

VC211 TYPICAL GENERAL CHEMISTRY LABORATORY SYLLABUS

“Read & understand this syllabus thoroughly including safety warnings & instructions. If you violate the safety rules you may be dismissed from the lab. Please be responsible to yourself & others”

“Syllabus subject to change at any time, please confirm all schedules with JI undergraduate office or on Canvas”

Prof. Thomas Hamade

Course Description:

Chemistry Laboratory VC211 is to foster critical thinking that allows students to design, perform, and interpret experiments. In addition, the student acquires technical skills that are required for further advancement in experimental sciences. An ability to collect and analyze data is developed, so the emphasis of the course is to provide a quantitative as well as a qualitative understanding of the basic concepts of chemistry. This is accomplished by demonstrating that chemical principles are derived from experimental data. The goal is to provide students both with a more accurate picture of the scientific process and also with skills that are relevant to solving real life problems. Chemistry VC211 is 1-credit and can be elected with, or following, General Chemistry.

In Chemistry Laboratory VC211, you will attend experimental lectures, do experiment and participate in discussion for 3 hours per week; the schedule is listed below. Students will do some experiments individually and finish some of the course work as a member of a team. Student groups each explore the same problem with each group using different reagents and/or conditions. Student groups address questions which require them to organize the laboratory data. Group answers are presented in discussion during laboratory hours.

The entire class is divided into **10 class sections** (1 lab/section) and a TA is assigned to lead each section. Each section will be divided into groups of 3-5 **students per group**. Each group conducts experiments jointly or individually as instructed. Starting the second week, each class section assembles in the laboratory area in the Chemistry Building **A**, second floor, according to the schedule posted on CANVAS and as shown by this Syllabus. The entire students will meet once for 1 ½ hours during the **first week** for introduction lecture by Dr. Hamade. There after students during the semester, will conduct a total of **5 assigned laboratory experiments, one experiment per week** (see class schedule at end of this syllabus).

During the 7th week there is no class and no laboratory experiments and students should spend the time preparing for the following week (8th week) their final reports and final presentations.

During the 8th week: each team is required to give 10-15 minutes presentation on one of the select experiments (E1-E5) that the TA will designate randomly. Students' PPT should include some photos documenting their experimental work. **In addition students should give the TA, immediately before presenting their PPT, a short team efforts report on experimental design to analyze Ca in commercial products.** This year the students will investigate on their own and propose experimental design and analysis of Ca content in common commercial products such as food, consumable products, or pharmaceutical vitamins. The students will rely on their work experience with experiments 1 & 3. The report should include abstract, introduction, theory, experimental setup, procedure, what data to measure (in suppliers supplementary products), & expected results. This design report should be condensed & similar to the depicted reports of any of their experiments and no more than 5 pages (or as posted by the announcements and instructions on Canvas or laboratory manual).

During the 9th week: is the final examination week.

Each student must check CANVAS very frequently to obtain the entire course materials, laboratory instructions, safety instructions, assigned experiments, announcements, sections assignment, grading, and detailed schedule & grouping.

The format of the course is organized into **4 segments:**

Segment 1, Week 1 Lecture: The students will attend once the 1 ½ hour lecture, introduction to chemistry laboratory, by Dr. Hamade, date **Wednesday (Feb. 22), 10:00AM-12:00 at Dong Shangyuan building Room D500**, first floor. Check CANVAS for confirmation of the schedule. After this lecture you will have no other scheduled meeting during the first week.

Segment 2: Week 2 - Week 6, Laboratory Work: Chemistry Building A

- a. Students of each section will assemble on scheduled time once a week in Lab **Room A230**, and attend a 20 minutes lecture about today's experiment by the lecturer. See Syllabus last page and CANVAS under "files" for your assigned section. Only appear at your assigned section date and time. For example Section 3 & 4 both will assemble in Chemistry A room **A230** at 8:00AM sharp (no late arrival) for short lecture on Thursday the second week to sixth week of classes. After 20 minutes of short lecture, Section 3 remains in the same Lab room **A230** while Section 4 will assemble in adjacent Lab room **A234** (in couple of minutes). Caution, check Canvas latest lab/class schedule.
- b. Immediately after assembly in **Room A230 or Room A234** (see Canvas and Syllabus for your assigned group & section), TA's will take attendance using attendance sheet and give 10-20 minutes orientation and instructions on today's assigned experiment. Each group will give 3-5 minutes discussion session on their last week experiment experience and hands in the report for the previous week experiment. Each group can discuss the Abstract of their previous week experiment and pose couple of questions to other groups. One student of each group leads the discussion & alternated weekly among each group so each student will give at least one discussion session per experiment.
- c. Each group will assemble by their assigned laboratory bench area and start conducting the experimental work for no later than 2 ½ hours. While at the start of the lab, the TA will examine the uncompleted and typed or handwritten **After-Lab Report (ALR)** that includes a completed **Pre-Lab Exercises (PLE)** section of this week experiment. Even for a typed ALR, a copy of handwritten LAB PROCEDURE must be taken to the lab before start of the lab session. Each student prepares ahead of class all parts of the ALR as instructed later in this syllabus that includes the PLE by reading and following the laboratory manual for the experiment (posted on Canvas) and answering questions prior to each laboratory to make sure that the student is well aware and familiar with the entire experiment. **The PLE and the experimental procedure must be handwritten and must be a duplicate copy of the version on Canvas. However, the remaining parts such as background, introduction, & theory should be your own words as much as possible. Further report instructions is in the laboratory manual posted on Canvas.**
- d. While conducting the experimental work, each student & group must complete the recording of their experimental results on their lab report and on a TA's provided **datasheet** (sample datasheets are given in the manual at the end of each experiment). **Make sure you turn in the datasheet to the TA after you copy the data for yourself, before leaving the laboratory.** Following the completion of each laboratory, the students also complete the handwriting of their own **Post-Lab Questions (PLQ)**, based on lab manual instructions for the conducted experiment, to analyze their experimental results and groups communicate their findings during discussion. TA will check the data and have brief discussion before leaving the laboratory and may ask a student or a group to repeat suspicious or incorrect experimental results. **The PLE & PLQ must be turned in the following week as parts of the After-Lab Report (ALR) for each experiment or as announced by the Instructor/TA.**
- e. The remaining half hour of the lab session and before dismissing the students, each student is responsible for general cleaning of their bench work area (including cleaning the glassware). Then 2groups/week will alternate on a weekly basis to do more thorough cleaning (sink, floor, etc.) of the entire laboratory immediately before leaving the laboratory.

Segment 3, Week 8 (Week 7 no class & no lab work): Students assemble inside their chemistry lab or as instructed by Canvas announcement on their normal section schedule, to give **PPT presentation** on their work experience with one randomly select experiment (TA assigns randomly any of E1-E5), and **hand-in two reports**, last week **Experiment 5 report** and the **experimental design report** about their special project on chemical analysis of Ca content in commercial products.

Segment 4, Tentative: Week 9, Final Exam: Tuesday April 18th. Closed books & notes & no programmable calculator can be used. Check CANVAS for final exam schedule & location.

Short Lectures on Experiments: The short lectures (20 min.) occur prior to the start of a new topic and experiment. Refer to the course schedule (below) for specific dates and topics (refer to Segment 2 on first page of Syllabus).

Discussions: Refer to the discussion information provided in the lab manual for information regarding discussions such as absence, late arrival and grading. Discussions occur after the completion of an experiment and before the start of a new topic and experiment.

Final Exam: There will be one term exam in the **9th week** (exam rooms and time will be assigned, check CANVAS). The exam tests your understanding (as opposed to memorization) of the topics and experimental results.

Office Hours Instructor / TA's :

Lecturer	Room - Location	Office Hours	Time	Contact
Prof. Thomas Hamade	Chemistry Bldg A Rooms A230 or A234	16:30-17:30 W and	During W, TH lab sessions between 19:00-20:30	+86-21-34207215
10 TAs: See CANVAS & LAST PAGE	See CANVAS or TA	See CANVAS or TA	See CANVAS or TA	See end of Syllabus

Required Course Materials: You must wear safety goggles through all your experimental work and whenever you are inside the laboratory and handling any chemicals. For calculation in laboratory, you will need a scientific calculator. However, programmable calculators are not allowed on the exams.

Lab Manual (posted on CANVAS under "Resource"): Based on edited version by Professor Hamade of Collaborative Investigations in Chemistry, Konigsberg Kerner & Penner-Hahn, Hayden McNeil; Hands on Chemistry Laboratory Manual, 1st Ed., Jeffrey A. Paradis, Kristen Spatz, McGraw Hill Higher Education Press, 2006.

Course Methods: You will conduct "inquiry" experiments where you are *not* expected to know the outcome in advance. A major goal of this lab course is to facilitate development of your qualitative reasoning skills. During this laboratory centered course you will be exposed to qualitative reasoning skills that scientists use when solving problems such as formulating hypothesis, organizing data, making inferences from data, and designing experiments. You will do some of your experiments individually and some in a group where you will combine and compare data, instead of competing with classmates for the "right" answer. In general, you will get no credit for memorizing "right" answers. Rather, your goal is to learn techniques for analyzing and interpreting data. A key objective is for you to learn *how* to approach a particular question (what data to measure, what chemicals should you use, etc.).

You don't need lab experience to do well in Chemistry Laboratory VC211. You *do* have to: prepare in advance for the labs; attend your laboratory section and work conscientiously and safely during the period; think about the experiments that you have done; and prepare in advance for the discussion. If each student do these things, then most of the students should be able to get at least a B grade for the course.

In case of illness or other emergency: Sometimes (rarely) students miss the exam because of illness or another emergency. If you are ill for the exam, e-mail your lecturer immediately and ask the Health Service or your M.D. for a note in confirmation.

Absence and Make-ups: Since the course is cumulative it is important that you do not miss a lab. Occasionally, circumstances will arise that force you to miss a lab. During spring term it may not be possible to schedule a make-up outside the normally scheduled lab hours. If you miss the last scheduled lab prior to check out, it will only be possible to schedule a make-up during the next year.

Honor Code Policy: Experimental reports must be completed independently unless otherwise instructed. However students are encouraged to discuss their experimental experience but not copy from each other unless instructed by the TA to copy some of the experimental results. Exams must be worked independently and they are closed books & closed notes (not allowed: dictionaries, digital devices, computers, course materials, notes and textbooks, allowed: standard non-programmable calculator). Follow the instructions in the laboratory manual and as posted on Canvas. You are not permitted to download any document without the authorization of the instructor, however, you are allowed to hand write the information and instructions you need to complete your lab reports and assignments. You are not allowed to make copies of any course materials without the written permission of the original publisher. You must follow JI policy on honor code and review consequences for violation of such policy. Refer to your student handbook for further honor code policies.

Grading Policy: Your grade will be determined based on your performance in the laboratory, the final exam, class attendance and discussion. The weighted points are assigned as follows:

GRADING GUIDE	MAX. POINTS	MAX. % GRADE
5 EXPERIMENTS 150 POINTS EACH AS FOLLOWING: a. PLE: PRE-LAB EXERCISES 30 POINTS b. PLQ: POST-LAB & DATA SHEET 40 POINTS c. EXPT'L OPERATION LAB WORK 50 POINTS <i>"TA gives grade at end of experiment"</i> d. ALR: AFTER-LAB REPORT 30 POINTS <i>(based on quality, discussion & analysis)</i>	750	75%
EXPERIMENTAL DESIGN REPORT: Relies on experiments 1 & 3 analyzing calcium (Ca) in commercial products	50	5%
FINAL EXAM: CLOSED BOOKS & NOTES	150	15%
FINAL PPT ON SELECT E1-E5 EXPERIMENT: Each group to present one assigned experiment during the 8th week of lab. You must document your experimental work with few photos to include in your reports and presentation.	50	5%
TOTAL	1000	100%

Lab Report Information and Turn in directions: Detailed instructions to below sections are on CANVAS for VC211, under "Files/ Lab Manual & Experiments". Students must underline and highlight titles & subtitles, i.e.

"**Introduction**", "**Theory**", "**Procedure**", "**Pre-Lab Exercises (PLE)**", Post-Lab Questions (PLQ), etc.

- A) Each student will be required to turn in for each experiment and **at the start of each experiment a printed & handwritten (combination as instructed below) individual comprehensive report** known as **After-Lab Report (ALR)**. The **ALR** will be initially incomplete because you still have to record your experimental data, notes and answering questions. The following **ALR** report sections should be completed as instructed below with only few clearly shown exceptions. TA inspects the **ALR** prior to the start of the experiment (see schedule in the next table):
- 1. Typed Cover page** with experiment title, date, Group number, section number, your Chinese & Pinyin name, student ID, email address, and telephone number. Must also include under your name the names of your teammates in Chinese & Pinyin. If any of such information is missing then you may not be graded for the **ALR**.
 - 2. Typed brief summary using your own words of the Introduction, Experimental Background, and Theory:** similar to the lab manual but use your own version as much as possible. **Then handwrite Experimental Procedure section by copying exactly the exactly the procedure from the manual.** All these sections of the report due upon entering the lab before conducting the same experiment. Give clear concise theory and procedure. Do not copy others ALR report or you may be in violation of honor code.
 - 3. Pre-Lab Exercise (PLE): Typed or handwritten, ok.** Answer and complete all sections including providing data tables, as instructed in the lab manual for the PLE prior to entering the lab session. **TA will check the PLE and you cannot start any lab work if PLE is not completed.**

4. **Post-Lab Questions (PLQ): Typed or handwritten, ok.** Must be completed and checked by the TA at the conclusion of each experiment before dismissal of the lab session. Ahead of lab session prepare all relevant sections including providing data tables, as instructed in the lab manual for the PLQ.
5. **TA-s Datasheet:** Report all the experimental results on your report and on the provided TA's datasheet. Have the TA check your data results before dismissal of the lab session. You must have correct record, reasonable result and keep tidy & safe. Gather all above report sections and attach to the next section.
6. **Discussion of results, analysis, conclusions and recommendations:** These sections must be completed at the start of the next week experiment except for the last E5 experiment it will be due the same day you conduct the experiment. ALR should include data processing, analysis of results, discussion & correlation to theory, conclusions & recommendations (also complete exercise questions).
7. **After-Lab Report (ALR):** All above sections are to be submitted to the TA as a final ALR report for each experiment. This final ALR report for each experiment is due the following week prior to the start of the next experiment except E5 will be due immediately after completing the experiment (the same day).

B) Laboratory discussion, Final PPT on randomly selected experiment (TA assigns from E1-E5), and Final Report Experimental Design for Ca –analysis: See below table for requirements & due dates.

For maximum points on the ALR, you need to respond to all directives and questions within the experiment itself and include specific examples from the data to support your conclusions. Check CANVAS for report formats and guidelines for the report contents and data analysis. Further guidelines are also posted on CANVAS on how to prepare PPT presentation on select experiments (E1-E5) and writing a technical report that will help you prepare the experimental design report on Ca containing products. The following table has specific instructions and due dates of reports and assignments:

Summary of	When? As assigned	Group vs. Individually	Where	Comments
Cover page, Introd., Expt'l Background, Theory, Procedure & PLE	Due at start of new experiment	Individually. Procedure must be handwritten exactly by copying from manual	Hand to TA as entering lab to be checked in lab then turn with ALR	Must do prior to entering the lab to be familiar with entire experiment
Post-Lab Questions (PLQ) & Data sheet	Due upon completion of experiment or as announced	Individually	Hand to TA after completing experiment to be checked in lab then turn with ALR	- Don't forget to copy the summary of your collected data into the TA's datasheet before leaving lab
After-Lab Report (ALR)	The completed ALR due in 1 week at start of the next experiment or as announced by instructor	Must be written individually. Only E5 is written by the group	Hand to TA before the next experiment begins Group E5 report – before leaving lab same day	- Don't forget to copy the data to TA before leaving lab - Analyze data and make conclusions! E5 due same day after conducting the experiment
Discussion (Presentation+ Abstracts) 5 min/group	Discussion of last week experiment	Group – One student leads the discussion per Group (alternating)	In lab before the next experiment begins. E5 same day after conducting the experiment.	Share previous lab experience with others (in lab) & may ask few questions. E5 discussion same day after experiment.
Final PPT on randomly selected experiment by the TA (one of E1-E5)	Given by each group after completion of all experiments, during the 8 th week or as assigned.	All Group members participate in PPT.	Hand in copy of PPT to TA immediately after presentation (before the final exam).	Follow CANVAS for PPT guidelines & instructions
Final REPORT on Experimental Design of Ca – analysis	Written report due upon completion of all experiments (last week of Lab).	Reports due Individually.	Hand to TA immediately before making the PPT presentation in the 8 th week.	Follow instructions in syllabus and CANVAS on report guidelines & instructions

VC211 SPRING 2017 LABORATORY COURSE SCHEDULE
TENTATIVE SCHEDULE SUBJECT TO CHANGE

Class is divided into 10 sections, each section to report to the labs according to the following schedule:

S1/S2: Wed. 18:00-21:00
 S3/S4: Thur. 18:00-21:00
 S5/S6: Frid. 8:00-11:00
 S7/S8: Frid. 13:00-16:00
 S9/S10: Frid. 18:00-21:00

WK	Dates	Experiment Topics: Lab dates W, Th, F	Lab Manual Pages
1	Wed. Feb. 22	Introduction and Safety Rules – one lecture, no labs 10:00AM-12:00, Dong Shangyuan, Room D500	MANDATORY LECTURE
2	Mar. 1-3	E1: Acids and Bases 1.Relative Acidity/Basicity of Common Household Products 2. Acid-Base Titration of vinegar.	PLE1, PLQ1 DUE
3	Mar. 8-10	E2: Properties of Buffers 1.Strong and Weak acids 2. Properties of a buffer 3.Designing a Buffer 4.Determination of Buffer Capacity	- ALR1 E1 REPORT DUE - PLE2, PLQ2 DUE
4	Mar 15-17	E3: Spectrophotometric Analysis 1.Adjusting the Spectrophotometer 2. Preparation of Standard Solutions 3.Making the Calibration curve Using the Standard Solutions 4. Determination of Unknown Concentration.	- ALR2 E2 REPORT DUE - PLE3, PLQ3 DUE
5	Mar 22-24	E4(I)&E4(II): Introduction to Kinetics, Determining the Rate Law 1.Effect of Changing the Concentration of Reactants 2. Effect of Changing the Temperature 3.Effect of Adding a Catalyst 4. Designing Reactions to Determining the Reaction Order.	- ALR3 E3 REPORT DUE - PLE4(A&B), PLQ4(A&B) DUE
6	Mar. 29- 31	E5: Precipitation and Water Purity 1. What is the Precipitate? 2. Precipitation Studies A. Is Precipitation Predictable? 3. Concentration and precipitation 4. Solvent Pollution and Precipitation. Individual reports due, each student must submit one group report immediately after conducting the experiment.	-ALR4 E4(A&B) REPORT DUE - PLE5, PLQ5 DUE - ALR5 E5 TEAM REPORT DUE
7	Apr. 3-9	NO LAB (no labs and no VC211 class meeting) / Prepare for next week your final report on Ca analysis and final presentation on select experiment.	STUDY & ASSIGNMENTS PREPARATION
8	Apr 12-14	Final PPT presentation on select experiment & Final Report on Ca analysis in Ca-commercial products. Students/Groups to appear either on their labs or as scheduled by your TA on Canvas.	- FINAL PPT DUE - FINAL REPORT EXPT. DESIGN: Ca- ANALYSIS DUE
9	Tue. Apr. 18	Final Exam: Time & location see CANVAS	Test schedule may change

“For TA-s only (not students): lab orientation on each experiment for 5 weeks starting the second week at 1:00PM-4PM every Wed.”