity lab report
- Week of Apr. 23 (4) Combinatorial Synthesis of a Series of Carboxylic Esters
- Week of Apr. 30 (5) Separation of a Mixture and Purification of the Individual Components
- Week of May 7 (6) Continuation of previous experiment
- Week of May 14 (7) The Kinetics of a Homogeneous Reaction in Solution – Part I
- Week of May 21 (8) The Kinetics of a Homogeneous Reaction in Solution – Part II
- Week of May 28 (9) Energetics of Chemical Processes Studied with Heat Conduction
Calorimetry (**no lecture 5/28 – Memorial Day**)
- Week of June 4 (10) The Thermodynamic Efficiency of Fuel Cells

Final Examination During Finals Week

Safety: Students are expected to practice proper and **SAFE** laboratory procedures. No food or drinks are allowed in the labs. Eye protection must be worn at all times.

Grading:

Lab reports (70%). The student's grade is mostly based on the written reports. The lowest lab report grade will be dropped from the final average.

Lab work/attendance (10%). This will be comprised of the student's attendance and the instructor's assessment of the quality of the work done in the lab. In order to get full credit, each student must be on time, practice safe and neat laboratory procedures, and be prepared for the lab, i.e., have read and understood the procedure before coming to lab.

Final Exam (in Exam Week) (20%). This exam will be based on the theory and analysis associated with the labs.

Cheating or dishonesty (which includes plagiarizing) will not be tolerated. Cheating or dishonesty may result in a ZERO, failure of the course, or dismissal, as appropriate.

Lab Reports:

Reports are due to your lab instructor by 5 PM **1 week** after the date of completion of the experiment. Points will be deducted from late reports (**5 points per day**). No reports will be accepted after the Friday of finals week.

Students will be working in groups of two or three. *Each group is responsible to submit one report for each experiment.* Since all members of the group will receive the same grade for the lab, good communication among the members of a group is essential. Note that the final exam will assume that all students have been involved in every aspect of the lab report to the extent that they can answer questions based on the lab.

Reports should follow a standard format. Each report must include 10 sections:

1. The title of the experiment, your name, etc.**2. Abstract**

This is a short paragraph that gives a summary of the experiment, including the final results with uncertainties, if possible.

3. Introduction (or background)

This section (generally no more than one page) describes the theory and concepts involved. Include primary equations used in the calculations.

4. Procedure

This should be a brief and general description of the experimental procedure, avoiding detailed descriptions of the operation of any instrumentation.

5. Data

Here the measurements and the raw data are presented. Use tables prepared with a spreadsheet. In general no calculations should be associated with the data.

6. Results

This section presents the results obtained using the raw data from the previous section, including any plots or figures produced (when making plots, label the axes and display the proper units). Once this part of the report is completed, you should know if you were able to accomplish the "Objective" of the experiment. For example, if the objective of the experiment is to measure the viscosity of a liquid at five different temperatures, you should have a table in the RESULTS section with values for viscosity at those five temperatures. An example of each type of calculation should be included in this section.

7. Error analysis

This section shows the accuracy and precision of the experimental results. The accuracy is represented by the relative error, which is obtained using the "true value" of the parameter of interest. The "true value" (or best accepted value) can usually be found in reference sources, such as the CRC Handbook of Chemistry and Physics. When reference data are cited, be sure to properly identify the source or sources of such data in the acknowledgements section.

In cases where repeated measurements are performed, the precision can be determined by obtaining the standard deviation and/or standard error. (A full treatment of the "error analysis" will be presented in the lecture for the density experiment.) Sample calculations of any error analysis should be included in this section.

This section should also include a discussion of sources of error and/or uncertainty. You must be specific here. "Human error" is not an acceptable source of error.

8. Conclusions and Discussion

The experimental results are discussed in this section. The quality of the experiment is evaluated considering its success or failure. In case of failure, the student should attempt to identify the source of the problem. In general, the student(s) should discuss how the lab demonstrated the objectives of the lab, or how the data answered the questions posed at the start of the lab.

9. Acknowledgements

This section should include any reference materials used in the interpretation of data, the writing of the report, or the answering of questions. Persons contributing to this work also should be acknowledged in this section (e.g., other groups who provided data).

10. Questions.

At the end of each experiment, there are a few questions. Include the answers to the questions in your report.

There are sample reports available from previous terms. You may look at them to get an idea of what is expected.