**CHEM 103: General Chemistry**

**Middlebury College**

**Fall 2019**

***– Laboratory Syllabus –***

1. **Course/Instructor Information**

**Meeting Time:** Monday, Tuesday, Wednesday, and Thursday 1:00 - 4:15 pm

**Location:** MBH 563

**Instructor:** Dr. Mary Jane Simpson, MBH 328

**Contact Information:** The preferred method of communication is email: msimpson@middlebury.edu. I will also attend your morning CHEM 103 lectures, and I am usually available to meet for a few minutes before and after.

**Open Lab/Office Hours:** Office hours are normally held in the lab. The lab is *your space* not only to meet with the instructor but also to study and work on your assignments. You are welcome to come with questions or just to enjoy the quiet and the view. Feel free to bring a friend! Open lab hours are *Tuesdays and Thursdays 9:30 - 11 am in the lab*, *MBH 563*. Private meetings may be held in my office, MBH 328, by appointment only.

**Phone number:** 802-443-5978

1. **Course Description**

The laboratory component of CHEM 103 serves the dual purpose of providing skills-based training in a chemistry laboratory and reinforcing lecture content through hands on experimentation.

1. **Learning Outcomes**

By the end of this course, students will:

* + Find and interpret chemical safety information, and demonstrate safe practices in the laboratory;
	+ Select appropriate measurement tools based on required precision and practical constraints, and apply significant figure rules to chemical calculations based on experimental data;
	+ Propose and execute the preparation of aqueous solutions, and calculate the concentration of the solution with correct significant figures; solutions will be prepared from solids and stock solutions, waste will be minimized, and the procedure will incorporate quantitative transfer, when necessary;
	+ Use dimensional analysis to solve quantum mechanics problems, such as those involving the Rydberg formula, and stoichiometry problems, particularly those relating to titrations and reaction yield;
	+ Perform linear regression with data analysis software. Use it as a calibration curve for quantitative chemical analysis, including experiments based on Beer’s law;
	+ Draw Lewis structures, molecular geometry and shapes, and molecular orbital diagrams, and estimate properties of molecules using both chemical principles and chemical modeling software (Chem3D);
	+ Collect experimental data accurately, and organize experimental data in tables and graphs;
	+ Integrate principles of general chemistry into brief explanations of experimental results;
	+ Analyze specific sources of random and systematic experimental error, and design a procedure to minimize error.
1. **Course Materials**
	* The lab manual and worksheets will be provided online and in print, respectively at http://sites.middlebury.edu/chem103lab/.
	* You need a pair of safety glasses; these can be purchased at the bookstore for about $20 or online. Make sure you get appropriate safety glasses to fit over eyeglasses if you need them.
	* *Optional for the week of October 14,* you can bring a clean 100% cotton white garment if you would like to tie dye.
2. **Course Structure**

**Before Lab:** Students will prepare for lab by reading the lab manual and occasionally by watching a video to learn basic lab techniques.

**In Lab:** Students will listen to a brief lecture (15-25 minutes) to get relevant background information, particularly notes about safety. Students may be asked to perform an individual or group exercise to guide their learning, but these exercises are not graded. Then, students will perform an experiment that takes 90-150 minutes. During that time, students may leave the lab to take breaks. After the experiment is finished and cleaned up, students may leave to complete data analysis and post-lab questions, but they are encouraged to remain in the lab to work with their peers, teaching assistant, and instructor.

**After Lab:** If students do not complete the worksheet during the lab, then they may complete the worksheet outside of class. Lab worksheets are due at the next lab meeting time, which is usually a week but sometimes longer, depending on the academic calendar. See schedule for exact due dates.

**Lab partners:** Most experiments are performed with 1 or 2 partners for a number of reasons: 1) to give you the opportunity to learn how to collaborate; 2) to allow you to do a lab that is too long or difficult to perform alone; and 3) to make it feasible to use equipment that we do not have enough for every student. Sometimes partners will be assigned randomly by the instructor, and other times partners will be self-selected. You will change lab partners every week or two. All students submit individual lab worksheets, and all students are graded individually.

1. **Grading Information**

The lab component counts as 25% of your final grade in CHEM 103. Per department policy, you must perform every experiment in order to pass CHEM 103. Grades are assigned on a numerical scale out of 150 possible points. Points are awarded based on lab preparation (5 possible points), lab etiquette (5 possible points), and lab worksheets (10 labs at 5 - 30 points each, see course schedule). Requests to change grades must be made in person during office hours or an appointment.

1. **Relevant Policies**

**Academic integrity:** It is of utmost importance in chemistry lab that you never falsify your data. You are encouraged to work together in and out of lab and to discuss your lab reports with other students, however, the assignments you turn in should represent *your own work, in your own words, based on your own original data*. If you use resources other than your textbook and online lab manual, then you must cite your sources appropriately. Each student in this course is expected to abide by the Middlebury College Honor Code. Suspected violations will be reported to the Office of Judicial Affairs.

**Accommodations for students with disabilities:** Students with documented disabilities who believe that they may need accommodations in this class are encouraged to contact me as early in the semester as possible to ensure that such accommodations are implemented in a timely fashion. Assistance is available to eligible students through Student Accessibility Services. Please contact Jodi Litchfield at litchfie@middlebury.edu for more information. All discussions will remain confidential.

**Use of Technology**: Students may use any kind of technology during lab, although students should consider the risk of their devices being contaminated or possibly exposed to liquids when in lab. The lab is equipped with a set of laptops that students may borrow anytime.

1. **Expectations of Students**

**Attendance:** Attendance is required in order to perform experiments and complete lab reports. Please arrive on time; pre-lab discussions are brief and provide critical information. *If you miss a lab, you must make it up promptly, ideally joining another lab section. Excused absences are eligible to receive full credit, but unexcused absences automatically lose 25%.*

**Lab etiquette:** Everyone is responsible for maintaining a safe laboratory. Follow the safety rules at all times. Failure to follow lab safety rules will result in a significant lab etiquette grade penalty, which may be assigned without warning.

**Preparation:** *Read through the lab handout and complete the pre-lab portion of the lab worksheet* prior to arriving to lab. Your pre-lab assignment will be checked for completion at the beginning of lab, but you can continue to make changes to this section even after it has been checked. Plan on preparation taking approximately 1 hour each week. Failure to come with a complete pre-lab will result in a lower preparation grade.

**Late assignments:** Lab reports are due one week after the lab has been completed (see schedule). Every student is allotted 5 calendar days of extensions to be used at your discretion throughout the semester without penalty. Additional extension days will be subject to a 1 point per calendar day penalty. Unexcused late assignments received after an answer key has been released (typically two weeks after the assignment was due) will receive no credit.

**Corrections:** Students who receive a 70% or below have the option to correct and resubmit a lab report for partial credit. Students considering correcting and resubmitting are encouraged to meet one-on-one with the instructor or a TA. Corrections are due a week after the assignment was returned, with corrections no longer accepted after an answer key has been released. *Corrections must be submitted in person during office hours or an appointment.*

1. **Relevant Campus Resources**

**Center for Teaching, Learning, and Research:** Analysis of experimental data requires advanced use of college-level algebra. Many students need to refresh math concepts in order to complete data analysis. The CTLR provides academic support for students in many specific content areas, including math, through both professional tutors and peer tutors. The Center is also the place where students can find assistance in time-management and study skills. These services are free to all students. For more information on how to get the help you need, go to <http://www.middlebury.edu/academics/resources/ctlr/students>.

**Disability Resource Center:** The DRC provides support for students with disabilities and facilitates the accommodations process by helping students understand the resources and options available and by helping faculty understand how to increase access and full participation in courses. The DRC can also provide referrals for students who would like to undergo diagnostic testing. Students who are on financial aid and have never undergone diagnostic testing can apply to the CTLR for support to cover the cost of off-campus testing. DRC services are free to all students.

1. **Course Calendar**

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| **Date** | **Name of experiment** | **Due date** | **Value** |
| Sept. 9 - 12 | Check in, lab safety, Lab 1: The discovery of eka-silicon | Sept. 16 - 19 | 5 points |
| Sept. 16 - 19 | Lab 2: Quantitative analysis of Kool Aid | Sept. 23 - 26 | 5 points |
| Sept. 23 - 26 | Lab 3: Spectrophotometric determination of iron | Sept. 30 - Oct. 3 | 10 points |
| Sept. 30 - Oct. 3 | Lab 4: Deduction of an empirical formula | Oct. 7 - 10 | 15 points |
| Oct. 7 - 10 | Lab 5: The law of multiple proportions | Oct. 14 - 17 | 15 points |
| Oct. 14 - 17 | Lab 6: Emission of light and tie dye | Oct. 23 - 29 | 15 points |
| Oct. 23 - 29 | Lab 7: Sunscreen: absorption of UV light | Oct. 30 - Nov. 5 | 15 points |
| Oct. 30 - Nov. 5 | Lab 8: Separation of a mixture | Nov. 6 - 12 | 15 points |
| Nov. 6 - 12 | Lab 9: Titration of citric acid | Nov. 13 - 19 | 15 points |
| Nov. 13 - 19 | Lab 10: Identification of an unknown volatile liquid |  |  |
| Nov. 20 - 26 | Continue Lab 10 | Dec. 2 - 5 | 30 points |
| Dec. 2 - 5 | Liquid nitrogen ice cream and check out |  |  |