

Syllabus

INTRODUCTION

Chemistry 202 laboratory provides students with the opportunity to become familiar with quantitative scientific techniques such as spectroscopy, titration, and calorimetry while using observation and measurement to verify scientific principles. This one credit hour laboratory course accompanies Chemistry 201 - *Chemistry: A Quantitative Science* (CAQS). CH 202 is a separate course, for which students receive a separate grade. Although the topics covered in this course follow the same general order as the CH 201 textbook, **this lab course is not meant to follow the lecture course on a day-by-day basis**. It is also not just a supplement to the lecture. Please consult your lab manual and the lab website often for additional information on the topics covered in lab.

Course Materials

Lab Manual: Chemistry 202 Laboratory eManual. Can be purchased online through Cengage/WebAssign at <http://webassign.net>¹ typically on the first day of the semester. The cost varies based upon the Cengage access package students choose. The stand-alone cost is ~\$55. (Required)

Calculator: Capable of handling scientific notation; does not need not be expensive. (Required)

Reliable Internet: Please ensure you have a reliable internet connection and computer/tablet. Smart phones sometimes have display issues so they are not recommended for lab work.

Course Websites

Wolfware: <http://wolfware.ncsu.edu>² also known as **Moodle**. Under the CH 202 course, students may find the lab schedule, TA emails and tutorial hours and other valuable information. Access typically begins a few days before the semester starts.

WebAssign: <http://webassign.net>³ Online homework distribution and submission system.

Corequisite

CH 201: This is the General Chemistry 2 lecture course. Students are required to register for CH 201 and CH 202 in the same semester. If extenuating circumstances exist, please email the Lab Director, Dr. Daniel Fowler at DFOWLER2@NCSSU.EDU.

Learning Objectives

Upon successful completion of this course, the student will be able to:

- Operate safely in a general chemistry lab environment and recognize the hazards associated with various classes of chemicals.

¹<http://webassign.net>

²<http://wolfware.ncsu.edu>

³<http://webassign.net>

- Operate lab equipment such as thermistors, pH probes, voltmeters, spectrophotometers, hot plates, and centrifuges.
- Perform the steps of an experimental procedure and utilize the measurements and observations to confirm different principles related to General Chemistry.
- Prepare standard solutions and measure the absorbance to create a Beer's Law Plot. Utilize this information to determine the concentration of unknown and experimental solutions.
- Perform an acid-base titration and analyze the results to determine the amount of analyte present.
- Calibrate a pH probe and determine the pH of sample solutions.
- Properly prepare a buffer solution.
- Properly report observed and calculated values with the correct number of significant figures.

Experiments

The following experiments are typically performed in CH 202. Specific dates may be found on the course Moodle site.

Lab 1: Reaction Stoichiometry

Lab 2: Solutions and Spectroscopy

Lab 3: Freezing Point Depression

Lab 4: Calorimetry

Lab 5: Determination of an Equilibrium Constant

Lab 6: Electrochemical Cells

Lab 7: Mixtures of Acids and Bases

Lab 8: Buffers

Lab 9: Titration Curves

Lab 10: Solubility Product Constants

Lab 11: Chemical Kinetics

Contacts

The assigned TA is a student's first resource for any course issues. TA names and email address can be found at the CH 202 course Webpage at <http://wolfware.ncsu.edu>⁴. **Please attempt to contact your TA first**, in the event of lab absences and InLab, PreLab, or PostLab questions.

Occasionally students may experience difficult technical issues, emergencies or extraordinary circumstances which cannot be resolved by a TA. In that case, please contact the following personnel for assistance:

⁴<http://wolfware.ncsu.edu>

Lab Director

Dr. Daniel Fowler

Fox 252

(919) 515-2539

DFOWLER2@NCSU.EDU

Lab Supervisor

Ms. Marcie L. Belisle

Fox 228

(919) 513-2964

MBELISL@NCSU.EDU

Grading

Each lab is composed of a PreLab (25 points), InLab (50 points) and PostLab (25 points) assignment. There is also a Dilution Quiz and affiliated PreLab (50 and 25 points) and a final exam (100 points). The typical semester grading components are shown below.

Activity	Point value	Percentage
Prelab (12)	11 x 25 = 300	23.53%
In-Lab (11)	11 x 50 = 550	43.14%
Postlab (11)	11 x 25 = 275	21.57%
Dilution Quiz	50	3.92%
Final Exam	100	7.84%
Total	1275	100.00%

The grading scale is shown below with grades rounded to the nearest 0.01%.

%	Grade
100.00 – 97.75	A+
97.74 – 92.75	A
92.74 – 89.75	A–
89.74 – 86.75	B+

%	Grade
86.74 – 82.75	B
82.74 – 79.75	B–
79.74 – 76.75	C+
76.74 – 72.75	C

%	Grade
72.74 – 69.75	C–
69.74 – 60.00	D
< 60.00	F

Disability Resource Office

Students with disabilities who are currently registered with the **DRO** office should ensure their accommodations are activated for the lab course. Documentation from DRO is sent directly to the Lab Director, who is able to adjust testing times based upon that documentation. The Lab Director implements time adjustments for the final exam upon receipt of the DRO documentation. Students with other concerns kindly email the Lab Director regarding the issue.

Counseling and Support

NC State's Counseling Center has a number of resources available to support students' overall well-being. This includes but is not limited to academic counseling; addictive behavior counseling; career counseling; group counseling; psychiatric services; services for veterans; sexual assault & interpersonal violence support; Let's Talk drop-in informal counseling consultations; and AcademicLiveCare Telehealth counseling. Visit <https://counseling.dasa.ncsu.edu/services/>⁵ and select the "Our Services" drop down for more details on any one of these support resources available to all NCSU students.

If you are experiencing a crisis or are thinking about suicide or self harm, you deserve immediate help. Help is always available for you at NC State at (919) 515-2423, at the National Suicide Hotline at 1-800-273-8255, and at the Suicide & Crisis Lifeline which you can access by calling or texting the number 988. In the case of an emergency, please call campus police at (919) 515-3000 or 911. There is always hope.

Supporting Fellow Students in Distress:

As members of the NC State Wolfpack community, we each share a personal responsibility to express concern for one another and to ensure that this classroom and the campus as a whole remains a healthy and safe environment for learning. Occasionally, students may come across a fellow classmate whose personal behavior is concerning or worrisome, either for the classmate's well-being or oneself. When this is the case, students are encouraged to report this behavior to the NC State's Students of Concern website <https://prevention.dasa.ncsu.edu/nc-state-cares/about/>⁶. Although students can report anonymously, it is helpful when students share their contact information so the office can follow-up if needed.

Pack Essentials Program:

The Pack Essentials program offers great resources for NC State students facing unexpected hardships such as financial, food, or housing insecurity: <https://dasa.ncsu.edu/pack-essentials/>⁷. According to a recent survey of NC State students, 4% of our students were food insecure in the month prior to the survey and almost 10% had experienced housing insecurity in the past year. Students can also reach out to the Student Ombuds (<https://ombuds.dasa.ncsu.edu/>)⁸ for assistance in these and other areas.

CLASS POLICIES

Section Information

Finding **your** section of CH 202 is important. Check your registration information in MyPack a day or two before your first lab. Write down the section number, room number, and teaching assistant's name, and bring them to lab. Once in lab, make sure you are in the right place. Also, make sure you are on the official roster for the section.

Safety and Risk Assumption

⁵<https://counseling.dasa.ncsu.edu/services/>

⁶<https://prevention.dasa.ncsu.edu/nc-state-cares/about/>

⁷<https://dasa.ncsu.edu/pack-essentials/>

⁸<https://ombuds.dasa.ncsu.edu/>

Participation in chemistry laboratory courses carries an inherent risk. Students will carry out procedures where they may encounter **certain hazards related to the chemicals and equipment associated with laboratory experiments**. The risk from these hazards can be minimized by compliance with the laboratory safety rules. Students are required to complete a safety compliance agreement prior to participating in this course. A form will be available at your first lab period.

Attendance

It is **expected** that students attend laboratory during **their assigned section** each week. Students should be present for the PreLab presentation by the laboratory instructor so plan for timely arrival. **Students who are more than 10 minutes late for lab will have an unexcused absence for the laboratory session.**

Absences

Excused absences: The University requires that absences due to illness, certain university-sponsored activities, deaths in one's immediate family, and court appearances be excused. Your instructor will require documentation for any of these. The Division of Academic and Student Affairs can assist students with documentation. Please visit <http://dasa.ncsu.edu/students/absence-verification-process/>⁹. If a student knows they must miss a lab they should contact the instructor as soon as possible. If a student misses a lab due to illness or other unforeseen circumstances, they must contact the instructor within 24 hours or the absence will not be excused. Instructor contact information and procedures for addressing excused absences are available on the course Moodle site.

Unexcused absences: Unexcused absences include tardiness, dismissal for safety violations (refusal to wear eye protection, improper attire, disruptive behavior) and dismissal for failure to complete PreLab preparations (WebAssign and notebook preparation). Unexcused absences will result in the loss of all InLab assignment points, for a score of 0/50.

Consequences of absence

Excused:

1st: Arrange with Lab Director or TA to attend the same lab experiment later in the week OR receive video recordings of the missed experiment from your Lab Director and TA.

2nd: Receive an incomplete for the course.

3rd: Grade of F for course.

Unexcused:

1st: Grade of 0 for missed lab.

2nd: Grade of F for course.

- A student **MUST** attend 10 labs per semester to receive a non-failing grade in CH 202 lab.

⁹<http://dasa.ncsu.edu/students/absence-verification-process/>

- Missing a lab does not excuse you from completing the WebAssign PreLab and PostLab assignments, so be sure to complete those even when excused from attending an in-person lab meeting. You are *not* allowed to receive credit for the InLab assignment or attend a make-up lab with an *unexcused* absence.

Adverse Weather Policy

In adverse weather, if the University closes, laboratory classes are cancelled. If the University has announced that it is operating under the Adverse Weather Policy, labs are cancelled. In the event of one lab cancellation, the student's InLab grade may be composed of one fewer InLab assignment or sample data/videos may be provided. However, students are responsible for the PreLab and PostLab WebAssign exercises.

In the event of two or more lab cancellations, the lab schedule may be altered such that students are required to attend lab during a previously unscheduled week at their usual lab section time. If this is not possible because of a University holiday, the students may be required to independently perform a simulated lab assignment outside of the lab period.

Assignments

Each experiment, except the first, has three WebAssign exercises, a **PreLab** (25 points), an **InLab** (50 points), and a **PostLab** (25 points). The first lab has a **Syllabus Quiz** in lieu of the PreLab. Therefore, the total point value for each experiment is 100 points.

Syllabus Quiz: An assignment to check your knowledge of course rules.

- Due at *11:00 PM one day after your first lab meeting.*
- Covers the Introductory Material section of the CH 202 lab manual.
- The quiz is worth 25 points and there are *three submissions.*

PreLabs: Assignments that prepare you for the lab experiments.

Webassign PreLab:

- Due at *11:00 PM the day before your lab meeting.* There is no PreLab for the first lab.
- Covers safety, waste disposal, lab procedures and background theory.
- PreLabs are worth 25 points and there are *three submissions.*

The PreLab exercises are an important part of your preparation for the laboratory. The first two questions will cover safety and waste disposal information, and you must answer them correctly to be admitted to lab. Students who do not complete their WebAssign PreLab must have their instructor check the answers on their written PreLab before proceeding with lab experiments.

Written PreLab:

- Due near the *beginning of your lab,* if the WebAssign PreLab has not been completed.
- Covers safety, waste disposal, lab procedures and background theory. Questions are similar to those found in the Webassign PreLab assignment.

- Your TA may call upon you to answer questions from the written PreLab during their short PreLab presentation. Your PreLab will be turned into the TA as a record of your attendance.

InLabs: Assignments you should try to complete during your lab period.

- Due at *the end of the lab period*.
- Covers data entry, observations and checks results.
- InLabs are worth 50 points and there are up to *three submissions*.

The InLab exercises cover the same material as your Data Tables and InLab Questions, and allow your work to be graded automatically. The last question is worth 15 points and requires a short essay detailing experimental observations and/or calculations. TAs may adjust these points due to incorrect answers or issues during the lab period. Be sure to follow the rules about safety glasses and attire, perform all elements of the experiment to the best of your ability and clean up your work station when finished to avoid any reduction of points.

PostLabs: Assignments that are essentially lab reports.

- Due at *11:00 PM two days after your lab meeting* (business days, so Thursday's postlabs are due the following Monday). This will allow you time to visit the Chemistry Tutorial Center (CTC) with your questions.
- Covers observations, results, conclusions and extensions of lab concepts.
- PostLabs are worth 25 points and there are *three submissions*.
- If you missed a lab, you can get "representative data" in order to complete the PostLab assignment. Consult with your TA and the Lab Director to obtain these data.
- The Medical Information and Eye Safety Form due during the first lab period is also counted as a PostLab assignment.
- Your lowest PostLab score during the semester is dropped from your grade calculation.

Dilution Quiz:

Overview: During a week with a short experiment, typically Lab 3, students will be asked to complete a Dilution Quiz. This quiz covers how to accurately prepare solutions in the lab from either a solid reagent or by dilution of a stock solution, and components of Beer's Law. This will require knowledge of proper use of the following—an analytical balance, a serological pipet and a volumetric flask. In total, the Dilution Quiz will count equal to a regular PreLab and InLab experiment, i.e., 75 points total. The Dilution Quiz PreLab (25 points) will be due on WebAssign at 11:00 PM the night before your lab meeting for the quiz. The quiz itself is worth 50 points.

Late WebAssign PreLab and PostLab Assignments:

Students with university-accepted documentation may receive extensions on PreLab and PostLab assignments. Students without documentation may have one full point extension per semester. Additional extensions on PreLabs and PostLabs will result in 5-point penalties per assignment. Excessive extensions are not allowed.

Late Dilution Quiz:

Students with University-accepted documentation who are absent the week of the Dilution Quiz may take the quiz during a different lab session in which there is time available at the end of the lab. Students with an unexcused absence may also complete the Dilution Quiz for 90% credit when lab time permits.

Honor Code

Duplication of another person's lab assignment is academic dishonesty and will be treated as such. This includes getting data from another student before performing the lab, typing unauthorized lab data into WebAssign from a non-lab location, or looking up information from cheating websites and entering it into WebAssign. Students are expected to perform **all** elements of the experiment, collect their own data, and input that data and any subsequent calculations/observations into WebAssign. The grade for an experiment in which academic dishonesty has occurred is recorded as a zero and reported in a manner consistent with the University's policy on academic dishonesty. The University's Code of Student Conduct can be found at <http://policies.ncsu.edu/policy/pol-11-35-01>¹⁰.

All members of the University community: students, faculty, and staff, share the responsibility and authority to challenge and make known to the appropriate authority acts of apparent academic dishonesty.

¹⁰<http://policies.ncsu.edu/policy/pol-11-35-01>

Each Week When You Come to Lab

- Be ready to stand or walk for the duration of the lab period. Proper levels of sleep, nutrition, and hydration prior to the start of lab are recommended.
- Dress appropriately.
- Be on time!
- Do not enter the lab until your instructor invites you into the lab.
- Store your backpacks and jackets, etc., in the cubbies under the white boards, away from traffic patterns and chemicals.
- Always bring your lab worksheet, a pen, and your calculator.

CHECK-IN

During check-in for your CH 202 lab, the following things will happen. Make sure you pay attention, some of them are very important.

- 1 Roll will be taken. **Make sure you are in the right section**, or your work will go to two different instructors. One will get your lab work and the other will see your WebAssign work. If you are not sure you are in the right place, check with your teaching assistant or the lab instructor or the lab director. **Once you are in a section, do not switch out of it without the permission of the lab coordinator.** If you do, you risk having some of your grades lost.
- 2 You will be issued safety glasses. **Safety glasses are to be worn at all times while you are in lab, over your regular glasses if you wear them.** Wearing contact lenses in the lab is *strongly* discouraged. If you wear them, you will be asked to sign a waiver stating that you understand the dangers in doing so, and will not hold the University liable if you are injured as a result of wearing contact lenses in the lab.
- 3 You will be shown the location of safety devices and how to operate them. These devices will include eyewashes, safety showers, drench hoses, and fire extinguishers. Safety policies in the lab will be explained, and you will be asked to sign a form saying you understand the rules and agree to abide by them.
- 4 You will be shown the evacuation route for a fire. Make sure you understand how to exit the building safely. **In a fire evacuation, it is important to get well away from the building.**
- 5 You will be asked to fill out a Medical Information and Eye Safety Form on WebAssign. This form acknowledges that there is a certain amount of risk inherent in working in a lab with chemicals. The form will also ask you to acknowledge the additional possible risk inherent in wearing contact lenses in the lab.
- 6 Policies regarding grading and attendance will be explained. Make sure you pay attention, as your teaching assistant may have specific policies for the sections she/he teaches, e.g. point penalties if you leave your workspace a mess, your lab work is illegible, etc.