

Advanced Analytical Chemistry
CHEM/ENCH 411
Fall 2021

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Questions?

1. Use the onQ discussion forum so that the whole class may benefit from the answers to your questions.
2. Ask during office hours (through Teams) Tuesday 9:30-10:30 am, starting September 14.
3. Those on campus may drop by my office (open-door policy).
4. Make an appointment (in person or virtual).

onQ: This electronic tool can only be accessed by students registered in CHEM/ENCH 411 by going to <https://onq.queensu.ca/d2l/home>. It contains:

- the course material (i.e. syllabus, slides, lecture videos, practice problems, answers to some past final exams, quizzes, etc.)
- your grades,
- a discussion forum where questions can be asked about the course material,
- a discussion forum for group tests,
- a discussion forum for oral presentations to be made in pairs.

Equity, Diversity and Inclusivity Statement

Equity in an educational institution is achieved when all members of our society have fair and equal opportunity to participate in and enjoy the benefits of an education, including the opportunity to experience success and human dignity while developing the skills, knowledge and attitudes necessary to contribute as leaders and citizens in society.

This is the reason why this course is offered remotely and asynchronously, as this maximizes accessibility. Last year, several students on internships took my course. The switch to asynchronous delivery did not significantly affect student performance as can be seen in the below summary of mark distributions over the last 5 years.

Year	# of students	Average	Lowest mark	Highest mark	% ≥80%
2020 (asynchronous)	27	80	56	99	78
2019 (in person)	19	82	53	97	74
2018 (in person)	20	83	65	100	70
2017 (in person)	20	85	72	98	80
2016 (in person)	20	84	70	98	70

Note: in the asynchronous format, more material is covered than in class (no class is missed for Thanksgiving or Remembrance Day Service) and in much less time because in-class activities (review at the beginning of class, questions, bingo game during class, etc.) cannot be held.

Recommended Text: Quantitative Chemical Analysis, 9th Ed., *Daniel C. Harris*, Freeman & Company (or other editions)

Summary of Assessment:

Group tests (5)	15%	(best 4 out of 5)
Individual on-line quizzes (5)	25%	(best 4 out of 5)
5-min oral presentation	20%	(during last two weeks of class)
Final exam	40%	(3-hour exam that will include a 10% bonus question; date to be set by the Exams Office)

All examinations are open-book.

Assessment Timing and Weight

Assessment	Material covered	Open period	Weight
Individual quiz 1	Week 1	September 10 th – 13 th	5%
Group test 1	Week 2	September 17 th – 20 th	3%
Group test 2	Week 3	September 24 th – 27 th	3%
Group test 3	Week 4	October 1 st – 4 th	3%
Individual quiz 2	Week 5	October 8 th – 18 th	5%
Individual quiz 3	Week 6	October 22 nd – 25 th	5%
Individual quiz 4	Week 7	October 29 th – November 1 st	5%
Individual quiz 5	Week 8	November 5 th – November 8 th	5%
Group test 4	Week 9	November 12 th – November 15 th	3%
Group test 5	Week 10	November 19 th – November 22 nd	3%
Oral presentation*	Literature paper	Post by November 19 th	20%
Ask questions (optional)	Presentations by others	Post questions by November 26 th	
Answer questions	Questions on your presentation	Answer questions by December 1 st	
Bonus	Assessment of other oral presentations	Submit marks by December 3 rd	≤5%
Final exam	Whole course	Date to be set by the Exams Office	40%

* 5 min per student will occupy 240 min, leaving some time to ask questions and evaluate the performance of each speaker. You should assign a mark out of 15 after watching each presentation and then add a mark out of 5 when you look at the answers in the discussion forum.

For students writing the final exam remotely, Regulation 7.2.3. Restrictions on Assessment is waived. Remote exams will be allowed in the last two weeks of classes and in the study period designated by Senate prior to the examination period to accommodate the limited number of online proctoring seats available.

Students who feel that there are reasons to review their grades should follow the steps set out in Regulation 13 'Review and Appeal of Grades.'

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.”

Location and Timing of Final Examinations

As noted in Academic Regulation 8.2.1, “the final examination in any class offered in a term or session (including Summer Term) must be written on the campus on which it was taken, at the end of the appropriate term or session at the time scheduled by the Examinations Office.” The exam period is listed in the key dates prior to the start of the academic year in the Faculty of Arts and Science Academic Calendar and on the Office of the University Registrar’s webpage. A detailed exam schedule for the Fall Term is posted before the Thanksgiving holiday. **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.**

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

Academic Integrity

Queen’s students, faculty, administrators and staff all have responsibilities for upholding the [fundamental values of academic integrity](#); honesty, trust, fairness, respect, responsibility and courage. These values 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 (see the [Senate Report on Principles and Priorities](#)).

Students are responsible for familiarizing themselves with the regulations concerning academic integrity and for ensuring that their assignments and their behaviour conform to the principles of academic integrity. Information on academic integrity is available in the Arts and Science Calendar (see [Academic Regulation 1](#)), on the [Arts and Science website](#), and from the instructor of this course. Departures from academic integrity include plagiarism, use of unauthorized materials, facilitation, forgery and falsification, and are antithetical to the development of an academic community at Queen's. Given the seriousness of these matters, actions which contravene the regulation on academic integrity carry sanctions that can range from a warning or the loss of grades on an assignment to the failure of a course to a requirement to withdraw from the university.

We all share in maintaining a culture of integrity, if you become aware of anyone trying to share, or solicit, answers to tests or exams, please remind them that this is against the rules and inform me immediately.

Copyright of Course Materials

Course materials created by the course instructor, including all slides, presentations, handouts, tests, exams, and other similar course materials, are the instructor's intellectual property. 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 (including note sharing sites), 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.

Learning objectives

The instructor will:

- ◆ Explain advanced topics in analytical chemistry in a down-to-earth, useful way.
- ◆ Review and deepen some of the knowledge acquired in second or third year analytical chemistry.
- ◆ Teach new material using interactive activities to deepen student learning.
- ◆ Ensure students' understanding through weekly open-book quiz or test.
- ◆ Give feedback to students to group tests within a week of each weekly test.
- ◆ Inasmuch as possible, answer questions on onQ by the next workday.
- ◆ Give many examples.

Learning expectations and outputs

Students will:

- ◆ Watch every lecture video.
- ◆ Participate in the learning activities.
- ◆ Take the on-line quizzes individually.
- ◆ Be valued members of their team during group tests.
- ◆ Ask questions on onQ so that everybody may benefit from the answers.
- ◆ Not wait until the last minute to prepare their oral presentation.
- ◆ Watch other students' oral presentations and objectively mark them.

Learning outcomes

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

- ◆ Select the best way to take a representative sample.
- ◆ Calculate the uncertainty associated with the primary and secondary sampling steps, as well as the overall uncertainty of the method.
- ◆ Develop analytical methods including sampling, storage and preservation, sample preparation, sample introduction into the analyzer, and calibration strategy.
- ◆ Describe the main components of a mass spectrometer and their purpose.
- ◆ Use isotopic abundance information to deduce the elemental composition of an unknown.
- ◆ Interpret mass spectra obtained using electron ionization.
- ◆ Make a clear oral presentation.

Course Outline

- 1. Introduction and review of fundamental concepts** (Week 1)
- 2. Sampling strategies for liquid, solid and gaseous samples** (Week 2)
- 3. Storage and preservation considerations** (Week 3)
- 4. Advanced sample preparation methods** (Week 4)
 - Microwave-assisted strategies
 - Sorbent extraction
 - Solid-phase microextraction
 - Chemical vaporization
- 5. Inductively coupled plasma (ICP) spectrometry** (Weeks 5-6)
 - Conventional sample introduction
 - Plasma processes
 - Calibration strategies
 - Hyphenation to liquid chromatography
 - Hyphenation to flow injection analysis
- 6. Mass spectrometry instrumentation** (Weeks 7-8)
 - Sample introduction systems
 - Ionisation methods
 - Mass analysers
- 7. Interpretation of a mass spectrum** (Weeks 9-10)
- 8. ICP spectrometry and mass spectrometry applications:** Oral presentations (Weeks 11-12)

Netiquette / Discussion Guidelines

Queen's University is a place to share, question, and challenge ideas. Each student brings a different set of lived experiences. You can help to create a safe, respectful place for learners by promoting 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 other people's lives 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 alright to disagree with ideas, but do not make personal attacks.
7. Be open to being challenged or confronted on your ideas and challenge others with the intent of facilitating growth. Do not demean or embarrass others.
8. Encourage others to develop and share their ideas.

Web Browsers

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.

Internet Speed

While a wired Internet connection is encouraged, we recognize that most students rely on a wireless connection. A minimum download speed of 10 Mbps and up to 20 Mbps for multimedia is recommended. Click here for an [Internet speed test](#).

Remote Course Support

For technology support ranging from setting up your device, issues with onQ to installing software, contact [ITS Support Centre](#).

Accommodation

Queen's University is committed to achieving full accessibility for people with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all their academic activities. The Senate Policy for Accommodations for Students with Disabilities was approved at [Senate in November 2016](#). If you are a student with a disability and think you may need academic accommodations, you are strongly encouraged to contact the **Queen's Student Accessibility Services (QSAS)** and register as early as possible. For more information, including important deadlines, please visit the [QSAS website](#).

Academic Considerations for Students in Extenuating Circumstances

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. Arts and Science undergraduate students can find the Faculty of Arts and Science protocol and the [portal where a request can be submitted](#). Students in other Faculties and Schools who are enrolled in this course should refer to the protocol for their home Faculty.

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 contact information:

- Instructor/Course Coordinator Name: Diane Beauchemin
- Instructor/Course Coordinator email address: diane.beauchemin@queensu.ca

Students are encouraged to submit requests as soon as the need becomes apparent and to contact their Professors/Course Coordinators as soon as possible once Consideration has been granted. Any delay in contact may limit the Consideration options available.

For more information on the Academic Consideration process, what is and is not an extenuating circumstance, and to submit an Academic Consideration request, [please visit website](#).