Physical Chemistry Laboratory
CHEM-UA 661
Tentative Syllabus, Fall 2020

General Information

Laboratory location and hours
T 11:00 PM - 2:30 PM Waverly 967b, 970
W 2:30 PM - 6:00 PM

Lecture location and hours
F 9:30 AM - 10:45 AM Online

Instructor
Prof. Dubravko Sabo
1001W Silver, 212-998-8799
dubravko.sabo@nyu.edu
Office Hours: Mon 2:30 PM - 4:00 PM

Laboratory Instructor:
Bryan Erriah 5th floor Brown be733@nyu.edu
Yuvraj Singh 1166 Waverly ys3382@nyu.edu

Text

Laboratory Notebook
You will need a laboratory notebook in which to record your data and experimental observations. You may use a bound composition book for this purpose, and submit photocopies of the relevant notebook pages with your laboratory reports.

Lecture Information
Lectures will be given every Friday. Some special dates to note:
Sep. 4 First lecture
Nov. 27 Thanksgiving Recess (no lecture)
Dec. 4 Last lecture
Exams
There will be no final examination.

Grading
The course grade will be determined by the following weighting:

Laboratory Reports  60%
Oral Presentation  30%
Instructor Evaluations  10%

Written lab reports are due in the lab period two weeks after the experiment is done.\textsuperscript{1} The lab report grade will be multiplied by a factor of 0.95 for each day that a report is late. You are expected to prepare for each lab by reading the experiment or handout in advance.

Course and Laboratory Rules

Laboratory check-in for the Tuesday section is on Sep. 8, while for the Wednesday section is on Sep. 2. At the check-out, you will be charged for any broken or lost items in your locker, which will be charged to your Campus Cash account.

You are required to perform the experiments during the assigned laboratory period. Careful planning and execution will be necessary to complete the work in one period.

Always prepare thoroughly for each experiment before the laboratory period. Carry out all calculations that can be carried out in advance before you come to the laboratory.

Some experiment involve theoretical and/or experimental principles and techniques that will be unfamiliar and that will require considerable study. Work out difficult points and obtain advice from the laboratory instructional staff in advance.

General Laboratory Policies

1. Observe all safety regulations.

2. Keep all equipment and working areas in the laboratory clean.

3. When in doubt about how to use a piece of equipment or apparatus, consult an instructor first.

\textsuperscript{1}In the event that the lecture pertaining to the experiment has not been given by the date the report is due, the written report will be due in the next regularly scheduled lab period following that lecture.
Covid-19 Laboratory Policies

We will have to comply with the safety regulations while being in the lab, maintain social distancing and wear personal protection equipment that will be provided to you upon arrival in the lab. The following is the list of mandatory PPE’s:

1. KN95 face mask.
2. Gloves.
3. Disposable laboratory coat.
4. Goggles.

You will need to purchase your own goggles. Other items from the list will be provided to you.

Laboratory Notebooks

All data and other primary information on an experiment must be recorded directly in your laboratory notebook. Your notebook must be initialized by an instructor during the laboratory period. Copies of the relevant laboratory notebook pages must be turned in, along with any chart recordings, spectra, etc., with your laboratory report.

DO NOT USE LOOSE SHEETS OF PAPER FOR ANY DATA TAKEN IN THE LABORATORY.

Be certain your name, the name of your partner, the date the data was taken, and the (short) title of each experiment are written on each page. Write subtitles for each part of the experiment. Clearly indicate with titles, headings, comments, etc., what the data refer to, what the units are, etc., and enter data in chronological order. If for some reason the data is not entered in chronological order, note this fact in your notebook.

Indicate any changes from the prescribed procedure that may have occurred. Note fully any difficulties encountered.

Record any identifying numbers and/or calibrations on special equipment.
USEFUL REFERENCES
(Can be found in the Bobst Library collection, unless otherwise noted.)

Experimental physical chemistry, instrumental and error analysis


Quantitative analysis


Physical chemistry, Quantum Chemistry and Spectroscopy


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UNDERGRADUATE LABORATORY SAFETY INSTRUCTIONS

To avoid injury to yourself and fellow students you are required to read, understand and sign this agreement. Failure to comply with these rules while performing laboratory experiments may result in suspension or expulsion from this laboratory course.

1. If you have a medical problem or condition that may effect your performance or safety in the laboratory, you must discuss it in private with your laboratory coordinator. This information will be held in strict confidence.

2. YOU MUST WEAR APPROVED SAFETY GOGGLES AND LAB COAT AT ALL TIMES WHILE DOING EXPERIMENTS. NO CONTACT LENSES are to be worn in the laboratory.

3. BARE FEET OR ANY TYPE OF OPEN SHOES OR SANDALS CANNOT BE WORN INTO A CHEMICAL LABORATORY.

4. NEVER WEAR CUT-OFF TEE SHIRTS, HALTERS, OR SHORT PANTS IN AN INSTRUCTIONAL LABORATORY. In order to minimize the possibility of chemical burns on the body, you are expected to dress sensibly.

5. In case of any accident or spill, NOTIFY THE LAB INSTRUCTOR IMMEDIATELY. Note location of eye fountains and safety showers so that you can use them if needed.

6. Eye injuries, whether chemical or mechanical, must always be considered serious. The best procedure IN CASE OF CHEMICAL INJURY TO THE EYE IS IMMEDIATE PROLONGED CONTINUOUS FLUSHING WITH WATER (15-20 minutes) at an eye fountain. Eyes must be forced open to be washed well.

7. Throw away cracked or chipped glassware immediately and obtain replacements from the stockroom. Broken glassware must be placed in the special trash can labelled Broken Glass Only.

8. Do not touch any chemical with your fingers. Use a spatula to transfer solids and wear gloves. FLUSH WITH WATER ANY PART OF YOUR BODY THAT COMES IN CONTACT WITH A CHEMICAL USED IN THIS LABORATORY. Plenty of running water is the best first aid treatment for all chemical accidents. Rapid and immediate treatment is essential. USE A LOT OF WATER. Clothing soaked with strong acid or alkali must immediately be removed. This is no time for modesty. The safety shower in the lab is mainly intended to be used in cases where corrosive chemicals are spilled or splashed over a large body area.

9. NEVER EAT OR DRINK IN THE LABORATORY. No food or drink is to be brought into the laboratory.

10. Exercise great care in noting the odor of fumes, and AVOID BREATHING FUMES OF ANY KIND. Use fume hood when necessary.

11. Never force glass rods or tubing into rubber stoppers. Always use a lubricant (grease or glycerin) and protect hands with a towel.
12. **DO NOT RUN** in the laboratory. Do not engage in any activities or behavior that might confuse, startle, or distract student.

13. **DO NOT PUT BACK ANY CHEMICAL, SOLID OR LIQUID, INTO THE STOCK BOTTLES** from which they were obtained. The excess chemical may now be contaminated.

14. **REPLACE STOPPERS, lids, covers, etc. on the proper containers immediately after using the containers.**

15. Never remove chemicals from the laboratory.

16. **BE CAUTIOUS**: assume all chemical are toxic, and all organic liquids are flammable.

17. Clean up chemical spills immediately. Check with your instructor for the proper procedure.

18. Ask your Lab Instructor about the disposal of used chemicals. All waste chemicals must be placed in containers labeled specifically for each waste material.

19. **SHOULD A FIRE ALARM SOUND** while you are working in the lab, turn off any hot-plate stirrer, remove any reaction from any heat source, and then leave the building by the nearest exit.

20. An instructor must always be present for students to work in the laboratory. No unauthorized experiments are permitted.

21. Always leave your work area clean at the end of each lab.

22. **WASH YOUR HANDS WHEN LAB WORK IS FINISHED.** It is a good idea to wash your hands whenever they have been in contact with any chemical, not just at the end of the lab period.

My signature below indicates that I have read the above rules, have been informed of these rules by my lab instructor, and that I will observe and abide by these rules.

Student’s Name: ___________________________  Group: ____________

Student’s Signature: ______________________  Date: ____________

Instructor’s Signature: ______________________  Course # CHEM-UA 661
# Experiments and Schedule

## EXPERIMENT

<table>
<thead>
<tr>
<th>EXPERIMENT</th>
<th>REFERENCE</th>
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<tbody>
<tr>
<td>0. Computational Chemistry: Spartan</td>
<td>Lab manual</td>
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<tr>
<td>1. Solid-Liquid Equilibrium (LQ)</td>
<td>Lab manual</td>
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<tr>
<td>2. Electrochemistry: Silver Equilibrium (LQ)</td>
<td>Lab manual</td>
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<tr>
<td>4. Vibration-Rotation Spectra</td>
<td>Lab manual</td>
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<td>5. Spectrum of a Particle-in-a Box</td>
<td>Lab manual</td>
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<tr>
<td>6. Fluorescence of Anthracene</td>
<td>Lab manual</td>
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<tr>
<td>7. Keto-enol Equilibrium by NMR</td>
<td>Lab manual</td>
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LQ indicates LabQuest Module

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<thead>
<tr>
<th>Week/Group</th>
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<th>B</th>
<th>C</th>
<th>D</th>
<th>E, F</th>
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<tr>
<td>Week starting</td>
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<td>31 Aug 20</td>
<td>No lab for Tuesday section; Check-in for Wednesday section</td>
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<tr>
<td>7 Sep 20&lt;sup&gt;a&lt;/sup&gt;</td>
<td>No lab for Wednesday section; Check-in for Tuesday section</td>
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<td>21 Sep 20&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>4&lt;sup&gt;Online&lt;/sup&gt;</td>
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<td>19 Oct 20</td>
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<td>26 Oct 20</td>
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<td>23 Nov 20</td>
<td>Thanksgiving Recess</td>
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<td>30 Nov 20</td>
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<td>7 Dec 20</td>
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<sup>a</sup>Legislative day (Wednesday): Classes will meet according to a Monday schedule.

<sup>b</sup>Exp.0 will be performed Online.

<sup>c</sup>Exp.1 will be performed Online.
Spartan
This exercise will be performed online by each student individually. We will use Spartan through the Virtual Computer Lab (VCL).

Experiments 1-3:
Students will work as partners. In normal circumstances the students work in groups of two. However, to keep the maximum number of students in the lab at 50% capacity we will have one member of the group perform one experiment one week and then her/his partner perform the other experiment the following week (in other words, you will alternate); after one of you performs the experiment you will share the experience and data. This way each student will have a chance to carry out in-person the half of experiments in the lab. Two of the experiments in this group will be carried out online (Computational Chemistry, Solid-Liquid Equilibrium). All the laboratory reports for this group of experiments will be written reports.

Experiments 4-8:
These experiments are done with your partner in the same fashion as those in the group (1-3). One of the experiments in this group will be carried out online (Vibration-Rotation Spectra). Three of the laboratory reports for this group of experiments will be written reports, and two will be oral presentation.

Oral Presentations:

♣ The first oral presentation will be based on the experiments performed during the weeks beginning October 12. This presentation will be given online to the instructors.

♦ The second oral presentation will be based on the experiments performed during the weeks beginning November 2. This presentation will be given online to the instructors.

You will be given 15-16 minutes for your presentation. There will then be 5 minutes of feedback followed by ~10 minutes of questions. You may use no more than 8 slides together (each 4 slides). Practice your presentation. The goal is a polished presentation that is clear and informative at the level of a beginning physical chemistry student. Refer to the Laboratory Manual, page 7, for guidelines for oral presentations. A list of grading criteria will be available in advance.

Written Reports:

You should refer to the Laboratory Manual, pages 6 - 7, for information on how to write a laboratory report. Your reports must include an abstract, a title, an introduction, the procedure that were used, your original data, results (including sample calculations and a summary table of results), a discussion of errors (typically with the propagated probable error) and possible sources of errors, graphs, and the answers to any questions or exercises in the text and handouts. Laboratory reports must be neat and legible. Reports should be concise but complete. Copies of the relevant pages from your laboratory notebook must be turned in with your report.