Queen's University

Chemistry




# 2026-2030 Strategic Plan

## Land Acknowledgement

The Department of Chemistry at Queen's University is situated on traditional Anishinaabe and Haudenosaunee Territory. To acknowledge this traditional territory is to recognize its longer history, one predating the establishment of the earliest European colonies. It is also to acknowledge this territory's significance for the Indigenous Peoples who lived, and continue to live, upon it and whose practices and spiritualities were tied to the land and continue to develop in relationship to the territory and its other inhabitants today.

We are grateful to work, study, learn, and teach on these lands. We invite our community members and visitors to reflect on the land we occupy, continue their education on Indigenous matters, and consider actions we can take as individuals and a collective towards reconciliation.

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# 1. Executive Summary

The Department of Chemistry commits to excellence and innovation in research and teaching, fosters diversity of perspectives in our students and faculty, and works to address global challenges through interdisciplinary partnerships and inclusive solutions in which **sustainability** and **education** underpin sector-leading work in materials & energy, molecules & living systems, and computational theory & artificial intelligence.

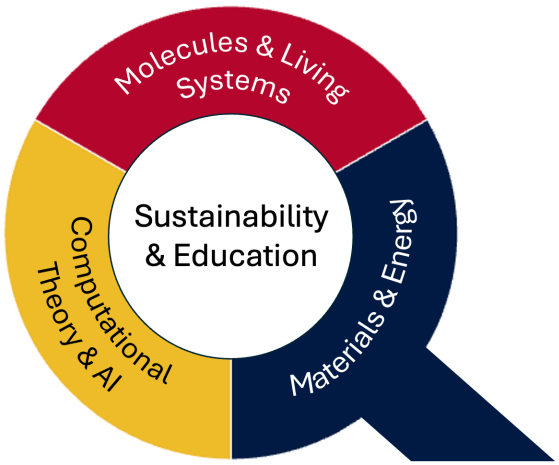



*Figure 1: Research priorities for the department are based upon the overarching themes of sustainability and education, with particular focus on Molecules & Living Systems, Materials & Energy, and Computation Theory & Artificial Intelligence.*

We are modernizing our undergraduate and graduate curricula to provide the flexible educational experience desired by students while also meeting the needs of employers who increasingly value creative thinking, leadership skills, and environmental stewardship. For the undergraduate programs, we are integrating educational technologies and experiential learning opportunities. Flexible program pathways are being created to better accommodate diverse student interests and meet the needs of cognate departments. Green and sustainable chemistry will be further integrated into our undergraduate curriculum, including required courses such as our first-year flagship course CHEM 112.

Graduate offerings are also being adjusted to match the current needs of students and their future employers. In addition to core science courses, we also offer graduate courses in *Business Skills* and *Science Leadership and Management*, increasingly offer seminars in career-related topics, and encourage selection of graduate courses in other departments to supplement those available in chemistry. To further assist our graduate students, we continue to increase our minimum stipends in line with inflation, finding ways to reduce the workload for teaching assistants (TAs), and improving our tracking and compliance of graduate program milestones and expectations to facilitate learning.

To mutually benefit our researchers and the wider community, we continually aim to build ties to industry, governments, and the public, including outreach, research collaborations, service, and knowledge mobilization.

Research facilities in the department are essential to our research and educational efforts and future expansion. Cross-training initiatives, streamlining administrative processes, and expanding access for students and external collaborators are being implemented, as well as keeping current with infrastructure investments.

As we look to the future, to support and expand our outstanding interdisciplinary research and teaching programs at Queen's, faculty recruitment in the following areas are departmental priorities.

- Theoretical and Computational Chemistry
- Analytical Chemistry
- Medicinal Chemistry
- Green Energy
- Green Chemistry

We have recently experienced exciting expansion in key research areas such as health-related chemistry and surface chemistry, reflecting both societal needs and the department's strategic priorities. These areas of increasing strength position us to elevate our research impact and foster a more robust, sustainable research environment.

The important departmental focus on indigenization, equity, diversity, inclusion, anti-racism, and accessibility will be further emphasized, recognizing past success in inclusion of several equity-seeking groups while recognizing the need to improve diversity and inclusivity of the chemistry community. This will include student groups that are actively working with the department to improve equity and awareness

## 2. Introduction

The Department of Chemistry at Queen's University is one of the oldest chemistry departments in Canada. Queen's offered instruction in chemistry as early as 1854 and has been granting degrees in Chemistry for over 130 years.



*Figure 2: Chemistry teaching lab in Carruthers Hall at Queen's University in 1905.*

We are grateful for the past many years of smooth sailing; as a department, we've had 9 new faculty hires since summer 2018, new centres created, and many prestigious awards

received. Queen's University is ranked 4th in the world and 1st in Canada by the Times Higher Education Impact Rankings for advancing sustainability, a notable area of strength for Chemistry. The faculty in our department win more awards per capita from the Chemical Institute of Canada, the Canadian Society of Chemistry, and Natural Sciences and Engineering Research Council of Canada (NSERC) than any other chemistry department in Ontario. Our world class research and instrumentation facilities are used by not just our own Highly Qualified Personnel but by researchers from departments across campus and beyond. We brought in $37.3 million in federal funding for research during 2021-2026, plus $6.1 million in other funding (including provincial, foundations, US government, and corporate sources). Our faculty, students, and postdoctoral fellows (PDFs) perform collaborative and interdisciplinary research; two thirds of our published papers have an international coauthor! The courses we offer to our graduate students include, in addition to the obvious chemistry topics, critical professional skills, research management, leadership, and scientific communication – these are valued by future employers of our students. Enrolment in Chemistry has increased in the 2020-2025 period for both our undergraduate and graduate programs. Our recent graduates have a 100% employment rate after 6 months post-graduation.

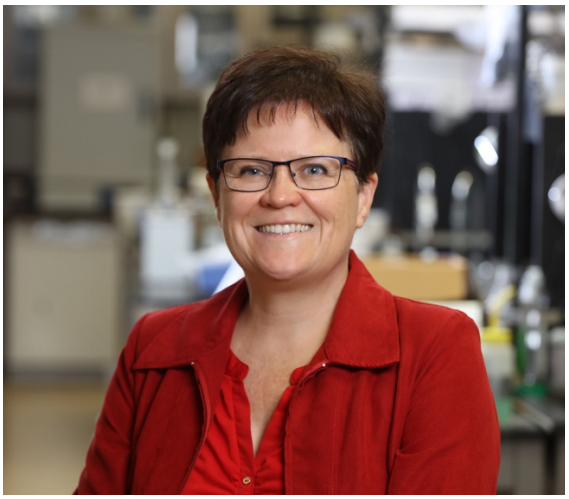


*Figure 3: Dr. Cathleen Crudden, Canada Research Chair in Metal Organic Chemistry and Scientific Director of the Carbon to Metal Coating Institute.*

Although we are celebrating our successes, stormy weather currently threatens the Department of Chemistry and the university as a whole. Headwinds faced by the department include financial constraints, staff layoffs, reduced teaching capacity, and physical issues with the building. Our future relies upon not only excellence in teaching and research but also self-reflection and strategic planning for a path forward.

## Vision

> *The Department of Chemistry is committed to excellence in education, research, and innovation, cultivating a dynamic community of students, faculty, and staff. Our vision is to create a modern, flexible, and distinctive academic environment that prepares trainees for diverse career paths while maintaining a leadership role in cutting-edge research.*

Through strategic faculty recruitment, curriculum modernization, enhanced research support, and continued investment in infrastructure, our vision is to create a department that is inclusive, innovative, and forward-looking—preparing students to thrive in diverse careers and positioning Queen's Chemistry at the forefront of global research and education.

Our **vision** for the future includes enhancing and expanding our research strengths, especially in fields of research that address 21st century challenges, such as sustainability and energy production and storage. We also seek to enhance our graduate and undergraduate programs to reflect the needs of our students and the job market demands they face. This plan will increase the research strength and diversity of our department, as evidenced by: a faculty and student body that reflects the community it serves; more collaborations with other departments and industries (local and global); increased grant funding levels, especially in collaborative and institutional grant programs (e.g.: NSERC CREATE, Alliance, NFRF, CFI); increased enrolment in our graduate program (especially by domestic students); and a vibrant undergraduate program with a modern curriculum.

An important departmental focus is to continue our efforts towards indigenization, equity, diversity, inclusion, anti-racism, and accessibility. Representation of women, Indigenous persons, visible minorities, and persons with disabilities are higher in the student population of our department than in Queen's as a whole. Women are well represented amongst our faculty, in comparison to chemistry departments at other universities in Canada. Since 2015, we have had gender parity in faculty hiring. We have 100% compliance in the required training for faculty and staff, including "Working Together: Building an Inclusive Queen's Community." Student groups are working actively with the department to improve equity and awareness.

Thus, using the language of the university's **Bicentennial Vision**, we prioritize "an inclusive and supportive campus culture where every student, staff, and faculty member knows they belong" and we align our research "with areas of strength and emerging societal needs."

## Departmental Governance

To support our academic and research goals, administrative duties are assigned to individuals and committees. Individuals can express their preferences for administrative duties, and the Department Head assigns these duties, which are held from 1 July- 30 June. However, elected committees operate from 1 May - 30 April. When the Department Head assigns duties, several factors are considered, including individual preferences, rank

(assistant professors do not chair committees), and workload (some committees require more effort than others). Administrative duties range from program reviews to outreach.

## Community, Outreach and Engagement

Although our programs and funding successes showcase the department's many achievements, its greatest strength is its people. Queen's Chemistry is home to a distinctive community, energized by an engaged student body that is encouraged to develop leadership skills with contributions that move far beyond the classroom (e.g. Department Student Council (DSC), Queen's Graduate Chemistry Society (QGCS), Queen's Chemistry Inclusivity Diversity Equity and Awareness Society (QC-IDEAS), and the Queen's University International Student Chapter of the American Chemical Society (Q-ACS)). The department provides comprehensive support to its students, staff, and faculty across academic, research, and personal domains. The leadership team continually identifies and addresses opportunities to strengthen workplace culture. Rather than fostering internal competitiveness, we emphasize support by recognizing and celebrating our people, for example through award nominations. This culture of care is reflected in the continued engagement of our community, with many alumni choosing to remain connected to the department well beyond their studies, including attending homecoming or participating in the Queen's Chemistry Innovation Council (QCIC).

The QCIC is an advisory body enabling greater interaction among the Department, Industry, Government, and other business areas. The group works with the department to ensure that Queen's programs are innovative, and aligned with the needs of employers. It provides our community members with an opportunity to connect with external bodies (e.g., student engagement with QCIC in the Fall term). The QCIC is a critical and unique example of the important leadership roles our chemistry alumni move into and the value they attribute to a Queen's chemistry education.

Collaboration with other departments and faculties within the university is prevalent. We have faculty cross-appointed or jointly appointed with Biomedical and Molecular Sciences, Chemical Engineering, Environmental Studies, and Physics, plus active collaborations with many more departments across Queen's and institutions around the world.

We are ideally situated for a focus on sustainability. Kingston is the number one city in Canada for cleantech and 8$^{th}$ in the world. The city is home to many chemistry-based companies and organizations such as Celanese, Cyclic Materials, Impact Chemistry* (formerly GreenCentre Canada), IDEXX Canada (Kingston),* JEOSAL, Kingston Aluminum Technology (KAT), Kingston Process Metallurgy* (KPM), Qnity (formerly DuPont), and

Reaction Hub*. Those with asterisks were created (at least in part) by our faculty or alumni. The chemistry department strives to work closely with industry to build a deliberate, strategic, and mutually beneficial relationship. Beyond the professional sectors, our department also engages with the local Kingston community. We have regular outreach activities such as tours of Chernoff, summer camps, and visits to local high schools, often organized by our research centres (C2MCI and CEC-REN). Science Stores serves as a resource for the community, including local high schools. Science Rendezvous impacts the largest audience, annually hosting ~ 5,000 visitors with hands-on science activities; we contribute multiple booths and perform a live Chemistry Magic Show! We enjoy interacting with community members of all ages, and hope our performance sparks their interest in science.

# 3. Academic Strategy

## Undergraduate Program

Queen's Chemistry is positioned to be a first-choice destination for chemistry education through the integration of innovative research, award-winning faculty, and state-of-the-art facilities. Our academic programs equip students with the knowledge and practical skills necessary for success across a wide range of careers, with hands-on learning and access to advanced resources fostering the ability to address real-world challenges.



*Figure 4: A live stage demonstration at the moment a hydrogen balloon ignites during the Chemistry Magic Show at Science Rendezvous Kingston, 2025.*

The Department of Chemistry offers seven undergraduate programs—Bachelor of Science Honours (Specialization), Bachelor of Science Honours (Specialization in Environmental Chemistry), Bachelor of Science Honours (Major), Bachelor of Science Honours in Foundations in Chemistry (Modular Major), Bachelor of Arts (General), Bachelor of Science (General), and Bachelor of Science (Minor)—as well as three graduate

programs: Master of Applied Science, Master of Science, and Doctor of Philosophy. In collaboration with Chemical Engineering, we also offer a BASc in Engineering Chemistry.

At the undergraduate level, we are making several key improvements to enhance student learning, engagement, and program distinctiveness.

- We have introduced a new modular major in Foundations in Chemistry to allow students to complete a double major in chemistry and another subject, such as Computer Science. This new Major will not require a 4$^{th}$ year research experience, which should alleviate the over-enrollment in that course and simultaneously allow students to tailor their program to their unique goals.
- The curriculum is being evaluated for modernization through the integration of technology (including virtual reality), practical demonstrations at all levels, active learning tools, programming, MakerSpace activities, more experiential learning opportunities with external organizations, and improved alignment between lab and lecture components.
- Courses in AI and machine learning are already being introduced into our grad program, with AI incorporation into our undergraduate program and/or a minor in these topics offered by the Department of Computing being considered for the future.
- We will introduce flexible program pathways and streams to accommodate diverse student interests, meet the needs of cognate departments—including Life Sciences and Health Sciences—and streamline general chemistry courses to focus on essential content. Assessment methods are being updated with technology-assisted strategies that maintain authenticity and accreditation compliance.
- We will integrate green and sustainable chemistry concepts across courses (including CHEM 112). The department signed the Green Chemistry Commitment in 2025, committing to expand our coverage of green and sustainable aspects of chemistry in our curriculum.

Together, these enhancements aim to create a modern, engaging, and distinctive undergraduate program that prepares students for a wide range of future employment opportunities.



*Figure 5: Chernoff Hall's modern teaching facilities, showcasing CHEM 112 students during laboratory classes.*

## Graduate Program

To provide cutting-edge training in our graduate program, we are expanding the range of graduate course options available across different fields of study. This includes recommending students engage with graduate courses in other departments (e.g., chemical engineering, physics, etc.) and developing collaborative grad courses that are offered jointly with other departments or universities. In parallel, an evaluation of the current number of required modules in MSc and PhD programs may be beneficial. We provide additional non-traditional training opportunities, such as leadership development, business skills, I-EDIAA, *and* industrial guest lectures that complement existing courses like CHEM 894 *Business Skills in the Chemical Industry* and PHYS/CHEM 904 *Science Leadership & Management*. These two courses are designed specifically to increase the ability of our students to obtain leadership roles in their future employment. We are committed to further explore and promote non-traditional training programs to better prepare students for diverse career paths; these include entrepreneurial and AI opportunities.

With the rising cost of living, student funding is an important topic. We will continue to keep graduate stipends roughly in line with inflation. The department also feels it's important to protect current funding sources and levels (in the form of TA contracts or otherwise) and seek additional funding opportunities. Simultaneously, teaching assistant workloads are being revised in conjunction with updating assessment methods for undergraduates. We are also implementing methods for better tracking student progress through the degree requirements (e.g. annual reports, candidacy exams, and research seminar) and tracking

and improving time to completion. Analyzing data on graduate employment outcomes will help further refine the program to better support students' post-graduation careers.

# 4. Research Strategy

## Research Activities

On the research front, we aim to drive next-generation discovery and problem-solving, aligning our initiatives with national and international research strategies and ethical frameworks, including the Dimensions Charter, the Scarborough Charter, the First Nations Principles of OCAP®, the Principles of Ethical Métis Research, the National Inuit Strategy on Research, and the Declaration on Research Assessment (DORA). By following the strategic objectives outlined by the Vice-Principal Research's Office, the Department of Chemistry continues to position itself as a leader in both impactful research and transformative education, while simultaneously enhancing the inclusiveness and diversity of our community.



*Figure 6: Dr. Kevin Stamplecoskie received the 2025 Keith Laidler Award from the Canadian Society for Chemistry (CSC) for outstanding early-career contributions to physical chemistry.*

Our research expertise spans Analytical/Environmental, Biological, Chemistry Education, Inorganic/Organometallic, Materials/Polymer, Organic, Physical, and Theoretical/Computational Chemistry. This excellence is recognized internationally, with Stanford University ranking many of our faculty among the top 2% of researchers in their respective fields.

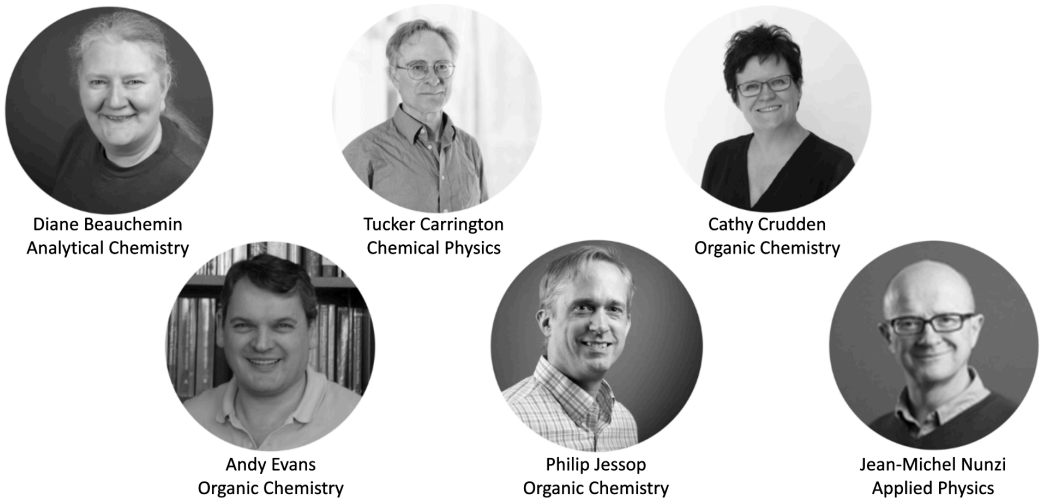



*Figure 7: Stanford University recognized six current Department of Chemistry faculty members among the top 2% of researchers in their respective fields, based upon impact in 2024. Four past faculty members (Drs. Gregory Jerkiewicz, Suning Wang, Vic Snieckus, and Guojun Liu) were similarly recognized. (https://topresearcherslist.com)*

Within the department there are four research institutes or centres.

1. The **Carbon to Metal Coating Institute** (C2MCI) is a Tier 1 research, innovation, and education institute developing technologies for preventing corrosion of metals and stabilizing them on nanometer scales. (Scientific Director: Dr. Crudden)
2. **Open Plastic** is a research consortium of faculty from seven universities harnessing enzymes and bacteria to break down waste plastic into recyclable components or valuable fine chemicals. (Project Leaders: Dr. Zechel, Dr. diCenzo (Biology), and Dr. McLellan (Chemical Engineering))
3. The **Contaminants of Emerging Concern Research Excellence Network** (CEC-REN) is a network of researchers at Queen's and Royal Military College studying the fate, transport, detection, and remediation of pollutants that have not yet been regulated by governments. (Co-Directors: Dr. Champagne and Dr. Jessop)
4. The NSERC CREATE to **Transform Scientific Computing Training to Advance Molecular Modeling in the Age of Artificial Intelligence** is a joint McMaster/Queen's initiative to modernize scientific computing training and research for molecular modeling in the age of AI. (Co-Directors: Dr. Heidar-Zadeh and Dr. Ayers (McMaster))

Several areas of exceptional strength position us as leaders in both research and teaching. We have deep expertise in sustainability and environmental science. Our excellence in nanomaterials, health applications, and advanced imaging drives innovative solutions at the interface of chemistry and medicine. In addition, our strong mass spectrometry and analytical chemistry capabilities support cutting-edge interdisciplinary research, while our expertise in mass spectrometry, materials science, and biocatalysis further enhances our

reputation for high-quality, collaborative science. Collectively, these strengths create a vibrant, forward-looking department with a strong foundation for continued growth and innovation.

Our research objectives require sustaining and enhancing our **infrastructure** (see Research Facilities), which will be better supported through improvements to both **pre- and post-award processes**. While Queen's has recently strengthened post-award support, there remain few incentives or benefits for undertaking grant applications. The substantial time and effort required for proposal preparation are not acknowledged through administrative relief or added support unless faculty can buy out their time—an option that disadvantages those with fewer resources. As a department, we aim to establish mechanisms that provide faculty with meaningful assistance during the grant preparation stage, including, when possible, assistance from facilities managers and reduced responsibilities. Strengthening this support system is anticipated to streamline proposal development, increase the likelihood of successful applications, and enhance overall research productivity across the department.

Within our overall themes of **Sustainability** and **Education**, we have identified three priority areas for promising research specialization:

- **Materials and Energy**, such as surface chemistry, nanomaterials, electrochemistry, batteries, green energy, recycling, and $CO_2$ utilization/sequestration.
- **Molecules and Living Systems**, including green chemistry, biochemistry, medicinal chemistry, and environmental chemistry.
- **Computational Theory and Artificial Intelligence**, including machine learning, theoretical chemistry, and computational methods.

Our research priorities are in alignment with the vision of the university's **Bicentennial Vision**, which prioritizes "leadership in global sustainable development by supporting research, teaching, partnerships, and operations that address pressing social, economic, and environmental challenges."

The overlap of our priorities with those identified in the university's **Strategic Research Plan** (2025-2030) is remarkable. Of the six research themes prioritized in that document, our plans directly address five!

*Table 1: Correlating our research priorities with the university's Strategic Research Plan.*

| Strategic Research Plan theme | Materials & Energy | Molecules & Living Systems | Computational Theory & AI |
|---|---|---|---|
| Understanding the Earth & universe | | 1 | 2 |
| Promoting heath and wellbeing | | 3 | |
| Delivering materials for the future | 4 | 5 | |
| Advancing next-generation computing and analytics | | | 6 |
| Building productive, inclusive and sustainable societies | 7 | 8 | |

[1]Environmental chemistry, composition, structure, and physical aspects of the Earth, including freshwater systems, [2]Developing mathematical models that describe physical phenomena, elucidating the nature of molecular and surface reactions, [3]Medicinal chemistry and biochemistry, bench-to-bedside innovations improving patient care and outcomes, [4]Nanomaterials, batteries, green energy production and storage, electric and computer technologies, [5]Green chemicals, green coatings, stimuli-responsivity, new medical treatments, recyclability of synthetic materials, corrosion resistance, [6]AI and machine learning approaches to chemical research including molecular modelling, [7]$CO_2$ capture, utilization and transformation, green energy production, [8]Protecting our water resources, environmentally responsible extraction of critical minerals

There are **several promising opportunities** for growth and development within our department. We have numerous untapped possibilities for collaboration both within and between departments that could enhance interdisciplinary research and innovation. Strategic recruitment efforts aimed at aligning with our core strengths, advancing diversity goals, and seizing emerging opportunities will be key to strengthening our team. Our research priorities are well aligned with the prescribed topic areas for Impact+ and Canada Excellence Research Chairs, so we are well poised to respond to such opportunities to recruit high-performing faculty. New pathways for funding are also arising, such as national defence (e.g. the IDEaS program) and Horizon Europe. Maintaining and further developing our first-class instrumentation facilities, along with comprehensive student training programs, will ensure continued excellence in research and education. Additionally, there is significant potential to establish new partnerships with local and regional companies in and around Kingston. Finally, introducing informal training sessions—such as faculty- or staff-led seminars or lunch-and-learn events—would provide valuable, flexible learning opportunities for our students and postdoctoral fellows, fostering a more engaged and knowledgeable community.

Knowledge mobilization and outreach are important aspects of our research program, allowing Canadian society to benefit from our discoveries. In the past, Chemistry faculty and alumni have been instrumental in creating both GreenCentre Canada and RXN HUB, non-profit organizations dedicated to facilitating the commercialization of new chemical technologies. Faculty have also created new for-profit companies based upon their inventions. Many faculty, with their HQP, submit patent applications in addition to journal publications. Outreach efforts, in addition to Science Rendezvous, include interactive presentations at local public and high schools by graduate students associated with CEC-REN. C2MCI offered a Summer of Science program in July and August of 2025 for local youth to learn how science works. Communication doesn't happen in only one direction – many research groups in the department have active collaborations and interactions with industry and academics across the world, improving the training of our HQP and helping our researchers understand industrial and multidisciplinary aspects of the research and the needs of society. The Department of Chemistry sees engagement with the public, the business community, and external academia as vital to our goal of excellence.



*Figure 8: Piloting a chemical technology developed in the department.*

## Research Facilities

In support of our research vision, Queen's Chemistry Research Facilities offer state-of-the-art instrumentation, expert technical support, and comprehensive training that underpin excellence in both teaching and research. The main facilities include the **electron microscopy facility, NanoFab Kingston (NFK)**, **NMR facility, mass spectrometry facility**, **X-ray crystallography facility**, **surface analysis facility**, **Science Stores**, and the recently opened **MakerSpace** 3-D printing facility. All of these, except NFK, are within Chernoff Hall. Located at 945 Princess Street, NFK is an essential resource to Chemistry and other departments, providing access to a clean room and expertise in etching, lithography, deposition, micromachining, and material characterization.

By supplying vital services to researchers in the department and beyond, the instrumentation managers support our internal research programs, permit us to collaborate with external researchers, train our students, and foster industrial relations. Researchers within our department also use shared departmental equipment that is housed in our undergraduate labs. Science Stores provides lab supplies, solvents, other consumables (e.g. gases, dry ice), and shipping and receiving. By investing in infrastructure, cross-training staff, streamlining administration, and expanding access to collaborators, we aim to maximize the impact of our facilities and expertise. We support departments across campus, other educational institutions (e.g. Royal Military College, high schools) and industry, addressing challenging research questions by delivering outstanding service through highly qualified personnel and state-of-the-art instrumentation.



*Figure 9: A section of the Nuclear Magnetic Resonance (NMR) facility housed in Chernoff Hall. The NMR lab is equipped with six Bruker NMR spectrometers ranging from 300 to 700 MHz.*

QChem Research Facilities (except NFK and Science Stores) are governed by the Technical Resource Committee, which is responsible for overseeing daily operations (setting user fees, releasing and reviewing annual user surveys, and instrument inventory updates), and long-term planning of shared research facilities (management of funds for upgrades and repairs >$1k, and recruitment of faculty members to lead grant applications). This committee advises the Department Manager and Head to change policies, and identifies required instrument maintenance (instrument renewal, repair, and decommissioning).

Improvements to our facilities operations that are currently underway include cross-training and streamlined billing. The lack of cross-training between our staff puts our facilities at risk when we lose expertise due to retirement, vacation, departure, or otherwise. We are therefore implementing cross-training between our instrument managers to ensure we can support one another, and instrument use is maximized. Our system of billing and ordering is onerous: we are actively exploring methods to streamline.

Our department's on-site infrastructure needs are as follows. Urgent needs are denoted with an asterisk. This section does not include NFK because its governance has stakeholders beyond the Department of Chemistry.

## Research Infrastructure Needs

1. Additional strategic planning for writing large infrastructure grants for new instruments, and incentives for grant writing.
2. Mechanism, training, and standard operating procedures for increased sharing of instrumentation. A full equipment inventory through the department and across campus.
3. Uninterruptable power supply (UPS) power backups for research and departmental instruments.*
4. Electronics support person for teaching and research equipment.
5. Ensure that training (and additional courses where applicable) is included in equipment purchases so technicians are adequately trained to fully operate and service instruments.
6. Lifespan and replacement planning, and replacement or new equipment purchasing.
7. Maintenance costs & service contracts for instrumentation.*
8. Automated hard drive backups or drop-in replacements.*
9. Space - we have limited space to house state-of-the-art instrumentation (e.g., high-bay electronic and vibration isolated space).

## Teaching Infrastructure Needs

1. A highly qualified technical support person.
2. Maintenance Coordinator/ Oversight: to oversee operation maintenance and upgrade equipment proactively.
3. Dedicated staff member to maintain and train on instruments.
4. Fund to cover equipment failure (replacement or repairs).
5. A review of the 1st year program: what instrumentation/consumables are needed and what skills are developed.
6. Equipment and software for teaching and active-learning classrooms.

# Future Hiring

Our department is currently experiencing gaps in faculty availability across several essential subdisciplines that are vital to our teaching and research missions. Expertise in climate and atmospheric science, electrochemistry, green chemistry, and organic chemistry is increasingly in demand, yet we lack sufficient dedicated faculty to support these growing areas. These shortages limit our ability to offer comprehensive course coverage, expand research opportunities, and meet the evolving needs of our students and scientific community. Addressing these hiring needs is critical to strengthening our program and ensuring our continued excellence and competitiveness.

Based upon our research priorities and teaching needs, there are several research areas where new hires are urgently needed. These positions are critical to maintaining our status as a leading destination for chemistry students, staff, and faculty:

- **Theoretical and computational chemistry**
  - This position would support our research priority area in *Computational Chemistry & AI*, bolster our ability to teach *Quantum Chemistry, Statistical Mechanics, Computational Chemistry*, and *Mathematical Tools* in our undergraduate and graduate programs, and introduce artificial intelligence and machine learning methods into our courses and labs.
- **Analytical chemistry**
  - This position would support our research priority area in *Molecules & Living Systems* and, depending upon the candidate's expertise, could also address a dearth of teaching capacity in *Bioanalytical Chemistry*.
- **Medicinal Chemistry**
  - This position would address our research priority area in *Molecules & Living Systems*, enable collaborative advances across campus in biocatalysis, drug discovery, and human health; and address a shortage of teaching capacity in *Biological Chemistry*, an area of rapidly increasing demand for cross-faculty teaching.
- **Green Energy**
  - This position would address our research priority area in *Materials & Energy* and address a lack of teaching capacity in *Electrochemistry* and possibly *Structural Determination*.
- **Green Chemistry**
  - This position would address our research priority area in *Molecules & Living Systems* and address an impending lack of teaching capacity in *Green Chemistry,* an area that is key to our sustainability efforts.

Since our last Strategic Plan, most of our **continuing adjunct positions** have been eliminated and replaced with staff roles supplemented by additional term-adjunct contracts. After several years of working within this new structure, it has created administrative challenges and placed significant stress on those in these roles. This undermines program continuity and the long-term retention of our talented community members. We are committed to restoring a program taught by long-term faculty including tenure-track faculty and continuing adjuncts.

# 5. Empowering Our Community

The Department of Chemistry at Queen's doesn't exist in a vacuum. We serve, and are served by, the university, governments, the public, the scientific community, and the students. We gratefully recognize their assistance, and strive, on our part, to serve them with

both excellence and understanding of their needs. That means modifying our educational programs, tailoring our research, making our facilities available, and adopting an empathetic and collaborative relationship with all stakeholders. In constantly asking ourselves *how* we can do better, we find the means by which we can achieve our goals of excellence and understanding.

Even though we sometimes face headwinds, we can make significant positive impacts on the world, through the best possible training of students, through innovative technologies that meet society's needs and reduce environmental impacts, and through the establishment of fundamental scientific knowledge that enables future discoveries. We have wonderful staff and faculty, amazing research facilities and technical expertise, and a truly collaborative work environment. With these assets, may we all work together to thrive and strive for research and educational excellence and the betterment of society.



# 6. Summary of Initiatives

| Category | Initiative | Bicentennial Planning Framework | Deliverable | Timeline |
|---|---|---|---|---|
| Academic-Undergraduate | Flexible Program Pathways | Embed experiential, work-integrated, and interdisciplinary learning in all programs. | Accommodate diverse student needs and interests, meet needs of cognate departments and streamline general courses to create more flexible programs. | 2028 (after effect of modular major is seen) |
| Academic-Undergraduate | Review Labs | Align academic programs with our research strengths and institutional mission. | Where possible, experiments will be updated in coordination with instructors, with an emphasis on green and sustainable chemistry. | 2026-2028 |
| Academic-Undergraduate | Review Labs | Embed experiential, work-integrated, and interdisciplinary learning in all programs | Expanding experiential learning or internships with external organizations. | Fall 2028 |
| Academic-Undergraduate | Revise curriculum | Align academic programs with our research strengths and institutional mission. | Courses, especially required courses, should be updated to incorporate concepts of green chemistry in the lecture content and practice problems. | 2026-2028 |
| Academic-Undergraduate | Revise curriculum | Expand access and enhance learning quality with digital and hybrid delivery methods. | Courses, especially required courses, should be updated to integrate technology such as virtual reality, active learning tools, etc. | 2026-2028 |
| Academic-Graduate | Graduate Course Selection | Embed experiential, work-integrated, and interdisciplinary learning in all programs. | Expand access to a range of course options across fields of study, incorporating additional non-traditional training opportunities. | Fall 2028 |
| Academic-Graduate | Revising TA Workloads | Align staff roles and resourcing with institutional priorities to support strategic goals and high-impact operations. | Investigate ways to reduce TA workload. | Fall 2027 |
| Academic-Graduate | Improve Tracking of Student Progress | Design student support systems to promote belonging, wellbeing, and success for a diverse student population. | Improve tracking of student completion of program milestones and improve time to completion. | Fall 2026 |
| Research Activities | Pre-And Post-Award Support | Enable high-impact research and minimize barriers in our infrastructure and administrative systems. | Provide faculty with assistance and resources during the award preparation stage, including, where possible, assistance from facilities | 2026-2029 |

| Category | Initiative | Bicentennial Planning Framework | Deliverable | Timeline |
|---|---|---|---|---|
| | | | managers and reduced responsibilities. | |
| Research Activities | Informal Training Sessions | Support role-specific skills, interdisciplinary collaboration, and career mobility through professional development opportunities. | The department will offer additional ad-hoc informal training sessions. | Fall 2026 |
| Research Activities (Hiring) | Strategic Recruitment | Align faculty recruitment and renewal with institutional priority areas and our overall commitment to academic excellence, high standards, and inclusive hiring practices. | Recruitment of faculty members will be based on our teaching needs and priority areas in research. | When faculty hiring becomes possible again |
| Hiring | Continuing Adjunct Positions | Incorporate resilience planning, including scenario modeling into financial strategies. | Return to continuing adjunct positions as opposed to term-adjuncts, where appropriate. | Term adjuncts will become continuing adjuncts over next few years |
| Research Facilities | Infrastructure Investments | Support high-impact and data-intensive work through investments in research infrastructure. | Short and Long-term planning for grant applications to support infrastructure needs. | Ongoing, starting 2026 |
| Research Facilities | Infrastructure Investments | Incorporate resilience planning, including scenario modeling into financial strategies. | Investing in uninterruptable power supplies (UPS) for instrumentation and sample preservation. | Ongoing, starting 2026 |
| Research Facilities | New Partner-ships with Local and Regional Companies | Enable high-impact research and minimize barriers in our infrastructure and administrative systems | Updating standard operating procedures to increase use of our instrumentation by all (on-campus and external users). | Yearly |
| Research Facilities | Cross-Training Staff | Incorporate resilience planning, including scenario modeling into financial strategies. | Cross-training among instrument managers to support one another and increase professional development. | 2026 (already underway) |
| Research Facilities | Staffing | Enable high-impact research and minimize barriers in our infrastructure and administrative systems | Staff dedicated to teaching and research equipment maintenance and training. | Conditional upon FAS allowing new hires |
| Teaching and Research Facilities | Streamlining Administration | Co-produce research with community, Indigenous, and industry partners, as appropriate | Create single-page promotional materials per research facility. | Fall 2026 |

| Category | Initiative | Bicentennial Planning Framework | Deliverable | Timeline |
|---|---|---|---|---|
| Teaching and Research Facilities | Streamlining Administration | Prioritize transparency, simplicity, and strategic alignment in financial processes. | Streamline administration including billing and ordering among research facilities. | Spring 2027 |
| Research Facilities | Expanding Collaborator Access | Support collaboration, innovation, and strategic growth through institutional structures. | Expand collaborator access through qualified user programs, standard operating procedures, and promotions with potential collaborators. | Fall 2026 |
| Outreach | Expanding links to local entities | Co-produce research with community, Indigenous, and industry partners, as appropriate | Reach out to, and form stronger links with, local organizations such as RMC and local chemistry-related companies. | 2026 (already underway) |



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