Department of Chemistry and Biochemistry

# Chemistry 1144 • Fall 2025 • Lecture Schedule

**Text**: *"Chemistry" by J. Overby, 15th ed, McGraw-Hill, 2025*

| Dates | Chapter No. | Topics |
|---|---|---|
| Aug 27, Sep 3 | 11 | Liquids; Solids; Intermolecular Forces |
| Sep 8, 10, 15 | 12 | Solutions |
| Sep 17, 29, Oct 6 | 13 | Kinetics |
| Oct 8, Oct 14 | 14 | Equilibrium |
| Oct 15 | | **EXAMINATION # 1**, covering Chapters 11-13 |
| Oct 22 | 14 | Equilibrium |
| Oct 24, 27 | 15 | Acids and Bases |
| Oct 29, Nov 3 | 15/16 | Acid-Base Equilibria |
| Nov 5, Nov 10 | 16 | Solubility and Complex Ion Equilibria |
| Nov 12 | 17 | Thermodynamics |
| Nov 17 | | **EXAMINATION # 2**, covering Chapters 14-16 (no solubility) |
| Nov 19, 24 | 17 | Thermodynamics |
| Nov 26, Dec 1, Dec 3 | 18 | Electrochemistry |
| Dec 8 | 23 | Transition Metals and Metal Complexes |
| Dec 10 | | **EXAMINATION # 3**, covering Chapters 16-18 |
| Dec 15 | 23 | Transition Metals and Metal Complexes |

**Point distribution:** Hour Exams: 45%; Homework (Aleks): 10%; Quizzes: 10%; Final (cumulative): 35%.

**There is no make-up for any missed midterm exam.**

**Deadlines for the homework:**
35% of pie chart must be complete by 11:59 pm on Oct 13
60% of pie chart must be complete by 11:59 pm on Nov 10
85% of pie chart must be complete by 11:59 pm on Dec 8
100% of pie chart must be complete by 11:59 pm on Dec 16

**Homework website:** www.aleks.com **Class Key:** VXMEG-3PV6N

Financial Aid Access Code for Aleks: 7AFF8-0E980-F9D3C-AAC9F

**Lecturer:** Michael V. Mirkin; Remsen Hall # 120E, phone: (718) 997-4111, mmirkin@qc.cuny.edu

**Office hours:** Wednesday 11:05 AM – 12:05 PM and by appointment.

**A grade of C or better is required to register for the next Chemistry course.**

***W and WU Grade policy:*** The drop deadline (w or change to p/nc) has been changed from the covid-era last day of class to Nov. 6, 2025. Students who do not officially withdraw by Nov. 6 (and receive a W grade) but stop attending classes and do not participate in any way after the withdrawal date will be given a WU grade.

Any participation in class (i.e. lab work, homework, taking quizzes and exams) after the withdrawal date will disqualify you from receiving the WU grade, and you will be given the appropriate letter grade.

Queens College, CUNY
Professor Edward G. Look

Department of Chemistry and Biochemistry
**Fall 2025**

# CHEM 113.1- General Chemistry I Laboratory

Section **7**- **Thursdays**, 9:10 AM – 12:00 PM, 156 RE

Section **8**- **Thursdays**, 1:40 AM – 4:30 PM, 156 RE

**Office Hour:** Wednesdays
11:00 AM, 120D Remsen

# Syllabus

## I. Course Description

A. Course format is *hybrid* (some work is available/done online)
B. Course coordinator- Prof. Sheila Sanders (ssanders@qc.cuny.edu)
C. However, all lab-related questions are to be directed to your instructor

## II. General Laboratory Rules

A. **Pre- or Corequisite course-** Chem 113.4
B. **Always** wear safety goggles and contact lenses **not** allowed.
C. No short pants, skirts, nor open toe shoes are allowed, and tie back long hair.
D. **NO** food, beverages, gum, horseplay, ***nor*** stunt experiments allowed.
E. No coats, jackets, bags, or backpacks are allowed in lab; use the hallway lockers.
F. No computer nor tablet nor cell phone use in the laboratory during class activities.
G. Therefore, **PRINT OUT** EACH DAY'S PROCEDURES FOR USE IN LAB.
H. Clean up your area after each lab session.
J. If you withdraw for any reason, you must notify your lecture instructor in order to stay in the lecture. You must check-out ASAP or there will be a monetary fine as listed in the stockroom.

## III. Laboratory Manual: posted on **Brightspace**

## IV. Laboratory Requirements:

A. **Eye protection must** be worn at all times in the lab; penalty for failure to do so is **dismissal** from that day's lab and/or 0 (zero) points for the day.
B. *If you drop the course, you **must** check-out ASAP!* Otherwise, you do so at the normal time on the final check-out day. If you do not check-out you will be charged a fine as listed in the Stockroom. You must notify your lecture instructor in order to stay in the lecture.
C. You must watch the American Chemical Society lab safety video during the first lab. If missed, watch it on Brightspace or the Chemistry Stockroom website (*see §VII below*) ASAP.
D. You **must** have safety goggles, a lab coat and a combination lock; ***we** will issue these to you*.
E. You must have an *approved* laboratory notebook with *carbonless copy pages* (for example, ISBN **978-1-930882-74-4** or **978-1-617319-14-3**; there are other acceptable ones), *and use it*; **do not take any notes on scrap paper or other things**. Either is available through the QC online bookstore.
F. You will need a scientific calculator and a USB flash drive or maybe a SD card.
G. You must read the day's experiment *before* coming to lab, and bring a hardcopy with you.

## V. Attendance

A. Attendance is required. There is NO make-up for any missed laboratory experiment. A missed lab will receive no credit. If you are absent, then you cannot submit a lab report for that day.
B. Lateness by ***more than* 15 min.** is counted as an absence.
C. For holidays only official CUNY free days are acceptable. Emergency or religious observances must be approved by the instructor, who reserves the right to approve or reject your request. If not approved, it will result in loss of the points for that lab.
D. In case of excused absence, a quiz OR the final quiz score will be used for the missed lab. Any further absences will result in ZERO (0) for the lab. For more than 2 missed reports (2 zeros), you will NOT be allowed to take the lab final. You should withdraw on time or be issued **WU**.

## VI. Grading

A. **Each report** is graded on 100 points, distributed as follows: *Heading and Abstract*, 12 points; *Introduction*, 20 pts.; *Experimental,* 20 pts.; *Results and Discussion*, 40 pts., and *Conclusion*, 8 pts. Each is due at the start of tha next lab. Reports *cannot* be accepted *more than **14*** days after the experiment or after two lab classes. These are 60% of your lab grade and graded for both scientific content and adherence to the format described below. If you have no absences, your lowest report score will be dropped. There are ***absolutely no makeups* for missed labs.**

B. **Prelab *Quizzes***- these are quizzes you need to take on Brightspace *before* you come to lab and are due 10 minutes before lab class starts; they will not be accepted *after* the lab is over. They may cover the previous and/or the experiment for that day. If prelab question material wasn't covered in the lecture class, utilize office hours or better, the discussion board on Brightspace to get help with prelab activity. No excuses will be accepted. Prelab quizzes are 10% of your lab grade.

C. **Prelab Write-Ups-** you must write in your notebook at home before you come to lab the theory and procedure of the day's lab. You may as well write the full instroduction and experimental sections for your report here instead, so that when you write the report after the lab, you can just copy these two sections into your report. Prelab notebook write-ups are 10% of your lab grade.

D. **Laboratory Performance** is to be judged by the instructor and consists of- **Safety:** if you do not work safely, points will be deducted at the discretion of the instructor. This includes not **wearing eye protection and lab coat at all times while in the lab**. Failure to do so entails a zero (0) for the day and/or ejected from that day's lab. Again, no makeups are possible. **Independence:** *i.e.*, your ability to work independently without having to depend on others, especially the instructor. **Efficiency and Effectiveness:** This is how quickly you can properly carry out your experiment and the quality of your results.

E. The reports, prelab quizzes, prelab write-ups and performance together are 85% of your total grade.

F. A written comprehensive lab final quiz will be administered on the last lab day. This is Part B and is 15% of the total grade. It will cover lab safety, and contents covered during the entire semester.

G. **W and WU Grade policy:**

1. **THE DEADLINE for CHANGE TO P/NC IS 11/3/5 the DEADLINE for W IS 11/6/25**. Students who do not officially withdraw by 11/6/25 (and receive a W grade) but stop attending classes and do not participate in any way after the withdrawal date will be given a WU grade.
2. Any participation in class (*i.e.*, lab work, homework, quizzes and exams) after withdrawal date disqualifies you from receiving the WU grade, and you will be given an appropriate letter grade.

H. **INC grade**: There is **no** INC grade for this course. If your grade is suffering due to absences in the lab, you are expected to withdraw on time and re-enroll for the next semester

J. CUNY/QC grading scale:

| Grade | Score | Numerical value / Definition |
|---|---|---|
| A+ | 97-100 | 4.0 |
| A | 93-96 | 4.0 |
| A- | 90-92 | 3.7 |
| B+ | 87-89 | 3.3 |
| B | 83-86 | 3.0 |
| B- | 80-82 | 2.7 |
| C+ | 77-79 | 2.3 |
| C | 73-76 | 2.0 |
| C- | 70-72 | 1.7 |
| D+ | 67-69 | 1.3 |
| D | 63-66 | 1.0 |
| D- | 60-66 | 0.7 (Grade of D- is the lowest passing grade in the undergraduate division) |
| F | 0-59 | 0.0 |

## VII. Laboratory Reports

A. A report is required for ***EACH*** experiment.
B. Lab reports are always due **next lab session**, for any lab. **Late reports** will receive a severe reduction in points, as determined by your instructor and ***not* accepted after 14 days or two lab sessions**.
C. All lab reports must be uploaded to Brightspace *and* submitted as a printed, not handwritten hardcopy by the start of the next lab.
D. **Format:**
   1. ***Heading:*** Always be sure ***your name, section number, experiment title AND date the experiment was performed*** is included- **DO *NOT use* a cover or title page**.
   2. ***Abstract:*** This is one short paragraph summarizing your entire paper. Write this last; just make sure you write it between the *Heading* and the *Introduction*.
   3 ***Introduction:*** Explain *concisely* the chemistry of the experiment, including any equations and other scientific and mathematical explanations; *i.e.*, the **theory**. No fluff, please.
   4. ***Experimental:*** A **concise** but complete summary of the steps, materials, and apparatus of the experiment.
   5. ***Data:*** Include your *original data*; *i.e.*, the "carbon copy" of measurements or observations you directly recorded during the experiment, signed by the instructor stapled to back of report. However, rewritten data *are to be included in the Data section of the report*.
   6. ***Results and Discussion:*** Show all work; but if there is a repetitive calculation, you need only show the equation and its use only once; after that, just list the answer. Include here also any **graphs** or **diagrams** that may be required. State whether results were good or bad, and reasons why, what may have affected them, any problems with the experiment, and what you learned from this experiment. Be brief but complete. There may be questions you must answer, or blanks from the manual to fill; work them into your discussion.
   7. ***Conclusion:*** Summarize your final conclusions from *Results and Discussion* section along with the results and very basically what you did. (Sum up the *Experimental and Results and Discussion* is where you actually draw your important conclusions.)
E. Reports will be graded for conformance to the above-described format and checked for plagiarism. *Introduction*, *results & discussion*, and *conclusions* are expected to be in your own words.

## VII. Safety

A. ***First*, you must sign and submit the safety contract.**
B. **You must watch the ACS safety video** regardless of whether you have seen it before; if you miss it, you must watch in on Brightspace or the Chemistry Stockroom website ASAP; you will **need it for the safety quiz**.
C. **Always** wear safety goggles, lab coat, and gloves
D. Wear long pants or skirts, closed toe shoes, and tie back long hair
E. Eating, drinking, gum chewing, horseplay, and stunt experiments are not allowed
F. Contact lenses are not allowed; wear glasses to lab instead
G. Safety shower, fire extinguisher, and eyewash locations must be noted
H. Never leave a flame unatended
J. No coats, jackets, bags, or backpacks are allowed in lab; use the hallway lockers
K. Chemical waste protocols must be observed, *e.g.*, proper waste disposal as per your instructor, in designated containers; if in doubt ***ask!***
L. **Points will be deducted for unsafe practices or violations of safety protocols; you may be ejected from lab and receive *zero* (0) for the day's work.** At the instructor's discretion, points may be assessed against your grade for (*see §IV above*): eye protection violation, violations of waste protocols, food or drink (candy, gum, even drinking water included) brought into lab, not cleaning your station after you are done for the day

## VIII. Code of Conduct

### A. Plagiarism

1. Plagiarism or any other form of cheating is not tolerated and will be severely punished by point and other penalties and/or referral to the Chairman and the Dean; any assignment involved will receive a grade of zero (0). Failure to properly cite a source may also be considered plagiarism.
2. **CUNY Policy on Academic Integrity:** Academic dishonesty is prohibited in The City University of New York and is punishable by penalties, including failing grades, suspension, and expulsion as provided at: CUNY academic integrity policy. Please read this document, paying careful attention to the sections on plagiarism and Internet plagiarism. If you are not sure how to cite work you have found on the internet, please review the APA Guidelines provided by the Purdue OWL.

B. **Inappropriate behavior**, *e.g.*, horseplay or off-color language, oral or written, will not be tolerated and may lead to expulsion from class and a zero if during an examination or assignment.

C. **CUNY Legal Notice on Live Recordings:**

When applicable: "Students who participate in this class with their camera on or use a profile image are agreeing to have their video or image recorded solely for the purpose of creating a record for students enrolled in the class to refer to, including those enrolled students who are unable to attend live. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live."

## IX. Schedule of Experiments:

| Lab # | Date | Experiment |
|---|---|---|
| 1 | 8/28 | Check-in, Syllabus, and Safety |
| 2 | 9/4 | Density |
| 3 | 9/11 | Hydrate |
| 4 | 9/18 | Precipitation |
| 5 | 9/25 | Fe-$CuSO_4$ |
| 6 | 10/9 | Qualitative Redox |
| 7 | 10/16 | Copper Cycle |
| 8 | 10/23 | Molar Mass of a Metal |
| 9 | 10/30 | Solutions |
| 10 | 11/6 | Titrations – Part I |
| 11 | 11/13 | Titrations – Part II |
| 12 | 11/20 | Calorimetry |
| 13 | 12/4 | Neutralization |
| 14 | 12/11 | Check-out, Last day reports accepted |
| 15 | 12/18 | **Final Lab Quiz** |

**X. If You Might Have COVID-19 or RSV or the flu:**
If you even just believe you may have COVID-19 (or RSV or the flu), ***please stay home and do not come to campus***, inform Mr. Alejandro Mendez at alejandro.mendez@qc.cuny.edu and me, and we can work with you with respect to the course material.

## XI. Accomodations

A. **Students with learning disabilities-** You may register with the Office of Special Services by e-mailing QC.SPSV@qc.cuny.edu. For more information- website: https://www.qc.cuny.edu/sp/
B. **Counseling-** Counseling Services are available to any Queens College student. This office assists with personal concerns that can affect enjoyment and success in college. Services are free, confidential, via Zoom or telephone; contact (718) 997-5420, ***or*** counselingservices@qc.cuny.edu. Be sure to include in either way telephone number and CUNY ID.
C. **Internet connectivity,** tool, or device access- contact https://provost.qc.cuny.edu/students.
D. **Technology and computer assistance,** helpdesk@qc.cuny.edu.

**Chemistry 371/650 Biochemistry I – Fall 2025**

Professor Susan A. Rotenberg (Susan.Rotenberg@qc.cuny.edu) Remsen 117B
Office hour: Tuesdays 2-3PM, or by appointment

**Text:** *Lehninger's Principles of Biochemistry* (8th Edition), D.L. Nelson and M. M. Cox (2021)
**Lecture:** Tuesdays and Thursdays, 4:10-6:05PM **Location:** Science Building SB-C207

**Course goals/learning objectives:**
Students will gain a strong foundation in the structure and function of macromolecules (carbohydrates, lipids and proteins) and how they are used as sources of chemical energy in biological cells. In addition, students will gain an understanding of metabolic pathways and the principles of their regulation. We will explore the ways by which pathways are coordinated under different physiological conditions.

After completing the course students will be able to:

- Describe and analyze the structural and functional characteristics of major dietary macromolecules: proteins, fats, and carbohydrates.
- Understand the molecular aspects of protein structure and function, including enzyme catalysis.
- Describe how glucose, triacylglycerides and amino acids are degraded to yield energy in the form of ATP.
- Analyze the coordinated regulation of catabolic metabolic pathways that maintain cellular energy levels.
- Predict the cellular response to physiological stimuli that accompany the fight-or-flight response, hunger, or following a meal

| **Topics** | **Chapter(s)** | **Week#** | **Dates** |
|---|---|---|---|
| Chemical Foundations, Water | 1, 2 | 1 | Aug 26 |
| Amino Acids, Peptides, and Proteins | 3 | 2 | Aug 28, Sept 2 |
| Protein Structure, Analysis and Purification | 3, 4 | 3, 4 | Sept 4, 9 |
| Protein Function: Hemoglobin and Allosteric Proteins | 5 | 4 | Sept 11, 16 |
| Enzyme Catalysis and Kinetics | 6 | 5-6 | Sept 18, 25 |
| **EXAM 1** (Chapters 1-6) | | | **Sept 30** |
| Carbohydrates | 7 | 7 | Oct 7 |
| Introduction to Metabolism | 12, 13 | 8 | Oct 9 |
| Glycolysis, Gluconeogenesis, PPP | 14 | 8-9 | Oct 16, 21, 23 |
| Glycogen Metabolism | 15 | 10 | Oct 28 |
| The Citric Acid Cycle | 16 | 11 | Oct 30, Nov 4 |
| REVIEW | | | Nov 6 |
| **EXAM 2** (Chapters 7, 12-16) | | | **Nov 11** |
| Electron Transport and Oxidative Phosphorylation | 19 | 12 | Nov 13, Nov 18 |
| Lipids and Membranes; Lipid Metabolism | 10, 17 | 13 | Nov 20, Nov 25 |
| Amino Acid Metabolism | 18 | 14 | Dec 2, Dec 4 |
| Metabolic inter-relationships; fed vs. fasted States | Notes | 14 | Dec 9 |
| REVIEW | | | Dec 11 |
| **FINAL EXAM** (Will emphasize Chapters 12-19) | | | Dec 16 |

**SCHEDULE CHANGES:** No class on Tuesday Sept 23, Thursday Oct 2, Tuesday Oct 14 (Monday schedule), & Thursday Nov 27.

**GRADING** Each exam will count as 30%. The final exam will count as 40% of the final grade.
**MAKEUP POLICY** In general, there will be **no** makeup exams given. The only acceptable excuse is if you provide **written documentation** of serious illness, accident, or family-related death. If you miss more than one exam, you must arrange to re-take the test when the course is offered again.

**REASONABLE ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES**
Students with disabilities needing academic accommodation should register with the Special Services Office by emailing QC.SPSV@qc.cuny.edu. For more information about services available to Queens College students, visit the Office of Special Services website: https://www.qc.cuny.edu/studentlife/services/specialserv/Pages/default.aspx.

**CUNY POLICY ON ACADEMIC INTEGRITY**
Academic dishonesty is prohibited in The City University of New York and is punishable by penalties, including failing grades, suspension, and expulsion as provided at https://www.cuny.edu/about/administration/offices/legal-affairs/policies-procedures/academic-integrity-policy/.

**COUNSELING SERVICES**
Counseling Services are available to any Queens College student. This office assists students with personal concerns that can affect their enjoyment of and success in college. Services are free and confidential. All sessions take place on Zoom or by Telephone, depending on student preference. To make an appointment, students should call 718-997-5420 and leave a message with their phone number and CUNY ID. They may also e-mail counselingservices@qc.cuny.edu.

10/30/2025

# CHEM 331.3/710, Adv. Inorg. Chem, Fall 2025

## I. Lecture Instructor Information

**Instructor:** Prof. Chen Wang **Office:** REM 120B

**Email:** chen.wang@qc.cuny.edu

**Office Hours:** Fri 10:00 AM - 12:00 PM or by appointment

## II. Course Information

**Lecture Times:** Wed 4:15 PM - 7:05 PM **Classroom:** Science A143

**Course Description:** This course will discuss periodic trends across the entire periodic table in the category of acid-base chemistry, coordination (complex-ion) chemistry, precipitation chemistry, and oxidation-reduction chemistry. Principles that help explain these trends in chemical reactivity will also be discussed. Symmetry and molecular orbital theory will be introduced after you have developed an understanding of fundamental trends across the periodic table, which allows molecular orbital theory to be more broadly applied in subsequent chapters. This course is not only to chemistry students, but also to other professionals in other fields of science in which inorganic chemistry has become important. There is no physical chemistry prerequisite, but a solid background in General Chemistry, and enrollment in a Foundations of Organic Chemistry course are assumed.

**Learning Goals:**

1) Understand the electronic structures of atoms (e.g., electron configurations, valence electrons) and correlate periodic trends (e.g., atomic radius, ionization energy, electronegativity) to their electronic configurations.

2) Predict the acidity/basicity of ions in aqueous solutions using periodic trends (charge density, electronegativity, etc.)

3) Evaluate the relative stability of ionic compounds based on lattice energy, hydration enthalpy, and charge-to-size ratios, etc.

4) Understand the concept of Lewis acid/base and apply the Hard/Soft Acid-Base theory to predict the behavior of metal cations and ligands in coordinated complexes.

5) Analyze the electronic structure of transition metal complexes using crystal-field theory, including d-orbital splitting, ligand field strength, and spectroscopic properties.

6) Understanding simple crystal structures (e.g., FCC, BCC, HCP) in terms of unit cell geometry, stoichiometry, and coordination number, and relate these structures to physical properties.

7) Predict chemical equilibria of redox reactions using standard reduction potentials.

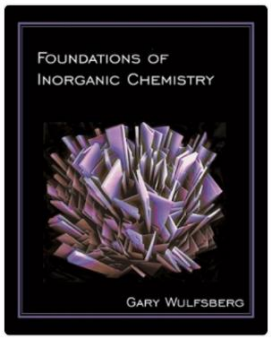
8) Apply symmetry principles and group theory to identify symmetry elements in molecules, assign point groups, and interpret spectroscopic selection rules or molecular orbital diagrams.

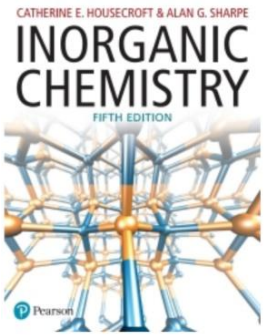
9) Applying the basic principles of Molecular Orbital (MO) Theory to understand orbital diagrams and bonding in molecules, and connect MO to electronic transitions in spectroscopy, such as UV-vis and photoelectron spectroscopy.

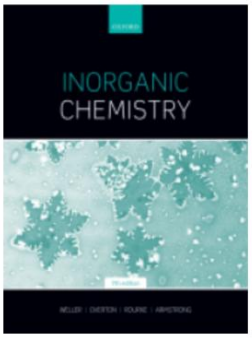
## III. Books and Materials

**Textbook:** Foundations of Inorganic Chemistry 1st Edition by Gary Wulfsberg

**Other Suggested References:** Inorganic Chemistry by Catherine Housecroft; Inorganic Chemistry by Mark Weller, Tina Overton, Jonathan Rourke, and Fraser Armstrong




**Important Notes:**

- The course materials (including the lecture slides and recorded lectures) and assignments will be posted on Brightspace.
- No material (now or in the future) obtained from this course can be distributed, sold, or purchased.
- There will be no extensions on the assignments.

## IV. Grading and Evaluation

**The grade is a 10-point grade scale as shown in Official Queens College Grade Scale** (https://www.qc.cuny.edu/academics/supportprograms/advising/academic-and-grading-policies/Pages/Default.aspx).

| Grades | GPA | Numerical Value / Definition |
|---|---|---|
| A+ | 97-100 | 4.0 (GPA in Good Academic Standing) |
| A | 93-96 | 4.0 |
| A- | 90-92 | 3.7 |
| B+ | 87-89 | 3.3 |
| B | 83-86 | 3.0 |
| B- | 80-82 | 2.7 |
| C+ | 77-79 | 2.3 |
| C | 73-76 | 2.0 |
| C- | 70-72 | 1.7 (GPA in Academic Probation) |
| D+ | 67-69 | 1.3 |
| D | 60-66 | 1.0 (Grade of D is the lowest passing grade in the undergraduate division) |
| F | 0-59 | 0.0 |

**The final course grade will be calculated based on:**

| | |
|---|---|
| 5% Participation | • You must attend class **ON TIME**. Excessive absences and tardiness will affect your grade. |
| 25% Mid-term | • One mid-term exam will cover the material for Chapter 1-6. Questions will be based on topics covered in the lecture and homework.<br>• **There will be no make-up mid-term exams.** |
| 40% Final | • There will be one comprehensive final exam that covers all chapters, with emphasis on the contents from Chapter 7-12 (~80%). Questions will be based on topics covered in the lecture and homework. |
| 30% (5% × 6) Homework | • Roughly one homework will cover two chapters.<br>• Homework will be announced in class and posted on Brightspace.<br>• Homework will be due in one week at the beginning of the class. **Late homework will not be accepted.**<br>• *Exams may be based on the homework.* |

## V. Tentative Class Schedule

**This schedule may be subject to change.**

| Date | Chapter # | Topic |
|---|---|---|
| 08/27 | Chapter 1 | Introduction to the course |
| | | Periodic Trends in Fundamental Properties of Atoms and Simple Ions |
| 09/03 | Chapter 2 | Monatomic Ions and Their Acid–Base Reactivity |
| 09/10 | Chapter 3 | Polyatomic Ions: Their Structures and Acid–Base Properties |
| 09/17 | Chapter 4 | Ionic Compounds in the Solid State, in Minerals, and in Solution |
| 10/08 | Chapter 5 | Trends in Coordination Equilibria |
| 10/15 | Chapter 6 | Principles of Oxidation–Reduction Reactivity |
| 10/22 | -- | Mid-term Exam |
| 10/29 | Chapter 7 | Introduction to Transition Metal Complexes |
| 11/5 | Chapter 8 | Oxides and Silicates as Materials |
| 11/12 | Chapter 9 | The Underlying Reasons for Periodic Trends |
| 11/19 | Chapter 10 | Symmetry |
| 11/26 | Chapter 11 | Molecular Orbital Theory |

| | | |
|---|---|---|
| 12/03 | Chapter 12 | The Elements as Molecules and Materials |
| 12/10 | | Review Session |
| TBD | -- | Final exam |

## VI. College Policies and Student Services

**Reasonable Accommodations for Students with Disabilities:** Any student who feels that he or she may need accommodation based upon the impact of a disability should contact me privately. Please contact the office of Services for Students with Disabilities at Room 111, Frese Hall, 718-997-5870 (QC.SPSV@qc.cuny.edu) to coordinate reasonable accommodation for students with documented disabilities. See: https://www.qc.cuny.edu/sp/

**CUNY Policy on Academic Integrity:** Academic Dishonesty is prohibited in The City University of New York and is punishable by penalties, including failing grades, suspension, and expulsion as provided at https://www.cuny.edu/about/administration/offices/legal-affairs/policies-procedures/academic-integrity-policy/. Please read this document, paying careful attention to the sections on plagiarism and Internet plagiarism. If you are not sure how to cite work you have found on the internet, please review the APA Guidelines provided by the Purdue OWL (https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_formatting_and_style_guide/reference_list_electronic_sources.html).

Students should complete their assignments and exams independently. Plagiarism or any other forms of cheating are **NOT** tolerated. Any assignment involved will receive a grade of zero. Students plagiarizing will receive a warning for the first time. The second time that a student is caught will result in the automatic failure of the course. Other penalties, and/or referral to the Chairman and the Dean may be carried out.

**Statement on student wellness:** As a student, you may experience a range of challenges that can interfere with learning, such as strained relationships, increased anxiety, substance use, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may diminish your academic performance and/or reduce your ability to participate in daily activities. QC services are available free of charge. You can learn more about confidential mental health services available on campus at:

https://www.qc.cuny.edu/StudentLife/services/counseling/counseling/

**Use of Student Work:** All programs in New York State undergo periodic reviews by accreditation agencies. For these purposes, samples of student work are occasionally made available to those professionals conducting the review. Anonymity is assured under these circumstances. If you do not wish to have your work made available for these purposes, please let the professor know before the start of the second class. Your cooperation is greatly appreciated.

**Chemistry and Biochemistry Department, Queens College - CUNY**

**CHEM 1131- General Chemistry I Laboratory (Fall 2025) Syllabus**

**Course Section and Code #:11 (49319), Th 6:30 – 9:20 pm, Rem. 156**

**Instructor's Full Name:** Mr. Henry Shum

**Instructor's Email**: hshum@qc.cuny.edu

**Instructor's Office Hour: Tu 5:30pm – 6:30pm Remsen 156 or by Appt.**

**Textbook for the course:** No charge to students and it is posted on Brightspace.

**Other required items:** A lab notebook with carbonless copy pages (Available on Amazon) is required for collecting your experimental data. In addition, a basic scientific calculator is required and can be purchased anywhere. Note that lab coat, safety goggles, and required glassware are provided upon check-in.

**Pre-Requisite/Co-Requisite:** CHEM 1134

**Coordinator**: Dr. Sheila Sanders (sheila.sanders@qc.cuny.edu)

**[Note: Students should contact their lab instructor for all lab-related questions.]**

**I.** Laboratory Course Format: In-person

A. ALL In-person lab sessions will be held on Queens College campus in Remsen at your scheduled time and day. Lateness by more than 10 min. is counted as an unexcused absence and you must leave the lab room.

B. Attendance is required. There is NO make-up for any missed laboratory experiment. A missed lab will receive no credit and will be dropped from the final average calculation ONLY if your absence is excused by providing acceptable documentation to the lab instructor. Students who miss more than two experiments (excused or not) must drop the course. Wtritten documentation will be required for excused absences.

**II.** General Laboratory Rules

A. Always wear safety goggles and lab coat.

B. NO short pants; skirts if worn must extend to the ankle; open toe shoes are NOT allowed; tie back long hair.

C. NO food, beverages, gum, horseplay, or unauthorized experiments allowed.

D. NO computer, tablet or cell phone use in the laboratory during class activities.

**III.** Laboratory Manual

A custom laboratory manual is used and is available free of charge, posted on Brightspace. You **must bring a printed** copy of the experiment write-up to the lab in order to complete the experiment. You will not be allowed to use electronic devices.

**IV.** Prelab Preparation AND Lab Reports

A. Prelab preparation is required for each experiment BEFORE you come to the lab. This includes reading the full experiment from start to finish in the lab manual and watching posted videos (if posted) on Brightspace. **The Prelab write-up should include section**

**IV C (1-4)*, listed below and must be initialed by the instructor before the lab experiment begins.** You should review the safety protocols for each experiment. **You should complete the prelab questions posted on Brightspace before each experiment.**

B A completed typed LAB REPORT as per specified format is ALSO required for EACH experiment. **Lab reports must be uploaded to Brightspace by the end of the day of the subsequent lab session**. Late lab reports are strongly discouraged. They will receive a severe reduction in points (see section V(B)).

C. **Format of Lab Report (*Reflect Items that should be completed in the lab notebook before each lab, i.e., the Prelab write-up).**

*1. **Title/Cover page:** Include your name, section number, experiment title, AND date of the experiment. Experiment title can be copied from the syllabus or lab book.

*2. **Abstract:** A brief summary of the experimental results and their meaning.

*3. **Introduction**: Explain concisely the chemistry of the experiment in your own words. Include any equations and other scientific and mathematical explanations; i.e., the theory.

*4. **Experimental Procedure:** A concise but complete summary of the steps, materials, and apparatus of the experiment.

5. **Data:** Include your original data, signed by the instructor; i.e., the "carbon copy" of measurements or observations you directly recorded during the experiment.

6. **Calculations and Results:** Show all work; If there is a repetitive calculation, you need to show the equation and its use only once; Include any tables, graphs or diagrams that may be required.

7. **Conclusions:** Summarize your final conclusions in this section.

8. **Discussion:** State whether results were good or bad, and reasons why, what may have affected them, and any potential problems with the experiment. Be brief but complete. There may be questions you must answer, based on the lab manual. Work them into your discussion. If you know your expected value from instructor or from reference sources, be sure to list the percent error and discuss experimental errors that can account for it.

9. **References:** Include the lab experiment write-up and other references, including those from the internet.

Finally, Lab Reports do not have to be excessively long, but they do have to cover all the important ideas of the experiment.

**V. Grading**: (Part A) Each lab is graded for 100 points distributed as follows - 10% Prelab Questions; 10% Prelab write-up in lab notebook; 60% Lab Report; 20% Performance in the Laboratory. Part A will be weighted 85% of your lab grade.

(Part B) A written comprehensive lab final will be administered during finals week. Check cunyfirst for the date. This part will be weighted 15% of final lab grade. The lab final will cover lab safety, and the contents that were covered during the entire semester.

Further,

A. Prelab will not be accepted after the lab session is over. If material for completing prelab questions has not been covered in the lecture, utilize the office hours of the lab instructor to get help with prelab activity. No excuses will be accepted.

B. ALL lab reports are due by the end of the day on the subsequent lab session. LATE reports are strongly discouraged, and they will receive a penalty as follows - 10%

reduction with each delayed week; Lab reports will NOT be accepted after two weeks or the last lab class (i.e., Check Out Day).

C. Reports will be graded for conformance to the above-described format and checked for plagiarism. Introduction, discussion, and conclusions are expected to be your original sentences.

D. If you have attended all the labs without any excused absences, your instructor will drop one of the lowest grades when calculating the lab average.

The criteria for Performance in The Laboratory Experiments are as follows:

1. **Safety:** If you do not work safely, you instructor will deduct points at their discretion. **Eye protection and lab coat must be worn at all times in the lab**; penalty for failure to do so is a 0 (zero) for the day and/or dismissal from that day's lab with no possibility of make-up [Points will be deducted from your final grade for safety offenses at instructor's discretion]. You should also cover your nose and mouth by wearing a mask during your in-person labs. Safety shower, eyewash, and fire extinguisher locations must be noted. Chemical waste handling protocols must be observed; if in doubt, ask! Points will be deducted for unsafe practices or violations of waste protocols; You may be ejected from lab and receive a zero (0) for that day's work.

2. **Independence**: Your ability to work and think independently, as determined by your instructor.

3. **Efficiency and Effectiveness**: Your ability to efficiently accomplish the goals of the experiment within the lab time frame. This also includes the quality of your results.

There will be no extra credit provided at the end of the semester. An INC grade will not be given to a student to avoid an F or WU grade. The P/NC deadline is M 11/3 and the W deadline is

Th 11/6.

**VI. Other Important Information**

(i) If you drop the course, you must notify your lecture instructor in order to stay in the lecture. You must check-out ASAP! Otherwise, you do so at the normal time on the final check-out day. If you do not check-out, you will be charged a fine as listed in the stockroom.

(ii) On the check-in day, a combination lock will be issued to you.

(iii) You must have an approved laboratory notebook with carbonless copy pages (for example, ISBN 978-1-930882-74-4 or 978-1-617319-14-3; there are other acceptable ones), and use it to collect and document your data. You can check the availability at QC online bookstore. Do NOT take any notes on scrap paper.

(iv) **Code of Conduct**

A. Plagiarism- Plagiarism or any other forms of cheating is NOT tolerated and will be severely punished by point, other penalties, and/or referral to the Chairman and the Dean; Any assignment involved will receive a grade of zero. Failure to appropriately cite a source of information may also be considered plagiarism.

B. Inappropriate Behavior, e.g., horseplay or off-color language, oral or written, will NOT be tolerated and may lead to expulsion from class and a grade of zero.

(v) Available accommodation for students with learning disabilities: Students with disabilities needing academic accommodation should register with the Special Services Office by emailing QC.SPSV@qc.cuny.edu. For more information about services available to Queens College students, visit the Office of Special Services website:

https://www.qc.cuny.edu/sp/

(vi) Counseling Services are also available to any Queens College student. This office assists students with personal concerns that can affect their enjoyment of and success in college. Services are free and confidential. All sessions take place on Zoom or by Telephone, depending on student preference. To make an appointment, students should call 718-997-5420 and leave a message with their phone number and CUNY ID. They may also e-mail counselingservices@qc.cuny.edu

(vii) CUNY Policy on Academic Integrity: Academic dishonesty is prohibited in The City University of New York and is punishable by penalties, including failing grades, suspension, and expulsion as provided at

https://www.cuny.edu/about/administration/offices/legal-affairs/policies-resources/academic-integrity-policy/

# Schedule of Experiments

Week 1 IN PERSON Check In, Safety Review, Discuss Syllabus, Take Safety Quiz. **(08/28)**

A score of 80% or above on the lab safety quiz is required before working in the lab.

Safety Video Links: https://www.youtube.com/watch?v=9o77QEeM-68

https://www.youtube.com/watch?v=gi3DeFY0cfw

Week 2 Exp. 1 Density **(09/04)**

Week 3 Exp. 2 Hydrate **(09/11)**

Week 4 Exp. 3 Precipitation **(09/18)**

Week 5 Exp. 4 Iron-Copper (II) Sulfate Redox **(09/25)**

Week 6 Exp. 5 Qualitative Study of Redox **(10/09)**

Week 7 Exp. 6 Copper Cycle **(10/16)**

Week 8 Exp. 7 Molar Mass of a Metal **(10/23)**

Week 9 Exp. 8 Solutions **(10/30)**

Week 10 Exp. 9 KHP Titration **(11/06)**

Week 11 Exp. 10 FAS Titration **(11/13)**

Week 12 Exp. 11 Calorimetry I and II **(11/20)**

Week 13 Exp. 12 Heat of Neutralization **(12/04)**

Week 14 Checkout **(12/11)**

Week 15 Final Exam **(TBA)**

**Chemistry and Biochemistry Department, Queens College - CUNY**

**CHEM 1141- General Chemistry II Laboratory (Fall 2025)**

**Section Number:**

**Instructor's Full Name:**

**Instructor's Email:**

**Instructor's Office Hour:**

Commented [CW1]: Update the information according to your session.

**Textbook for the course:** No charge to students, and it is posted on the course Brightspace.

**Other required items:** A lab notebook with carbonless copy pages is required for collecting your experimental data. In addition, a scientific or graphing calculator is required and can be purchased anywhere. Note that lab coats, safety goggles, and required glassware are provided upon check-in.

**Pre-Requisite/Co-Requisite:** CHEM 1144

**Coordinator**: Prof. Chen Wang (chen.wang@qc.cuny.edu)

**[Note: Students should contact their lab instructor for all lab-related questions.]**

**I.** Laboratory Course Format- In-person

A. ALL In-person lab sessions will be held on the Queens College campus in Remsen 153 at your scheduled time and day. Lateness by more than 15 min. is counted as an absence.

B. Attendance is required. There is NO make-up for any missed laboratory experiment. A missed lab will receive no credit and will be dropped from the final average calculation ONLY if your absence is excused by your lab instructor.

This is a laboratory class with a limited capacity in the classroom. As a result, there are NO make-up options (Excused or Unexcused) for any missed lab. YOU ARE EXPECTED TO ATTEND ALL LAB SESSIONS. If you miss a lab class due to QC-approved religious reasons OR due to emergencies, inform the instructor and make sure it is excused. A valid documentation for the excused absence will be required.

In case of absence(s), the following policy will be adopted:

1st Excused Absence: The missed lab will be excluded from calculating your overall lab score.

2nd Excused Absence: A quiz may be given for the missed lab, OR the Final Exam score will be used to replace the missed lab score. Any further absences will result in a grade penalty, irrespective of the reasons (excused or unexcused).

3rd Absence: You will receive a ZERO for the lab. [Note: If your 3rd absence is ALSO an excusable absence, you may be eligible for the 'INC' grade. See instructions below for INC grade]

4th Absence: If you were absent for the 4th regular lab session, you will NOT be allowed to take the lab final. You should withdraw on time or be issued WU.

**IMPORTANT**: For students who have attended ALL labs, their lowest lab scores may be dropped when calculating their letter grades. All unexcused absences are given a zero and will be included in calculating the average lab score.

**W grade:** Automatic Withdrawal with W: The deadline is April 1st. If you are not passing the course by this deadline, you will have to make a choice between staying in the course for whatever letter grade you get OR apply for W to avoid a hit to GPA. A failing student will not be eligible to apply for retroactive withdrawal or INC grade request later in the course.

**INC grade**: INC grade is applicable only if the student is passing the course already and may have to make up NO more than one lab due to 3rd excused absence. Students need to request instructors for this option, and the terms for resolving the INC grade must be clearly communicated and approved by the course coordinator.

Written documentation will be required for excused absences.

**II.** General Laboratory Rules

A. Always wear safety goggles.

B. NO short pants, skirts, or open-toe shoes are allowed; tie back long hair.

C. NO food, beverages, gum, horseplay, or unauthorized experiments allowed.

D. NO computer, tablet, or cell phone use in the Laboratory during class activities unless the instructor permits the use of these devices for course-related purposes

**III.** Laboratory Manual

A custom laboratory manual is used and available free of charge. It is posted on Brightspace in the Content Section. You **must bring a printed** copy of the experiment write-up to the lab. You will not be allowed to use electronic devices.

**IV.** Prelab Preparation AND Lab Reports

A. Prelab preparation is required for each experiment BEFORE you come to the lab. This includes reading the full experiment from start to finish in the lab manual and watching posted videos (if posted) on the Brightspace. **The Prelab write-up should include section IV C (1-4)*, listed below, and must be initialed by the instructor.** You should review the safety protocols for each experiment. **You should also complete the prelab questions posted in the Assignment section of Brightspace before each experiment.**

B. A completed **typed LAB REPORT** as per the specified format is ALSO required for EACH experiment. **Lab reports must be uploaded to Brightspace by the end of the day of the subsequent lab session.** Late lab reports are strongly discouraged. They will receive a severe reduction in points (see section V(B)).

C. **Format of Lab Report (*Reflect Items that should be completed in the lab notebook before each lab, i.e., the Prelab write-up).**

*1. **Title/Cover page:** Include your name, section number, experiment title, AND date of the experiment. Experiment titles can be copied from the syllabus or lab book.

*2. **Objective:** It should clearly specify the aim of that day's experiment. It most often starts with "To find", "To measure", etc. Example: "To determine the heat energy released by the neutralization reaction of hydrochloric acid and sodium hydroxide."

*3. **Introduction**: Explain concisely the chemistry of the experiment in your own words. Include any equations and other scientific and mathematical explanations, i.e., the theory.

*4. **Experimental Procedure:** A concise but complete summary of the steps, materials, and apparatus of the experiment.

5. **Data:** Include your original data, signed by the instructors, i.e., the "carbon copy" of measurements or observations you directly recorded during the experiment.

6. **Calculations and Results:** Show all work. If there is a repetitive calculation, you need to show the equation and its use only once. Include any graphs or diagrams that may be required.

7. **Conclusion:** Summarize your final conclusions in this section.

8. **Discussion:** State whether the results were good or bad, and reasons why, what may have affected them, and any potential problems with the experiment. Be brief but complete. There may be questions you must answer based on the lab manual. Work them into your discussion. If you know your expected value from the instructor or from reference sources, be sure to list the percentage error and precision and discuss experimental errors that can account for them.

9. **References:** Include the lab experiment write-up and other references, including those from the internet. See the Lab Report Guide.

Finally, Lab Reports do not have to be excessively long, but they do have to cover all the important ideas of the experiment.

**V. Grading**: (Part A) Each lab is graded for 100 points distributed as follows - 10% Prelab Questions (Posted in Brightspace); 10% Prelab write-up (Handwritten in lab notebook); 60% Lab Report (Uploaded to Brightspace); 20% Performance in the Laboratory. Part A will be weighed 85% of your lab grade.

(Part B) A written comprehensive lab final will be administered during finals week. Check cunyfirst for the date. This part will be weighted 15% of the final lab grade. The lab final will cover lab safety and the contents that were covered during the entire semester.

*** Week 1 grading will be different than the rest. There will be a Math quiz (20%), a Safety Quiz (20%), and the lab report for Exploring Boiling points (60%).

Further,

A. Prelab will not be accepted after the lab session is over. If the material for completing prelab questions has not been covered in the lecture, utilize the office hours of the lab instructor to get help with prelab activity. No excuses will be accepted.

B. ALL lab reports are due by the end of the day of the subsequent lab session. LATE reports are strongly discouraged, and they will receive a penalty as follows - 10% reduction with each delayed week. Lab reports will NOT be accepted after two weeks or the last lab class (i.e., Check Out Day).

**Commented [CW2]:** Instructor must hold the same timeline.

C. Reports will be graded for conformance to the above-described format and checked for plagiarism. The introduction, discussion, and conclusions are expected to be in your original sentences.

D. If you have attended all the labs without any excused absences, your instructor will drop one of the lowest grades when calculating the lab average.

The criteria for Performance in The Laboratory Experiments are as follows:

1. **Safety**: If you do not work safely, your instructor will deduct points at their discretion. **Eye protection and a lab coat must be worn at all times in the lab**; the penalty for failure to do so is a 0 (zero) for the day and/or dismissal from that day's lab with no possibility of make-up [Points will be deducted from your final grade for safety offenses at instructor's discretion]. You should also cover your nose and mouth by wearing a mask during your in-

person labs. Safety shower, eyewash, and fire extinguisher locations must be noted. Chemical waste handling protocols must be observed; if in doubt, ask! Points will be deducted for unsafe practices or violations of waste protocols. You may be ejected from the lab and receive a zero (0) for that day's work.

2. **Independence**: Your ability to work and think independently, as determined by your instructor.

3. **Efficiency and Effectiveness**: Your ability to efficiently accomplish the goals of the experiment within the lab time frame. This also includes the quality of your results.

No extra credit will be provided at the end of the semester. An INC grade will not be given to a student to avoid an F or WU grade.

**VI. Other Important Information**

(i) If you drop the course, you must check out ASAP! Otherwise, you do so at the normal time on the final check-out day. If you do not check out, you will be charged a fine as listed in the stockroom.

(ii) On check-in day, you will receive a combination lock.

(iii) You must have an approved laboratory notebook with carbonless copy pages (for example, ISBN 978-1-930882-74-4 or 978-1-617319-14-3; there are other acceptable ones), and use it to collect and document your data. You can check the availability at the QC online bookstore. Do NOT take any notes on scrap paper.

(iv) **Code of Conduct**

A. Plagiarism- Plagiarism or any other forms of cheating are NOT tolerated and will be severely punished by points, other penalties, and/or referral to the Chairman and the Dean. Any assignment involved will receive a grade of zero. Failure to appropriately cite a source of information may also be considered plagiarism.

B. Inappropriate Behavior, e.g., horseplay or off-color language, oral or written, will NOT be tolerated and may lead to expulsion from class and a grade of zero.

(v) Available accommodation for students with learning disabilities: Students with disabilities needing academic accommodation should register with the Special Services Office by emailing QC.SPSV@qc.cuny.edu. For more information about services available to Queens College students, visit the Office of Special Services website: https://www.qc.cuny.edu/sp/.

(vi) Counseling Services are also available to any Queens College student. This office assists students with personal concerns that can affect their enjoyment of and success in college. Services are free and confidential. All sessions take place on Zoom or by Telephone, depending on student preference. To make an appointment, students should call 718-997-5420 and leave a message with their phone number and CUNY ID. They may also email counselingservices@qc.cuny.edu

(vii) CUNY Policy on Academic Integrity: Academic dishonesty is prohibited in The City University of New York and is punishable by penalties, including failing grades, suspension, and expulsion as provided at https://www.cuny.edu/about/administration/offices/legal-affairs/policies-procedures/academic-integrity-policy/.

## Schedule of Experiments

**Week 1 (Date)**IN PERSON Check In, Safety Review, Discuss Syllabus, and Refresh Basic Math (e.g., common log, natural log, quadratic equation, etc.). [Homework: Exploring Boiling Points; Prepare and Take Safety and Basic Math Quiz]

Commented [CW3]: Update the dates

Safety Video Links: https://www.youtube.com/watch?v=9o77QEeM-68

https://www.youtube.com/watch?v=gi3DeFY0cfw

**Week 2(date)** Iron Content of a Tablet by Redox Titration; (Online Safety Quiz AND Basic Math Quiz Due This Week)

**Week 3(date)**Beer's Law

**Week 4(date)**Analyzing a Complex Mixture with Paper Chromatography and Visible Light Spectroscopy

**Week 5(date)**The van't Hoff i Factor and Osmosis

**Week 6(date)**Kinetics

**Week 7(date)**Equilibrium - Part I: Le Châtelier's Principle

**Week 8(date)**Equilibrium - Part II: Measuring an Equilibrium Constant and

Preparation and Analysis of a Complex Ion Compound – Part I

**Week 9(date)** Preparation and Analysis of a Complex Ion Compound - Finish

**Week 10(date)**Acids, Bases, Buffers and Salts

**Week 11(date)**Identifying an Acidic Salt by Titration

**Week 12(date)**Qualitative Analysis of Cations: Do It Yourself

**Week 13(date)**Electrochemistry

**Week 14(date)**Review for Lab Final and Check Out

**Week 15 (TBD, check CUNYFirst)** Lab Final Quiz

Queens College, CUNY Department of Chemistry and Biochemistry
Professor Edward G. Look 120 D Remsen edward.look@qc.cuny.edu (718) 997-4102 **Fall 2025**

# CHEM 331.1- Physical Inorganic Chemistry Laboratory I

**Lecture:** F, 1:40PM - 2:25 PM, **354** RE **Laboratory:** W, 2:25 PM -5:30P M, **354, 355** RE

## SYLLABUS

**I. Texts:** The instructor will provide required lecture notes, slides, and lab writeups.

**II. Suggested Reference Sources:**

1. *Physical Chemistry, twelfth ed.* Atkins, de Paula, Keeler Oxford University Press New York **2022** ISBN: 9780192608772 (ebook) **(Early editions, fourth or eariler may be better; on reserve in Rosenthal Library)**
2. *Advanced Inorganic Chemistry, sixth ed.* Cotton, Wilkinson, Murillo, Bochmann John Wiley & Sons, Inc. New York **1999** ISBN: 9780471199571 **(Or any edition; on reserve in Rosenthal Library)**
3. *Synthesis and Technique in Inorganic Chemistry, third ed.* Angelici, Girolami, Rauchfuss University Science Books Cambridge, MA **1999** ISBN: 9780935702484 **(Or any edition; on reserve in Rosenthal Library)**
4. *The Synthesis and Characterization of Inorganic Compounds*- Jolly Prentice-Hall, Inc. Englewood Cliffs, NJ ISBN: 978-0881335781 **1970 (On reserve in Rosenthal Library)**
5. *Principles of Instrumental Analysis*, 7th ed. D. A. Skoog, F. J. Holler, and S. R. Crouch Cengage Boston **2018** ISBN: 9781305577213 **(Or any edition; on reserve in Rosenthal Library)**
6. *Experiments in Physical Chemistry, eighth ed.* Garland, Nibler, Shoemaker McGraw-Hill New York **2009** ISBN: 978-0072828429 **(Or any edition; on reserve in Rosenthal Library)**

**III. Other Required Materials:** Scientific calculator, bound laboratory notebook

**IV. Attendance:** Both laboratory and lecture (recitation) sessions are required. Excessive absences in either will adversely affect your grade. The last class is mandatory; at least five (5) points will be deducted from final course total if absent.

**V. Safety:**

A. **Goggles**, lab coats, gloves, long pants or skirts, closed toe shoes, and long hair tied back are required.
B. Eating, drinking, gum chewing, horseplay, and stunt experiments.
C. Contact lenses are not allowed; wear glasses to lab if needed.
D. Safety shower, eyewash, and fire extinguisher locations must be noted.
E. Chemical waste handling protocols must be observed; if in doubt ***ask!***
F. **You may be ejected from lab and fail the course for unsafe practices or violations of waste protocols, and referred to the Chairman and the Dean.**

**VI. Work in the Laboratory**

A. **Safety-** Observe all safety protocols, use caution; (*see §V above, §VI.B-C below*).

**VI.** B. **Equipment Usage-** Failure to observe these rules will result in grade deduction.

1. You may be assigned to work with other students in small groups on the same experiment or equipment.
2. However, your submissions to me are to be solely your own.
3. You must leave the equipment and work areas at end of lab clean and neat, observing safety protocols. Put away all glassware, other equipment, and chemicals after use.
4. When done with an instrument, ***do not turn off the computer*****;** *simply leave it on, or at most, log out of it*. (*See § VI. D, below.*)
5. The instruments used in the lab are research grade, which allows the students the opportunity to experience a wide range of state-of-the-art instrumentation. Thus, all instruments should be treated with care.

C. **Group Interactions-** observe all safety requirments and exercise caution. You may be assigned to work with other students in small groups or teams. However, your submissions to me are to be solely your own. Plagiarism or any other form of cheating is not tolerated and will be punished by point and other penalties and/or referral to the Dean (*see §V*)

D. **Lab Computers-** The computers in the laboratory are for use with the experiments and related work. They are ***not*** for personal recreational use. When finished for the day, please leave on, *maybe* log off but *do* ***not*** *shut down*.

E. Pay attention to the Lab Schedule below (*§XII*); dates therein are tentative, depending on class progress. Any individual assignment dates will be e-mailed. It is ***your*** responsibility to follow **Brightspace** and e-mail for any communication and changes.

## VII. Code of Conduct

A. **Plagiarism-** Plagiarism or any other form of cheating is not tolerated. The student perpetrating such an act will receive a zero (0) for the assignment in question and a warning, along with other possible penalties, for a first offense. A second offense by the student will result in automatic failure of the course (F) and referral to the Chairman and/or the Dean. A failure to properly cite any sources, including figures, charts, tables, and artwork, in a submission or work is also considered plagiarism.

B. **Laboratory Conduct-** No horseplay. No offensive language. No other activities or materials in the laboratory or classroom that are not relevant to the coursework. Return all items used to proper places, keep equipment and work areas clean and neat. Strictly observe all safety protocols.

## VIII. Communication:

A. I can be reached-

1. Preferably via **our Brightspace** ***discussion board*** (will be set up before class starts).
   a. In the discussion board, you may ask questions, discuss course (or school) topics, and answer each other's questions, too! (I will check the answers.)
   b. Course materials, this syllabus, and any ancillary materials will be posted on Brightspace.
2. Secondarily via e-mail, but only for messages that require some privacy.
3. Use telephone only if necessary (I may not be at the telephone; *see Heading above*).

## IX. Course Objectives:

A. **This is a Writing Intensive (W) course** and fulfills one Writing Intensive requirement. W classes include a significant portion of time devoted to writing instruction. This may include things such as revision workshops, discussions of rhetorical strategies, or reflective writing about writing assignments.

B. **Learning Objectives:**

1. Learn how to design and execute experimental procedures to address specific scientific questions through a hypothesis-driven approach.
2. Mastery lab skills for synthesizing inorganic compounds and nanomaterials.
3. Apply the principles of spectroscopy (UV-vis absorption, FT-IR and fluorescence, and NMR), to characterize inorganic compounds and nanomaterials, prepare samples for analysis, operate instruments, qualitatively and quantitatively interpret the analytical results
4. Understanding the basic concepts in photocatalytic mechanisms (excited state dynamics, energy and electron transfer processes).
5. Analyze reaction dynamics using experimental methods such as Stern-Volmer quenching analysis and time-resolved photoluminescence, including data interpretation (e.g., calculating quenching rate constants, lifetime measurements)
6. Perform qualitative and quantitative analysis of photosensitized reaction products using TLC, HPLC, NMR and GC-MS.
7. Build up necessary skills for writing scientific articles, including literature review with citations, graphical presentation of data, critical discussion of results, and proper formatting.

C. **Academic Program and General Education Outcomes:**

1. Apply concepts and methods of physical science and lab operational principles to make informed decisions with analytical reasoning during the experiments.
2. Reason quantitatively as required in various fields of interest and in everyday life.
3. Apply information management and digital technology skills useful for academic research and lifelong learning.
4. Learn to work collaboratively to accomplish learning objectives.
5. Communicate effectively through written lab reports.

## X. Grading:

A. Your course grade will consist of:

1. Lab performance **100 pts.**
2. Lab notebook evaluation **50 pts.**
3. Exe# 1-5 **150 pts.**
4. Writing assignments **700 pts.**; this includes preliminary written exercises,
   a. Experimental, **50 pts.**
   b. Introduction, **50 pts.**
   c. Results, **100 pts.**
   d. formally written 1st report, **100 pts.**
   e. 〃 〃 2nd 〃 **400 pts.** (*total of §X.A.4.a-d is 700 pts.*)

B. **NOTE:** Lab Safety is *mandatory* (pass/fail).

1. It has no point value.
2. **If you violate any safety rule or protocol, you may be asked to leave the laboratory.**

**X.** C. The grand total will be used to determine your letter grade for the course.

D. **Point deductions**

1. Unexcused missing labs will cause a deduction of **100 pts.** each from the final grades.
2. Failure to care for equipment/instruments, failure to clean the work area will cause points deduction from the lab performance.
3. Working in an unsafe manner is not tolerated and may lead to dismissal from the lab.
4. Any assignment involved in plagiarism (*see §VII.A*) will receive a grade of **zero**.

E. The CUNY/QC Grade Schedule is used for this course:

| Grade | Score | Numerical value / Definition |
|---|---|---|
| A+ | 97-100 | 4.0 |
| A | 93-96 | 4.0 |
| A- | 90-92 | 3.7 |
| B+ | 87-89 | 3.3 |
| B | 83-86 | 3.0 |
| B- | 80-82 | 2.7 |
| C+ | 77-79 | 2.3 |
| C | 73-76 | 2.0 |
| C- | 70-72 | 1.7 |
| D+ | 67-69 | 1.3 |
| D | 63-66 | 1.0 |
| D- | 60-66 | 0.7 (Grade of D- is the lowest passing grade in the undergraduate division) |
| F | 0-59 | 0.0 |

F. **Assignments** and **exercises** are due uploaded online by 11:59 PM the night before scheduled lab. **Full reports** are due on day indicated; *N.B.*- 2nd report is due Friday during finals week.

## IX. If You Might Have COVID-19 or RSV or the flu:

If you even just believe you may have COVID-19 (or RSV or the flu), ***please stay home and do not come to campus***, inform both the coordinator and me, and we can work with you with respect to the course material.

## XI. Accomodations

A. **Students with learning disabilities-** You may register with the Office of Special Services by e-mailing QC.SPSV@qc.cuny.edu. For more information- website: https://www.qc.cuny.edu/sp/

B. **Counseling-** Counseling Services are available to any Queens College student. This office assists with personal concerns that can affect enjoyment and success in college. Services are free, confidential, via Zoom or telephone; contact (718) 997-5420, ***or*** counselingservices@qc.cuny.edu. Be sure to include either way, telephone number and CUNY ID.

C. **Internet connectivity**, tool, or device access: go to https://provost.qc.cuny.edu/students

D. **Technology and computer assistance**, contact helpdesk@qc.cuny.edu.

## XII. Laboratory Schedule:

*See **experimental handouts** for details. This is subject to change as semester progresses. Check Brightspace for updates.*

| Week | Dates | Class Discussion | Lab Work | Asgmt (Due 11:59 PM before lab) | Objectives |
|---|---|---|---|---|---|
| 1 | 8/29 | Check-in; **Safety lecture**; Syllabus: course overview; Transition to independent lab work; Writing in the lab notebook | Transition to working independently in the lab; How to prepare for an experiment; Reaction reagents and glassware | | |
| 2 | 9/5 | Metal complex experiment; Review writing in notebook | Synthesis of $Fe(acac)_3$ metal complex | **Exe 1-**Prepare all experimental calculations for the synthesis of $Fe(acac)_3$ | |
| 3 | 9/12 | Introduction to UV-vis and fluorometry; How to prepare a sample for spectroscopy; Making sample dilutions | UV-vis measurement $Fe(acac)_3$ in different solvents; Discussion of Exe 1 | **Exe 2-** Protocol for UV-vis sample preparation and UV-vis measurements | |
| 4 | 9/19 | Introduction to IR & FTIR;; Literature searching and citation | Discussion of Exe 2 Determination of the extinction coefficient of $Fe(acac)_3$ | **Exe 3-** Protocol for FTIR sample preparation and measurements | 1 hour lecture on necessary writing skill; literature searching; and how to cite in scientific writing |
| 5 | 9/26 | Scientific article outline: Overall structure, Abstract, Introduction, Experimental, Results, Graphics and tables, Discussion | Continue FTIR and and fluorescence spectroscopy of $Fe(acac)_3$ | **Exe 4-** Independent literature search for metal complex experiments | 1.5 hours lecture on the general structure of writing a scientific paper; how to make a writing plan with an outline; Exe 4 asks for practicing a literature search and taking reference notes for preparing writing |
| 6 | 10/3 | Review Exe 4; Introduction to semiconductor nanocrystals; Quantum confinement; Hot injection synthesis; Introduction to NMR spectrocopy | Synthesis of CdSe Quantum Dots; Initial UV-vis and photoluminescence characterization of QD samples; Determination of the sizes of the QDs | **Exe 5-** UV-vis figures | Feedback provided for Exe 4; Exe 5 focuses on preparing figures and writing appropriate captions for a scientific paper |
| 7 | 10/10 | Review of Exe 5; Formatting graphics; Introduction to the surface chemistry of QDs | Characterization of CdSe QDs with ATR-FTIR and steady state photoluminescence; Analysis of the bound configuration of surface ligands and estimation of the number of bound ligands | Writing Assignment 1 (WA1)- Experimental for 1st lab report | 1 hour instruction lecture on details for graphic presentation of data in scientific writing; Revision provided for Exe 5 to the figures; WA1: 300-500 words of writing experimental procedure |

| | | | | | |
|---|---|---|---|---|---|
| 8 | 10/17 | Review/discussion of the 1st writing assignment | Photluminescence quenching; NMR | WA2- Introduction (50 pts.) | Revision provided for WA1; WA2: 500 words of writing with practice for citations while writing |
| 9 | 10/31 | Review/discussion of the 2nd writing assignment; Introduction; Discussion of references and citation; Laser safety; Introduction to exciton dynamics | Time-resolved photoluminescence; NMR | WA3- Results and Discussion | Revision provided for WA2; 1 hour lecture on proposing discussio topics based on experimental data will be provided |
| 10 | 11/7 | Basics of photophysics and photophysical processes; Individual meetings with instructor on writing metal complex reports | Continue lab; CdSe nanocrystal characterization; PL quenching; TR-PL; NMR | | WA3: 1000 words of writing with the graphic presentation of data and practice for citng while writing |
| 11 | 11/14 | Review/discussion of the 3rd writing assignment; Stern-Volmer analysis; Individual meetings with instructor on questions with the CdSe nanocrystal experiment | Continue lab; CdSe nanocrystal characterization; PL quenching; TR-PL; NMR | | Revision is provided for WA3 |
| 12 | 11/21 | Time resolved spectroscopy and lasers | Continue lab; CdSe nanocrystal characterization; PL quenching; TR-PL; NMR | Metal complex laboratory reports | 1st lab report: 2000+ words of formal scientific writing with graphic presentation, data discussion, and citations |
| 13 | 12/5 | Review/discussion of metal complex lab reports; Individual meetings with instructor on questions with the CdSe nanocrystal experiment | Photocatalytic reaction setup | | Revision is provided for the 1st lab report |
| 14 | 12/12 | Individual meetings with instructor on questions with the CdSe nanocrystal experiment | Reaction result analysis (HPLC) | | |
| 15 | 12/16-19 | **EXAM WEEK-** no lab | | CdSe nanocrystals lab report (400 pts.) | 2ne lab report: 3000+ words of formal scientific writing with graphic presentation, data discussion, and citations |

Queens College, CUNY
Professor Edward G. Look
edward.look@qc.cuny.edu
Department of Chemistry and Biochemistry
**Fall 2025**

# CHEM 101.1- Basic Chemistry Laboratory

Section **5- Wednesdays**, 1:40 – 4:30 PM, 151 RE

# Syllabus

## I. Laboratory Requirements

A. **You MUST bring a hardcopy of the correct lab experiment handout each lab session**
B. **If you fail to bring this hardcopy to class, you will not be permitted to enter the lab**
C. No computer nor tablet nor cell phone use in the laboratory during class activities
D. A scientific or graphing calculator
E. Goggles, lab coat, and a lock will be issued to you on check-in day; *USE* them
F. Clean up your area after each lab session
G. If you withdraw for any reason, you must check out ASAP or there will be a monetary fine as listed in the stockroom
H. Each experiment is performed ***individually***; there are **NO** team experiments
J. **Lab reports**:
   1. Data measured will be directly written into **report sheets** *you must print **before** you come and bring with you*. (See §I.A above.)
   2. Calculations and results also are written on the report sheets
   3. Lab reports will always be due **right after the experiment, *before* you leave the lab**
K. **Pre-Requisite/Co-Requisite**: Chem 101.3

## II. Course Description

A. Course format is *hybrid* (some work is available/done online)
B. Course coordinator- Prof. Seogjoo Jang (seogjoo.jang@qc.cuny.edu)
C. However, all lab-related questions are to be directed to your instructor
D. All in-person sessions will be held on campus in 151 RE

## III. Laboratory Manual

A custom laboratory manual is available free of charge, posted in Brightspace in the Content section

## IV. Learning Outcomes

A. **This course satisfies the following two Queens College General Education learning outcomes:**
   QC 1: Address how, in the discipline (or disciplines) of the course, data and evidence are construed and knowledge is acquired; that is, how questions are asked and answered
   QC 2: Position the discipline(s) in the liberal arts curriculum and the larger society
B. **This QC College Option SCI course satisfies the following three learning outcomes:**
   SCI 1: Familiarity with a body of knowledge in the physical or biological sciences.
   SCI 2: Successful study of the methods of science, including the use of observation, the information of hypotheses and the testing of models

**IV.** B. SCI 3: Experience and awareness of the impact of science on modern society

C. **This course satisfies the Life and Physical Science (LPS) requirements of the Pathways General Education Required Core**

LPS 1: Identify and apply the fundamental concepts and methods of a life or physical science

LPS 2: Apply the scientific method to explore natural phenomena, including hypothesis development, observation, experimentation, measurement, data analysis, and data presentation

LPS 3: Use the tools of a scientific discipline to carry out collaborative laboratory investigations

LPS 4: Gather, analyze, and interpret data and present it in an effectively written laboratory or fieldwork report

LPS 5: Identify and apply research ethics and unbiased assessment in gathering and reporting scientific data

## V. Attendance

A. Attendance is required. There is NO make-up for any missed laboratory experiment. A missed lab will receive no credit. If you are absent, then you cannot submit a lab report for that day.

B. Lateness by ***more than*** **15 min.** is counted as an absence.

C. For holidays only official CUNY free days are accepted. Acceptable emergency or religious observances must be approved by the instructor, who reserves the right to approve or reject your request. If not approved, it will result in loss of the points for that lab.

D. In case of an excused absence, a quiz may be given for the missed lab OR the final quiz score will be used to replace the missed lab score. Any further absences will result in a ZERO (0) for the lab. If there are more than 2 missed reports (2 zeros), you will NOT be allowed to take the lab final. You should withdraw on time or be issued **WU**.

## VI. Code of Conduct

A. **Laboratory Rules** (*see also §VI below*)

1. **Always** wear safety goggles and contact lenses **not** allowed
2. **NO** short pants, skirts, nor open toe shoes are allowed, and tie back long hair
3. **NO** food, beverages, gum, horseplay, ***nor*** stunt experiments allowed
4. **NO** computer nor tablet nor cell phone use in the laboratory during class activities
5. **NO** coats, jackets, bags, or backpacks are allowed in lab; use the hallway lockers
6. Never leave a flame unattended
7. Chemical waste must be disposed of properly as per your instructor's directions

B. **Inappropriate behavior**, *e.g.*, horseplay or off-color language, oral or written, will not be tolerated and may lead to expulsion from class and a zero if during an examination or assignment

C. **Plagiarism**

1. Plagiarism or any other form of cheating is NOT tolerated and will be severely punished by point and other penalties and/or referral to the Chairman and the Dean; any assignment involved will receive a grade of zero (0). Failure to appropriately cite a source of information may also be considered plagiarism.

**VI.** C. 2. **CUNY Policy on Academic Integrity:** Academic dishonesty is prohibited in The City University of New York and is punishable by penalties, including failing grades, suspension, and expulsion as provided at:

a. https://www.cuny.edu/about/administration/offices/legalaffairs/policies-procedures/academic-integrity- policy/. Please read this document, paying careful attention to the sections on plagiarism and Internet plagiarism.

b. If you are not sure how to cite work you have found on the internet, please review the APA Guidelines provided by the Purdue OWL.

D. **CUNY Legal Notice on Live Recordings:**

When applicable: "Students who participate in this class with their camera on or use a profile image are agreeing to have their video or image recorded solely for the purpose of creating a record for students enrolled in the class to refer to, including those enrolled students who are unable to attend live. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live."

## VII. Safety:

A. **First**, you must sign and submit the safety contract
B. **Always** wear safety goggles, lab coat, and gloves
C. Wear long pants or skirts, closed toe shoes, and long hair tied back are required
D. Eating, drinking, gum chewing, horseplay, and stunt experiments not allowed
E. Contact lenses are not allowed, wear glasses to lab instead.
F. Safety shower, fire extinguisher, and eyewash locations must be noted
G. Never leave a flame unattended
H. No coats, jackets, bags, or backpacks are allowed in lab; use the hallway lockers
J. Chemical waste must be disposed of properly as per your instructor,in designated containers
K. You **must** watch the ***American Chemical Society*** **lab safety video** before any work starts, regardless of whether you have seen it before. If you miss it, arrange a session ASAP
L. **Points will be deducted for-**

1. ***any*** **unsafe practices**, as deemed by the instructor, including but not limited to, eye protection violation; improper disposal of any chemicals (*i.e.*, not disposed into designated waste containers); food or drink (candy, gum, even drinking water included) brought into lab; coats, jackets, bags, backpacks, *etc.*, brought into lab- **use the lockers in the hallway**; not cleaning your station after you are done for the day
2. **violations of waste protocols**
3. **and you may be ejected from lab and receive a *zero* (0) for that day's work**

## VIII. Grading

A. Missed reports will receive grade of zero (0), unless excused
B. First excused absence- if no missed labs, lowest grade and no more will be dropped

**VIII.** C. Second excused absence- you may take a quiz or use final lab exam score instead

D. Third absence will result in a zero (0) for that lab regardless of reasons

E. More absences will bar you from the lab final so you must withdraw or receive a WU grade

F. **W and WU Grade policy:**

1. **THE DEADLINE for CHANGE TO P/NC IS Nov. 3, 2025 the DEADLINE for W IS NOV. 6, 2025**. Students who do not officially withdraw by Nov. 6, 2025 (and receive a W grade) but stop attending classes and do not participate in any way after the withdrawal date will be given a WU grade.
2. Any participation in class (i.e., lab work, homework, taking quizzes and exams) after the withdrawal date will disqualify you from receiving the WU grade, and you will be given the appropriate letter grade.

G. **INC grade**:

1. There is **no** INC grade for this course.
2. If your grade is suffering due to absences in the lab, you are expected to withdraw on time and re-enroll for the next semester

H.. There are **prelabs** that must be done before lab begins, and are posted on *Brightspace*

J. There are **postlabs** on *Brightspace* that are due before the next lab sesson.

K. There is a **final exam** that is done in person. Details will be posted on *Brightspace* and discussed in class before the exam date. **There are *no* make-ups for the final exam. If you miss it, you will receive a zero (0) for it and you grade calculated according to the grading formula**

L. Your final lab course grade is determined by:

1. prelabs- 10%
2. postlabs- 10%
3. lab reports- 60%
4. lab final exam- 20%

M.

| Grade | Score | Numerical value / Definition |
|---|---|---|
| A+ | 97-100 | 4.0 |
| A | 93-96 | 4.0 |
| A- | 90-92 | 3.7 |
| B+ | 87-89 | 3.3 |
| B | 83-86 | 3.0 |
| B- | 80-82 | 2.7 |
| C+ | 77-79 | 2.3 |
| C | 73-76 | 2.0 |
| C- | 70-72 | 1.7 |
| D+ | 67-69 | 1.3 |
| D | 63-66 | 1.0 |
| D- | 60-66 | 0.7 (Grade of D- is the lowest passing grade in the undergraduate division) |
| F | 0-59 | 0.0 |

## IX. If You Might Have COVID-19 or RSV or the flu:

If you even just believe you may have COVID-19 (or RSV or the flu), or any such symptoms thereof, ***please stay home and do not come to campus***, inform the course coordinator and the instructor; we can work with you with respect to the course material.

## X. Accomodations

A. **Students with learning disabilities-** you may register with the Office of Special Services and provide to them a letter indicating the need and what type, at 111 Frese; telephone: (718) 997-5870; e-mail: QC.SPSV@qc.cuny.edu. This **should be done during the first week of class**. For more information about services available, visit: https://www.qc.cuny.edu/sp/, or contact: Director Miriam Detres-Hickey, Monday – Thursday 8:00 a.m. to 5:00 p.m. & Friday 8:00 AM to 4 PM at same number and address.

B. **Counseling-** Counseling Services are available to any Queens College student. This office assists with personal concerns that can affect enjoyment and success in college. Services are free, confidential, via Zoom or telephone; contact (718) 997-5420, ***or*** counselingservices@qc.cuny.edu. Be sure to include in either way telephone number and CUNY ID.

C. **Internet connectivity,** tool, or device access- contact https://provost.qc.cuny.edu/students.

D. **Technology and computer assistance,** helpdesk@qc.cuny.edu.

## XI. Schedule of Experiments

| Week | Dates | Expt. # | **Experiment** |
|---|---|---|---|
| 1 | 8/27 | 1 | **check-in;** The Bunsen Burner |
| 2 | 9/3 | 2 | Measurements |
| 3 | 9/10 | 3 | Conversion Factors |
| 4 | 9/17 | 4 | Density |
| 5 | 10/8 | 5 | Determination of the Formula of a Metal Oxide |
| 6 | 10/15 | 6 | Water of Hydration |
| 7 | 10/22 | 7 | Chemical Reactions I: Combination and Decomposition Reactions |
| 8 | 10/29 | 8 | Chemical Reactions II: Single and Double Replacement Reactions |
| 9 | 11/5 | 9 | Calorimetry |
| 10 | 11/12 | 10 | Kinetics |
| 11 | 11/19 | 11 | Equilibrium |
| 12 | 11/26 | 12 | Charles' Law |
| 13 | 12/3 | 13 | Analysis of Vinegar by Titration |
| 14 | 12/10 | n/a | **check-out**, ***NO*** *experimental work permitted;* **FINAL EXAM** |
| 15 | 12/17 | n/a | **evaluation and review** |