

**SYLLABUS 2023 CHEM/ENCH 213:
Introduction to Chemical Analysis**

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Lectures Room:
Lectures Time:



Each week a new module of the course will be released through OnQ, it will consist of a combination of lecture notes, textbook readings, and supportive documents.

Tutorials: Weekly 1-hour tutorial will be held from week 1 to 12. Some of the examples and past exam or test questions will be discussed during tutorial sections.
(No tutorial content is delivered in week 1. Students should find their tutorial section room.)

Labs: Will be in person and offered at several different times. Each student will complete five 1-2 week experiments during the course of the semester. (Detailed lab schedule and content will be provided in the lab manual and on onQ in the “Lab Information” section.)

Office Hours: Time and location of the office hour with Dr. She will be determined and announced during the first week.

onQ: This electronic tool can only be accessed by students registered in CHEM/ENCH 213 by going to <https://onq.queensu.ca/d2l/home>. It contains:

- the course lecture-related material (i.e. syllabus, slides and practice problems)
- a week-by-week calendar of the topics/tests
- Laboratory Information Section, including lab report guidelines, report grading outlines, and the lab schedule and lab TA information
- your grades
- tips to further help you
- a discussion board where questions can be asked about the course material.

Learning Goals: (1) Understanding the fundamentals of analytical chemistry in a down-to-earth, relevant way. (2) Review and deepen some of the knowledge acquired in first year chemistry. (3) Understanding analytical methods, tools and learning how to perform relevant calculations.

Learning Outcomes:

At the end of this course, students will be able to:

1. Demonstrate the proper use of the balance, pipets, buret and volumetric flask.
2. Assess the quality of a result and the validity of a method.
3. Accurately analyse samples by UV-visible spectrophotometry, fluorescence and atomic spectroscopies.
4. Calculate the concentrations of different species of a compound in solution.
5. Prepare buffers in various ways.
6. Perform titrations successfully and interpret the results correctly.

Assessment of Learning Outcomes:

Tutorials will assess outcomes 1-5

Tests will assess outcomes 1-4

Final Exam will assess outcomes 1-6

Labs will assess outcome 1-6

Assessment Timing and Weights:

- Lab reports (5): 30%
- **Open book**[#] on-line tests* (5): 36%
- **Open book**[#] final exam (In person, timing to be announced): 34%

#Open book. Hard copy of “Quantitative Chemical Analysis” textbook and handwritten notes are permitted. Accessing notes and textbooks through electronic devices is NOT permitted.

***There is no make-up test or deferral of a test.** Flexibility was built in to facilitate academic consideration:

- The best 3 out of 5 on-line tests will be used to calculate the overall test mark. (12% x 3 tests) Grades of lowest 2 tests will be dropped from overall grading to allow extenuating circumstances.
- Bi-weekly on-line tests will be hosted on OnQ quiz in week 3, 5, 7, 9 and 11. More details will be released in class.

Students must pass BOTH the lecture and the laboratory components to pass the course.

If a student does not pass both the laboratory and lecture components of a course, they will fail the entire course and be allocated a mark of 47% or their actual mark, whichever is lower.

Grading Method:

All components of this course will receive numerical percentage marks. The final grade you receive for the course will be derived by converting your numerical course average to a letter grade according to Queen's Official Grade Conversion Scale:

Queen's Official Grade Conversion Scale

| Grade | Numerical Course Average (Range) |
|--------------|---|
| A+ | 90-100 |
| A | 85-89 |
| A- | 80-84 |
| B+ | 77-79 |
| B | 73-76 |
| B- | 70-72 |
| C+ | 67-69 |
| C | 63-66 |
| C- | 60-62 |
| D+ | 57-59 |
| D | 53-56 |
| D- | 50-52 |
| F | 49 and below |

Required textbook:

Quantitative Chemical Analysis, 10th Ed., *Daniel C. Harris*, Freeman & Company.

(The reading assignment and page numbers in this course will be provided based on the 10th ed.)

Note:

1. The 9th ed. Version of Quantitative Chemical Analysis textbook is similar to the current 10th ed. ***But there are some differences. As the reading assignment and page numbers in this course will be provided based on the 10th ed. It is best to work with current version.***
2. Please work with a hard copy of the textbook for your tests and exam, as reading electronic copy on electronic devices, such as computers, phones or tablets during open book tests and exam is NOT permitted. Using hard copy/printouts from e-book is permitted.
3. This textbook is also currently used for CHEM/ENCH321 and part of CHEM/ENCH411
Readings will be posted in OnQ each week.

Course Outline

| | |
|--------|---|
| Week 1 | Preparation of solutions, technical and errors |
| Week 2 | Statistical analysis and tests |
| Week 3 | Least squares and weighting |
| Week 4 | Standard addition, atomic spectroscopy and FAAS |

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|---------|--|
| Week 5 | Spectroscopic techniques and internal standard |
| Week 6 | Fundamentals of spectrophotometry |
| Week 7 | Fundamentals of spectrophotometry and applications |
| Week 8 | Spectrophotometry instrument and chemical equilibrium part 1 |
| Week 9 | Chemical equilibrium parts 2 and 3 |
| Week 10 | Monoprotic buffers and polyprotic equilibria |
| Week 11 | Titration principles |
| Week 12 | EDTA titration |

Useful software:

- Data processing requires Microsoft Excel

Problem sets: Practice problems and solutions will be posted on the CHEM/ENCH 213 OnQ site. These are not marked, but are recommended, as they will help you practice applying concepts from the course and will help you prepare for the tests and final exam.

Tutorials: Weekly 1-hour tutorial will be held from week 1 to 12. (*No tutorial content is delivered in week 1. Students in in-person sections should find their tutorial room.*) The tutorials in weeks 2 to 12 will be focusing on illustrating the applications of concepts and discussing example problems. This will be useful in preparation of tests and final exam. You are encouraged to interact with your TA and peers during tutorial sessions to gain a good understanding of topics.



Labs: All labs must be attended as scheduled. Detailed lab schedule is posted on the CHEM/ENCH 213 onQ under “Lab Information” and in the lab manual.

All students must attend the introductory lab for their corresponding section (lab group assignment, lab safety, lab quiz) in week 2 (Sept. 12-14th) (~1 h). Your experiment schedule will be defined by your lab group number, which you should obtain during the Introductory lab for your specific lab section).

Weeks 3-12 (Sept. 19th – Nov. 30th), students rotate between the following five experiments:
Experiment 1: Direct Spectrophotometric Analysis of Energy Drinks (DSA)

Experiment 2: UV-VIS Spectrophotometry with Multi-wavelength Detection (VIS-MWD)

Experiment 3: Analytical Techniques based on Fluorescence Spectroscopy (FL)

Experiment 4: Microwave Plasma Emission and Flame Atomic Emission Spectroscopy (MP-AES/FAES)

Experiment 5: Elemental Analysis using Advanced Techniques of Atomic Spectroscopy

To pass the course, students must receive a passing grade on each lab. Students must attend all labs scheduled for their lab group. If a lab is missed due to extenuating circumstances, the student may be able to perform the missed work with a different lab section (conditional to the equipment and TA supervision availability). Permission of the course instructor is required for any lab work with the alternate lab section. Please inform the TA in your lab section and course instructor as soon as possible about any expected problems with lab attendance and scheduling.

Calculator Policy

As noted in Academic Regulation 9.2, “Calculators acceptable for use during quizzes, tests and examinations are intended to support the basic calculating functions required by most Arts and Science courses. For this purpose, the use of the **Casio 991 series calculator** is permitted and is the only approved calculator for Arts and Science students.”

Technology

Students are encouraged when possible to work with the most recent versions of software including web browsers, Java, Flash and Adobe Reader.

Web Browsers (for online or blended courses)

onQ performs best when using the most recent version of the web browsers, Chrome or Firefox. Safari and Edge are strongly discouraged as these web browsers are known to cause issues with onQ.

Support (for online or blended courses)

For technology support ranging from setting up your device, issues with onQ to installing software, contact ITS Support Centre <https://www.queensu.ca/its/itsc>

Queen’s Policy Statement on Academic Integrity

Queen’s University is dedicated to creating a scholarly community free to explore a range of ideas, to build and advance knowledge, and to share the ideas and knowledge that emerge from a range of intellectual pursuits. Queen’s students, faculty, administrators and staff therefore all have responsibilities for supporting and upholding the fundamental values of academic integrity. Academic integrity is constituted by the five core fundamental values of honesty, trust, fairness, respect and responsibility and by the quality of courage. These values and qualities are central to the building, nurturing and sustaining of an academic community in which all members of the community will thrive. Adherence to the values expressed through academic integrity forms a foundation for the "freedom of inquiry and exchange of ideas" essential to the intellectual life of the University.

The following statements from “The Fundamental Values of Academic Integrity” (2nd edition), developed by the International Center for Academic Integrity (ICAI), contextualize these values and qualities:

1. **Honesty** Academic communities of integrity advance the quest for truth and knowledge through intellectual and personal honesty in learning, teaching, research, and service.
2. **Trust** Academic communities of integrity both foster and rely upon climates of mutual trust. Climates of trust encourage and support the free exchange of ideas which in turn allows scholarly inquiry to reach its fullest potential.
3. **Fairness** Academic communities of integrity establish clear and transparent expectations, standards, and practices to support fairness in the interactions of students, faculty, and administrators.
4. **Respect** Academic communities of integrity value the interactive, cooperative, participatory nature of learning. They honor, value, and consider diverse opinions and ideas.
5. **Responsibility** Academic communities of integrity rest upon foundations of personal accountability coupled with the willingness of individuals and groups to lead by example, uphold mutually agreed-upon standards, and take action when they encounter wrongdoing.
6. **Courage** To develop and sustain communities of integrity, it takes more than simply believing in the fundamental values. Translating the values from talking points into action -- standing up for them in the face of pressure and adversity — requires determination, commitment, and courage.

Students are responsible for familiarizing themselves with and adhering to the Senate [regulations](#) concerning academic integrity, along with [Faculty or School](#) specific information. Departures from academic integrity include, but are not limited to, plagiarism, use of unauthorized materials, facilitation, forgery and falsification. Actions which contravene the regulation on academic integrity carry sanctions that can range from a warning to loss of grades on an assignment, to failure of a course, to requirement to withdraw from the university.

Copyright of Course Material

Course materials created by the course instructor, including all slides, presentations, handouts, tests, exams, and other similar course materials, are the intellectual property of the instructor. It is a departure from academic integrity to distribute, publicly post, sell or otherwise disseminate an instructor’s course materials or to provide an instructor’s course materials to anyone else for distribution, posting, sale or other means of dissemination, without the instructor’s express consent. A student who engages in such conduct may be subject to penalty for a departure from academic integrity and may also face adverse legal consequences for infringement of intellectual property rights.

Turnitin Statement

This course makes use of Turnitin, a third-party application that helps maintain standards of excellence in academic integrity. Normally, students will be required to submit their course assignments through onQ to Turnitin. In doing so, students’ work will be included as source documents in the Turnitin reference database, where they will be used solely for the purpose of

detecting plagiarized text in this course. Data from submissions is also collected and analyzed by Turnitin for detecting Artificial Intelligence ([AI-generated text](#)). These results are not reported to your instructor at this time but could be in the future.

Turnitin is a suite of tools that provide instructors with information about the authenticity of submitted work and facilitates the process of grading. The similarity report generated after an assignment file is submitted produces a similarity score for each assignment. A similarity score is the percentage of writing that is similar to content found on the internet or the Turnitin extensive database of content. Turnitin does not determine if an instance of plagiarism has occurred. Instead, it gives instructors the information they need to determine the authenticity of work as a part of a larger process.

Please read Turnitin's [Privacy Policy](#), [Acceptable Use Policy](#) and [End-User License Agreement](#), which govern users' relationship with Turnitin. Also, please note that Turnitin uses cookies and other tracking technologies; however, in its service contract with Queen's Turnitin has agreed that neither Turnitin nor its third-party partners will use data collected through cookies or other tracking technologies for marketing or advertising purposes.

For further information about how you can exercise control over cookies, see [Turnitin's Privacy Policy](#).

Turnitin may provide other services that are not connected to the purpose for which Queen's University has engaged Turnitin. Your independent use of Turnitin's other services is subject solely to Turnitin's Terms of Service and Privacy Policy, and Queen's University has no liability for any independent interaction you choose to have with Turnitin.

Accommodations for Disabilities

Queen's University is committed to working with students with disabilities to remove barriers to their academic goals. Queen's Student Accessibility Services (QSAS), students with disabilities, instructors, and faculty staff work together to provide and implement academic accommodations designed to allow students with disabilities equitable access to all course material (including in-class as well as exams). If you are a student currently experiencing barriers to your academics due to disability related reasons, and you would like to understand whether academic accommodations could support the removal of those barriers, please visit the [QSAS website](#) to learn more about academic accommodations or start the registration process with QSAS by clicking *Access Ventus* button at [Ventus | Accessibility Services | Queen's \(queensu.ca\)](#)

VENTUS is an online portal that connects students, instructors, Queen's Student Accessibility Services, the Exam's Office and other support services in the process to request, assess, and implement academic accommodations.

To learn more go to: <https://www.queensu.ca/ventus-support/students/visual-guide-ventus-students>

Academic Consideration for Students in Extenuating Circumstances

Academic Consideration is a process for the University community to provide a compassionate response to assist students experiencing unforeseen, short-term extenuating circumstances that may impact or impede a student's ability to complete their academics. This may include but is not limited to,

- Short term Physical or Mental Illness or Injury (stomach flu, anxiety/depression, mononucleosis, concussion, broken bones, surgery, medical treatments, etc.)
- Traumatic Event/Confidential (Bereavement, serious injury, illness or required treatment for a significant other/family member or a traumatic event such as divorce, sexual assault, social injustice, etc.)
- Requirements by Law or Public Health Authorities (court dates, jury duty, requirements to isolate, etc.)
- Significant Event (varsity athletic event, distinguished event, serving in the Reserve Forces, etc.)

Queen's University is committed to providing academic consideration to students experiencing extenuating circumstances. For more information, please see the [Senate Policy on Academic Consideration for Students in Extenuating Circumstances](#).

Each Faculty has developed a protocol to provide a consistent and equitable approach in dealing with requests for academic consideration for students facing extenuating circumstances. For more information, undergraduate students in the Faculty of Arts and Sciences should consult the Faculty's webpage on [Academic Consideration in Extenuating Circumstances](#) and submit a request via the [Academic Consideration Request Portal](#). Students in other Faculties and Schools who are enrolled in this course should refer to the protocol for their home Faculty.

Students are encouraged to submit requests as soon as the need becomes apparent and to contact their instructor and/or course coordinator as soon as possible once academic consideration has been granted. Any delay in contact may limit the options available for academic consideration.

For more information on the Academic Consideration process, what is and is not an extenuating circumstance, and to submit an Academic Consideration request, please see the Faculty of Arts and Science's [Academic Consideration website](#). ASO courses include links to information on **Academic Consideration** on your **Course Homepage** in onQ.

If you need to request academic consideration for this course, you will be required to provide the name and email address of the instructor/coordinator. Please use the following:
Instructor Name: Zhe She
Instructor email address: zhe.she@queensu.ca

Timing of Final Examinations

Once the exam schedule has been finalized, the exam date will be posted on your SOLUS account. The exam dates for each term are listed on the Faculty of Arts and Science webpage under "[Important Dates](#)." Student exam schedules for the Fall Term are posted on SOLUS immediately prior to Thanksgiving and on the Friday before Reading Week for the Winter Term. **Students should delay finalizing any travel plans until after the examination schedule has been posted. Exams will not be moved or deferred to accommodate employment, travel/holiday plans or flight reservations. For information regarding what is considered extenuating circumstances**

and qualifications for Academic Consideration, please visit the [Faculty of Arts and Science's Academic Consideration webpage](#).

Discussion Guidelines

University is a place to share, question and challenge ideas. Each student brings a different lived experience from which to draw upon. To help one another learn the most we can from this experience please consider the following guidelines.

1. Make a personal commitment to learn about, understand, and support your peers.
2. Assume the best of others and expect the best of them.
3. Acknowledge the impact of oppression on the lives of other people and make sure your writing is respectful and inclusive.
4. Recognize and value the experiences, abilities, and knowledge each person brings.
5. Pay close attention to what your peers write before you respond. Think through and re-read your writings before you post or send them to others.
6. It's ok to disagree with ideas, but do not make personal attacks.
7. Be open to being challenged or confronted on your ideas and to challenging others with the intent of facilitating growth. Do not demean or embarrass others.
8. Encourage others to develop and share their ideas.