Degree Level Expectations, Learning Outcomes, Indicators of Achievement and the Program Requirements that Support the Learning Outcomes

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<th>Expectations</th>
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<td><strong>Depth and breadth of knowledge</strong></td>
<td>A thorough understanding at the forefront of the student’s specific sub-discipline in chemistry, the broader field of chemistry, and related areas, including: A systematic understanding of fundamental chemistry. A critical awareness of problems and/or new insights in the immediate area of research and cognate areas, which is at the forefront of the discipline. Development of specialized knowledge, intellectual autonomy, critical thinking and analytical skills beyond the M.Sc. degree. Development of scientific communication skills.</td>
<td>Performance in courses, satisfactory performance at supervisory committee meetings Composition and defense of a thesis based on the student’s research.</td>
<td>Up to six (6) module lecture courses selected by the student and supervisor. specify CHEM 802 – Chemistry Seminar Program. Composition and defense of a thesis based on the student’s research.</td>
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| Research and scholarship | Development of a conceptual understanding and methodological competence in the student’s area of chemical research that enables:  
The formulation and completion of original research projects at the forefront of the field.  
The ability to produce original research of a quality to satisfy peer review and to merit publication.  
A working comprehension of how established techniques of inquiry and investigation are used to create and interpret information and knowledge.  
The review, analysis and critical evaluation of research carried out in the laboratory.  
The ability to critically process information from primary and secondary literature sources and to distinguish opinions from facts. | Completion of a thesis project consisting of original research and composition of a thesis, which demonstrates:  
Competency and judgment in research.  
An understanding of the theoretical basis for the research and associated methodology.  
The scope of the research field.  
Peer reviewed publications, communications, presentations and conference proceedings. | All students complete a PhD research project, and write and defend a thesis based on that research. |
| **Application of Knowledge** | Competence in the research process needed to:  
Undertake pure and/or applied research at an advanced level.  
Review, interpret, and present quantitative and qualitative information.  
Make sound judgments in accordance with the major theories, concepts and methods of the subject.  
Evaluate the appropriateness of different approaches to solving problems in their area of study.  
Contribute to the development of academic or professional skills, techniques, tools, practices, ideas, theories, approaches, and/or materials. | Completion of a thesis project consisting of original research and composition of a thesis, which demonstrates:  
The ability to apply chemical research techniques and knowledge to study new problems in chemistry.  
The integration of learning and application of ideas and theories to old and new questions in chemistry.  
The ability to perform research at an advanced level.  
Contributions to the development of academic or professional skills, techniques, tools, practices, ideas, theories, approaches and/or materials. Indicators? | All students complete a PhD research project, and write and defend a thesis based on that research.  
All students complete a PhD research project consisting of original research, and write and defend a thesis based on that research.  
Students also complete up to six (6) module lecture courses to broaden their knowledge of the discipline.  
Performance in these courses requires the application of knowledge in the form of tests, presentations, and reports. |
| **Professional capacity/autonomy** | Students have the qualities and transferable skills needed to:  
Enter employment in areas requiring academic and intellectual autonomy, professional character and judgment in complex situations.  
Remain current and informed in their area of study.  
Exhibit academic integrity and social responsibility.  
Evaluate the broader implications of applying knowledge. | Critical thinking skills, independent inquiry, rational argumentation and ethical behaviour consistent with academic integrity and appropriate for the responsible conduct of research. | All students complete a PhD research project consisting of original research, which involves:  
The ability to work independently and exhibit professional judgment.  
Professional interactions with the research supervisor, supervisory committee, lab-mates, and scientific community.  
AODA |
| **Communication Skills** | Students develop competency in oral and written scientific communication. | Scientific Communication is demonstrated by:  
- Ability to write a research thesis and describe the work contained therein.  
- Communication components to coursework.  
- Publication of scientific articles requirement? and participation in research conferences. Coursework presentations? | All students write and defend a scientific thesis.  
All students attend weekly department seminars as part of CHEM 802.  
All PhD students deliver a public seminar describing their research |
| --- | --- | --- | --- |
| **Awareness of limits of knowledge** | Students gain an awareness of the limits of their knowledge with respect to their specific research area, the broader field of chemistry and related disciplines. Students also appreciate how the limits of their knowledge may influence their abilities to interpret and analyze experimental and theoretical data in chemistry. | Exposure to various areas of chemistry provides an awareness of the complexity of knowledge and other interpretations, methods, and disciplines.  
- Recognition of the limits of various experimental and theoretical methods.  
- Awareness of the limitations of the student’s work and how it contributes to the broader field. | Students are required to complete up to six module lecture courses, which can span several sub-disciplines of chemistry. Specify assessment  
PhD students are required to attend weekly seminars, which provide exposure to other interpretations and areas of research. |