Instructor: Diane Beauchemin  
Office: Chernoff 308  
Phone: 533-2619  
E-mail: diane.beauchemin@chem.queensu.ca  

Questions? Office hour (through Teams); Monday 13:30-14:30 Kingston, ON time  
Use the onQ discussion forum so that the whole class may benefit from the answers to your questions.

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 and practice problems)  
▪ a week-by-week breakdown of course material and quizzes,  
▪ your grades  
▪ tips to help you  
▪ discussion board where questions can be asked about the course material  
▪ discussion board for group tests

Calculator Policy  
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.

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

Assessment:  
Group tests (5) 15%  
Individual on-line quizzes (5) 25%  
Oral presentation 20% (during last two weeks of class)  
Final exam 40% (3-hour exam; date to be set by Exams Office)  
All examinations are open-book.

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.'

Timing of Final Examinations  
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 via SOLUS immediately prior to 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:

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<tr>
<th>Grade</th>
<th>Numerical Course Average (Range)</th>
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<td>A+</td>
<td>90-100</td>
<td>B+</td>
<td>77-79</td>
<td>C+</td>
<td>67-69</td>
<td>D+</td>
<td>57-59</td>
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<td>A</td>
<td>85-89</td>
<td>B</td>
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<td>63-66</td>
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<td>A-</td>
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**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 (see [www.academicintegrity.org](http://www.academicintegrity.org)). 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 [http://www.queensu.ca/secretariat/policies/senate/report-principles-and-priorities](http://www.queensu.ca/secretariat/policies/senate/report-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 [http://www.queensu.ca/artssci/academic-calendars/regulations/academic-regulations/regulation-1](http://www.queensu.ca/artssci/academic-calendars/regulations/academic-regulations/regulation-1)), on the Arts and Science website (see [https://www.queensu.ca/artssci/students-at-queens/academic-integrity](https://www.queensu.ca/artssci/students-at-queens/academic-integrity)), 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.

Please note that, regardless of how and where you retrieve information, the principles of academic integrity apply. Please visit these helpful websites to help you make sure that you write things in your own words:

- [https://www.queensu.ca/academicintegrity/students/avoiding-plagiarismcheating](https://www.queensu.ca/academicintegrity/students/avoiding-plagiarismcheating)
- [https://integrity.mit.edu/handbook/academic-writing/avoiding-plagiarism-paraphrasing](https://integrity.mit.edu/handbook/academic-writing/avoiding-plagiarism-paraphrasing)

Also, you must work independently on quizzes.
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 and third year analytical chemistry.
✦ Teach new material using learning activities involving student participation to deepen student learning.
✦ Ensure students’ understanding through weekly open-book tests.
✦ Give feedback to students 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:

✦ Go through all the course material.
✦ Participate in the learning activities.
✦ Take the weekly examination (individual quiz or group test).
✦ 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.
✦ Attend 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.

Copyright of Course Materials

This material, including that on the CHEM/ENCH 411 onQ website, is copyrighted and is for the sole use of students registered in CHEM/ENCH 411. The material on this website may be downloaded for a registered student’s personal use, but shall not be distributed or disseminated to anyone other than students registered in CHEM/ENCH 411. Failure to abide by these conditions is a breach of copyright, and may also constitute a breach of academic integrity under the University Senate’s Academic Integrity Policy Statement.
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 and sampling uncertainties (Week 3)
4. Advanced sample preparation methods (Week 4)
   a) Microwave-assisted strategies
   b) Sorbent extraction
   c) Solid-phase microextraction
   d) Chemical vaporization
5. Flow injection analysis (Week 5)
   a) Principles
   b) Classification of flow injection systems
   c) Stopped flow
   d) Sequential injection
6. Inductively coupled plasma (ICP) spectrometry (Week 6)
   a) Conventional sample introduction
   b) Plasma processes
   c) Calibration strategies
   d) Hyphenation to liquid chromatography
   e) Hyphenation to flow injection analysis
7. Mass spectrometry instrumentation (Weeks 7-8)
   a) Sample introduction systems
   b) Ionisation methods
   c) Mass analysers
8. Interpretation of a mass spectrum (Weeks 9-10)
9. ICP spectrometry and mass spectrometry applications: Oral presentations (Weeks 11-12)
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 of their academic activities. The Senate Policy for Accommodations for Students with Disabilities was approved at Senate in November 2016 (see https://www.queensu.ca/secretariat/sites/webpublish.queensu.ca.uslcwww/files/files/policies/senateandtrustees/ACADACCOMMPOLICY2016.pdf). 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 at: http://www.queensu.ca/studentwellness/accessibility-services/

Academic Considerations for Students in Extenuating Circumstances
Queen’s University is committed to providing academic consideration to students experiencing extenuating circumstances that are beyond their control and are interfering with their ability to complete academic requirements related to a course for a short period of time. The Senate Policy on Academic Consideration for Students in Extenuating Circumstances is available at http://www.queensu.ca/secretariat/sites/webpublish.queensu.ca.uslcwww/files/files/policies/senateandtrustees/Academic%20Considerations%20for%20Extenuating%20Circumstances%20Policy%20Final.pdf. Arts and Science undergraduate students can find the Faculty of Arts and Science protocol and the portal where a request can be submitted at: http://www.queensu.ca/artsci/accommodations. 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. Please use the following:
   Instructor Name: Diane Beauchemin
   Instructor email address: diane.beauchemin@queensu.ca

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.