

NEW GRADUATE PROGRAM PROPOSAL

Submission Form

This template is to be used when seeking approval for new Graduate programs of study leading to a degree. New program submissions must receive the approval of the Graduate Studies Executive Council (GSEC) prior to being externally reviewed. The submission, external review, and the internal response to the review will, as a package, be submitted by GSEC to the Senate Office for referral to the Senate Committee on Academic Development (SCAD) which will then make their recommendations to Senate. Academic Units are strongly advised to contact the Director of the Office of the Vice-Provost and Dean SGS or the appropriate Associate Dean in the SGS with any questions that arise during this proposal development. Refer also to the QUQAP website at: <http://www.queensu.ca/provost/responsibilities/qualityassurance.html>.

NOTE: the textboxes in this template will expand as needed.

Part A – General Summary

Name of Proposed Programs:	Graduate Programs in Biomedical and Molecular Sciences [MSc (Anatomical Sciences), MSc and PhD]
Unit(s):	Department of Biomedical and Molecular Sciences (DBMS)
Proposed Start Date:	September 2014

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Executive Summary (1 page maximum suggested)

Briefly summarize the rationale for introducing the new Programs and how they fit with the academic goals of the Faculty/School and University (i.e. the rationale for amalgamating the current Programs. Briefly describe: the educational goals and learning outcomes; how the relevant stakeholders (e.g. faculty, staff, students) were consulted in preparing the proposal and whether additional resources are required to deliver these Programs.

In the summer of 2011, to promote interdisciplinary research and increase the efficiency of delivering undergraduate and graduate education, the five basic science departments (Anatomy and Cell Biology, Biochemistry, Microbiology and Immunology, Pharmacology and Toxicology, and Physiology) from the Faculty of Health Science amalgamated into the Department of Biomedical and Molecular Sciences (DBMS). This was part of a Faculty-wide commitment, in keeping with the Queen's 2012-2017 Strategic Research Plan, to find common research interests and enhance collaborations and interdisciplinary initiatives. The current five basic science graduate programs are approaching a cyclical program review, which has provided an opportunity to reflect on the programs and consider the implications of amalgamating them in line with the single departmental structure in which they are located. Following discussions, it was determined that it was in the best interests of the faculty, programs, and students to merge into integrated programs. Thus, we propose new integrated graduate programs, which are consistent with our amalgamated Department. The Graduate Programs in Biomedical and Molecular Sciences will offer:

(i) An MSc (Anatomical Sciences), which would continue in the same manner as it currently operates.
(ii) A thesis-based MSc research degree and (iii) A PhD degree. In the latter two degree programs (MSc and PhD), students would choose one of the following Fields of Specialization, which represent the current research strengths of the amalgamated Department:

- **Biochemistry and Cell Biology**
- **Experimental Medicine**
- **Microbes, Immunity, and Inflammation**
- **Reproduction and Developmental Sciences**
- **Therapeutics, Drug Development, and Human Toxicology**

The Graduate Programs in Biomedical and Molecular Sciences will replace the existing discipline-based programs (Anatomy and Cell Biology, Biochemistry, Microbiology and Immunology, Pharmacology and Toxicology, and Physiology). The benefits of this approach include: facilitating access to graduate students for all members of the Department as well as for members from other Faculty of Health Science research centres, groups, and clinical divisions, and members from other Faculties within the University; reducing curricular overlap that currently exists between programs; allowing faculty to carry out work that may be better accommodated in an interdisciplinary setting; facilitating collaborations between scientists; providing students access to an interdisciplinary environment where they can pursue interest that may not align with a single discipline (that is, one of the 5 original programs); and, through the implementation of core competencies and common elements, encouraging student-student interactions.

We are poised to make significant contributions to academic growth via publishable results of advanced graduate work in several fields. Resource needs are anticipated to be similar to that of the current five programs. There is existing office space for any new students, and supervisors have sufficient laboratory or other research space in Botterell Hall, Biosciences Complex, Humphrey Hall (Psychology) and Kingston General Hospital. No additional revenue will be required to support the research facilities or administrative structure for these integrated programs.

This proposal was developed by the DBMS Postgraduate Education Committee, which includes the DBMS Graduate Student representative, and at each stage of development, the proposal was circulated for comment to all faculty members involved. As such, this proposal reflects a synthesis of the interests and ambitions of all faculty members.

Part B – Evaluation Criteria

Part B is to be completed by the Unit/Faculty.

In accordance with Queen’s University Quality Assurance Processes (QUQAPs), the criteria should be regarded as the minimum criteria upon which the new program submission will be assessed. Further information can be found in the Guide to QUQAPs on the Provost website and the Senate Policy on Quality Assurance: https://qshare.queensu.ca/Groups/VPA/Quality%20Assurance/QUQAPsFinalApr28-11.pdf?ticket=t_30hxGrsb.

1. Introduction

1.1 Describe how the Programs are consistent with the University’s mission and values as well as the academic goals of the Faculty(ies) and Unit(s).

Amalgamation of the Faculty of Health Sciences basic science departments (Anatomy and Cell Biology, Biochemistry, Microbiology and Immunology, Pharmacology and Toxicology, Physiology) into the Department of Biomedical and Molecular Sciences (DBMS), provides an opportunity to re-organize the current departmental graduate programs into an interdisciplinary entity that is inclusive of the supervisory needs of all interested faculty members, and promotes participation by research groups and clinician-scientists. Thus, the mandate for the integrated Biomedical and Molecular Sciences graduate program is to provide research-based MSc and PhD students training in hypothesis-based mechanistic research, and MSc (Anatomical Sciences) students, referred to as MSc (AS) throughout this document, training in the art of teaching and designing curricula in the anatomical sciences. For the research-based MSc and PhD candidates, this will be achieved through a program strongly emphasizing experimental work that tests original research questions, and the oral defense of a written dissertation; complemented by a focused course-load tailored to student background and project requirements. For the MSc (AS) candidates, this will be achieved by completing 30 credit units of coursework, a practicum to produce a human anatomy specimen, lecturing and laboratory teaching. Additionally, MSc (AS) students must also complete and defend a research project.

The Departmental vision is to deliver these programs in a collaborative and integrated manner, with all members who have active research laboratories participating in the research-based MSc and PhD programs, and a mixture of active researchers along with teaching specialists participating in the MSc (AS) program. This interdisciplinary setting will allow students to undertake research with few technological and/or intellectual barriers. Candidates will have access to over 80 faculty members (see Table 5a) engaged in a broad spectrum of biomedical research, using techniques to address questions concerning single molecules, cellular/microbial function, organ-systems, and whole-animal biology. If a thesis project requires a distinct experimental approach or level of expertise, this can be readily sourced from within the department.

These programs will facilitate interdisciplinary research and meet the challenge for Queen's faculty to develop collaborative and integrated programs of teaching and research by working across discipline, faculty, and institutional boundaries. The graduate training vision of DBMS is consistent with the research mission put forth by both the Faculty of Health Sciences and Queen’s University as a whole.

By way of comparison to the School of Medicine’s 2012-2016 strategic plan, it is apparent that the integrated departmental approach directly aligns with that of the Faculty. Specifically, the research pillar of the Faculty of Health Science is to “make targeted investments in bold and pragmatic research initiatives”. In doing so, the Faculty will seek to “enhance research capacity” by “unifying research efforts and foster a culture of collaboration”. Moreover, the School of Medicine’s Strategic Research Development Program, which includes the Clinician Investigator Program and the recently established MD/PhD-MD/Master’s program for undergraduate medical students, is dedicated to clinician scientist development. The integrated Biomedical and Molecular Sciences graduate training program will serve as a conduit for the supervision of MD/PhD-MD/Master’s students and provide an efficient means for many Queen’s clinical researchers to supervise

students.

At the level of the institution, the Queen's University 2012-2017 Strategic Research Plan seeks to promote "alternative operating structures, including collaborative and interdisciplinary models such as research centres and institutes, to enable researchers to respond quickly to embrace new opportunities". Again, the integrated Biomedical and Molecular Sciences graduate training program directly aligns with several University research objectives; in particular, the promotion of collaborative and interdisciplinary initiatives between faculty across the University (objective 3), the enhancement of research partnerships which expand the University's research strengths (objective 4), and the support of research outcome, translation and transfer (objective 6). DBMS will use graduate training to further Queen's overall goal of "distinguish[ing] itself as one of the most research intensive institutions within Canada, with a focus on excellence, leadership and impact at a national and international level".

1.2 *List the Objectives of each of the Programs and specify the anticipated learning outcomes with respect to each of the Master of Science (Anatomical Sciences), Master of Science and PhD Programs [Refer to Graduate Degree Learning Outcomes GDLE, p. 34 of QUQAPs].*

Objectives of the Programs:

MSc (Anatomical Sciences); MSc (AS):

- 1) To educate students in the art of teaching anatomical sciences.
- 2) To train students to design curricula in the anatomical sciences (human gross anatomy, histology, embryology, neuroanatomy).
- 3) To train students to develop the skills and attributes necessary, including professional and transferable skills, to achieve their future career objectives as researchers, educators and professionals.

Master of Science (MSc):

- 1) To provide opportunities for students to conduct original research in biomedical and molecular science.
- 2) To train students to develop and test hypotheses in order to carry out productive scientific research resulting in findings with the potential to be published in peer-reviewed journals.
- 3) To develop students' communication skills to enable them to articulate their research clearly and efficiently in a variety of forums.
- 4) To train students to develop the skills and attributes necessary, including professional and transferable skills, to achieve their future career objectives as researchers, educators and professionals.

PhD:

- 1) To provide opportunities for students to conduct in-depth research on complex biomedical and molecular science topics that require intellectual curiosity and independence.
- 2) To train students to develop and test hypotheses in order to carry out productive scientific research resulting in findings published in peer-reviewed journals.
- 3) To develop students' communication skills to enable them to articulate complex molecular and biomedical ideas and issues clearly and efficiently in a variety of forums.
- 4) To train students to develop the skills and attributes necessary, including professional and transferable skills, to achieve their future career objectives.

Anticipated Learning Outcomes:

MSc (AS):

1. *Depth and breadth of knowledge in anatomical sciences:* Graduating MSc (AS) students will demonstrate a sound command of knowledge in the area of anatomical sciences (gross anatomy, neuroanatomy, embryology and histology) to support their future academic teaching activities. Graduating students will also demonstrate a critical awareness of the current issues in anatomical sciences.

2. *Research and scholarship:* Graduating MSc (AS) students will have a firm understanding of current methods in anatomical sciences and the ability to teach these aspects.

3. *Application of knowledge:* Graduating MSc (AS) students will have the ability to make informed judgments on complex issues in the area of anatomical sciences.

4. *Professional capacity/autonomy:* Graduating MSc (AS) students will possess the qualities and transferable skills necessary for employment training, including the self-confidence to take initiatives and responsibilities during decision-making situations. Graduating students will also possess the intellectual independence to actively engage in continuing professional development, the ethical behaviour consistent with academic integrity, and the use of appropriate guidelines and procedures for responsible conduct of research. Students will also have the ability to appreciate the broader implications of applying knowledge to the anatomical sciences.

5. *Communication skills:* Graduating MSc (AS) students will have the ability to communicate anatomy and cell biology, both orally and in written format to undergraduates, colleagues, and diverse audiences.

6. *Awareness of limits of knowledge:* Graduating MSc (AS) students will gain an appreciation for the breadth of ever-expanding information found in all science and accept that there are always different ways of interpreting science. Graduating students will also have the ability to accept and act on constructive criticism.

MSc:

1. *Depth and breadth of knowledge in biomedical and molecular sciences:* Graduating MSc students will demonstrate a sound command of knowledge in the area of biomedical and molecular sciences which will support the student's future academic activities or professional practice within government, private or civil society sectors (e.g. medical professional, biotechnology companies, Health Canada regulatory affairs, clinical trial groups). Graduating students will also demonstrate a critical awareness of the current issues in biomedical and molecular sciences.

2. *Research and scholarship:* Graduating MSc students will have a firm understanding of current methods in biomedical and molecular sciences and the ability to utilize them to test a specific, novel research hypothesis. Graduating students will have an understanding of the current literature so as to make informed conclusions on the interpretation of their research results. These results should be published or publishable in peer-reviewed journals.

3. *Application of knowledge:* Graduating MSc students will have the ability to make informed judgments on complex issues in the area of biomedical and molecular sciences. Through the application of the scientific process, graduates will demonstrate competence in the research process by using available current literature to guide and critically analyze a novel research hypothesis.

4. *Professional capacity/autonomy:* Graduating MSc students will possess the qualities and transferable skills necessary for employment training. These include: the self-confidence to take initiatives and responsibilities during decision-making situations. Graduating students will also possess the intellectual independence to actively engage in continuing professional development, the ethical behaviour consistent with academic

integrity, and the use of appropriate guidelines and procedures for responsible conduct of research. Students will also have the ability to appreciate the broader implications of applying knowledge to new contexts.

5. *Communication skills*: Graduating MSc students will have the ability to clearly articulate their research findings, their ideas, and their opinions both orally and in written format to colleagues as well as non-professionals.

6. *Awareness of limits of knowledge*: Graduating MSc students will demonstrate an appreciation for the limitations of their research methods and potential biases of their interpretations of results.

PhD:

1. *Depth and breadth of knowledge in biomedical and molecular sciences*: Graduating PhD students will demonstrate a thorough command of knowledge in the area of biomedical and molecular sciences which will support the student's future academic activities or professional practice within government, private or civil society sectors (e.g. biotechnology companies, Health Canada, hospitals, teaching or research position at a college, university or research institute, postdoctoral fellowship, further studies in business administration, medicine, law, dentistry, optometry). Graduating students will also demonstrate an expert knowledge of current practice, concepts and issues in their field of study.

2. *Research and scholarship*: Graduating PhD students will have the ability to conceptualize, design and implement research for the generation of new knowledge regarding biomedical and molecular sciences. Graduating students will have an understanding of the current literature to make informed conclusions on the interpretation of their research results. The expectation is that these results will be published in peer-reviewed journals.

3. *Application of knowledge*: Graduating PhD students will have an in depth understanding of the literature broadly relevant to their research area that informs the process of applying pre-existing knowledge to the creation and interpretation of new data. Graduating students will demonstrate competence in the research process using existing literature and their own preliminary results to formulate a novel hypothesis and the experiments to test this hypothesis. Graduating students will have an awareness of the importance of translation research and the application of basic research knowledge to improve human health. Graduating students will demonstrate integrity and honesty in the scientific process.

4. *Professional capacity/autonomy*: Graduating PhD students will possess the attributes necessary to support academic, personal and professional success, including mentoring, knowledge transfer, management, leadership and interpersonal skills. Graduating students will demonstrate the intellectual independence and self-learning skills required for continued professional development. Graduating students will have a solid grasp of ethical principles and practices so that they can make sound decisions and judgements with respect to academic integrity and the responsible conduct of research. Graduating students will also have the ability to apply knowledge to new contexts.

5. *Communication skills*: Graduating PhD students will have the ability to clearly articulate their research findings, ideas, and opinions both orally and in written format to both colleagues and non-professionals (including diverse audiences).

6. *Awareness of limits of knowledge*: Graduating PhD students will demonstrate an understanding of the assumptions upon which their research is based, the limitations of their research methods, and possibility of alternative interpretations of their results. Graduating students will also demonstrate an awareness that science, while in principle a simple act of pursuing fact, is in reality far more complex and subject to the pitfalls of any process involving human judgement. Graduating students will have the ability to accept and act on constructive criticism.

1.3 Explain how the objectives will be achieved (e.g. course work, teaching and research seminars, independent research, laboratory and technical training, internships, practica, major research papers, and thesis)

NOTE: All course numbers will be brought into alignment with a single departmental designation if approval is granted.

MSc (AS):

This program is structured around three pillars of competency (content, pedagogy, inquiry) and designed to educate students in the art of teaching and designing curricula in anatomical sciences. This teaching Masters program spans 16-months and consists of 30 credit units (two 6 credit units and six 3 credit units advanced courses). All MSc (AS) students must complete and defend a well-written MSc (AS) research project.

The following academic requirements will contribute to the achievement of learning outcomes and degree expectations for the MSc (AS) degree:

1. *Depth and breadth of knowledge:*

- The MSc (AS) requires the completion of 30 credit units of coursework at the graduate level. The following are required: ANAT 812* (or ANAT 837*), ANAT 814, ANAT 817* (or ANAT 836*), ANAT 831*, ANAT 834*, ANAT 835*, ANAT 838*, ANAT 847*.
- ANAT 898 – Master’s Independent Project Report. As a component of this curriculum, students will complete an independent studies project under the supervision of a departmental faculty member. Students will summarize their work in a written report that will be reviewed by a committee and orally defended.
- ANAT 889 - As a component of this curriculum, students will complete practicum on a number of specimen preparation techniques, give lectures and conduct laboratory teaching in small and large classes and teach in various outreach programs.
- Students report every three months to an advisory committee comprised of three faculty members.

2. *Research and scholarship:*

- ANAT 898 - This course will contribute to the research training of the student.
- ANAT 889 (Practicum).
- Committee meetings every three months.
- MSc (AS) research project and defence.

3. *Application and knowledge:*

- Required course work, including required project proposal and practicum.
- Committee meetings every three months.
- MSc (AS) research project and defence.

4. *Professional capacity/autonomy:*

- Mentoring by supervisor, other faculty members, particularly supervisory committee members, and postdoctoral and/or student colleagues.
- Although not required, we will encourage students to participate in "Expanding Horizons" and serve

as student representatives on various committees.

5. *Communication skills:*

- Required student presentations in courses.
- MSc (AS) research project and defence.
- Research Abstracts and publications.
- Required lectures (teaching).

6. *Awareness of limits of knowledge:*

- Mentoring by supervisors, colleagues, and other faculty members.

Thesis based MSc and PhD:

The MSc and the PhD programs are research-based. The purpose of these programs is to provide an enriched environment for training highly qualified personnel with the skills required to study the fundamental biomedical and molecular processes underlying normal cellular and microbial processes, organ system function, and human disease. MSc students will have both course work and independent research requirements, as well as oral defence of a written MSc thesis. PhD students have independent research requirements, a comprehensive exam, and an oral defence of a written PhD thesis. The extent of original research carried out by a doctoral candidate must be substantially greater than that of an MSc candidate. Students with an MSc from a related field will normally not be required to take additional courses as part of the PhD.

The following academic requirements will contribute to the achievement of learning outcomes and degree expectations:

MSc:

1. *Depth and breadth of knowledge:*

- The Biomedical and Molecular Sciences MSc requires, at minimum, the completion of 12 credit units at the graduate level. BMED 860* (3 credit units, Fundamentals of Academic Research and Research Proposal) and BMED 897*(3 credit units, Biomedical Sciences Seminar Program). Additional required credit units are specified by some of the Field Specialization (see below). Students may take no more than one 3 credit unit dual-numbered undergraduate course towards their additional credits. Students are encouraged to take additional graduate-level courses, and may be required to do so upon recommendation of their supervisory committee and/or depending upon participation in an interdisciplinary program.

Specific Field Course Requirements in addition to the 6 mandatory units described above:

Biochemistry and Cell Biology: MSc Students in this field must complete 6 credit units from: BCHM 820*, BCHM 822*, or BCHM 823*.

Experimental Medicine: MSc students in this field can choose from any of the courses listed in Table 1 to complete the remaining required 6 credit units of coursework in consultation with the supervisor.

Microbes, Immunity, and Inflammation: MSc students in this field can choose from any of the courses listed in Table 1 to complete the remaining required 6 credit units of coursework in consultation with the supervisor.

Reproduction and Developmental Sciences: MSc students in this field can choose from courses covering reproduction and development, or if appropriate other courses listed in Table 1 to complete the remaining required 6 credit units of coursework.

Therapeutics, Drug Development, and Human Toxicology: MSc Students in this field must complete an additional 3 credit units from the Methods Modules. In addition, students must complete 3 credit units from one of PHAR 810*, PHAR 811*, PHAR 815*, PHAR 853*, or PHAR 854*; the specific course will be determined in consultation with the supervisor. In cases where students do not have the necessary background in core pharmacology, PHAR 840* and PHAR 850* may also be required.

- BMED 860* - (Fundamentals of Academic Research, 3 credit units) This mandatory course will introduce all graduate students to topics such as academic integrity, ethics in research, laboratory safety, proper record keeping, and use of library resources. Additionally, Students will write a thesis proposal that includes a review of the related literature.
- BMED 897* – (Biomedical and Molecular Sciences Seminar Program, 3 credit units). Students are required to attend weekly seminars and present their research in seminar format to a broad yet knowledgeable audience.
- ANAT, BCHM, MICR, PHAR and PHGY 899 - Master's Thesis Research (will be revised to BMED 899 - Master's Thesis Research).
- New one credit unit modules for Interdisciplinary Methods are being developed and include: animal handling and surgical techniques, nucleic acids, bioinformatics, cell imaging, small molecule analysis, reproductive analysis, and cellular techniques. The goal of these modules is to familiarize graduate students with the principles and practice of cutting edge technologies used in biomedical and molecular sciences research.
- Each student will report annually to an advisory committee comprised of three faculty members, which includes their supervisor (at least one member other than the supervisor must be a primary DBMS member). Additional committee members could be added to the advisory committee if the student, supervisor, or field coordinator felt that it would be appropriate.

2. *Research and scholarship:*

- BMED 860* - This course will contribute to the research training of the student. The thesis proposal prepared by students requires that they start to review the literature and design experiments upon entry into the program. Similarly, the proposal is read by their committee members, which streamlines the feedback process and puts students in contact with a diversity of expertise as quickly as possible.
- Other course work requirements including BMED897*. BMED 897* allows students to present their ideas and research in formal seminars which provides an opportunity for additional feedback, and allows faculty, particularly supervisory committee members, to track student progress.
- MSc thesis research and defence.

3. *Application and knowledge:*

- Required course work, including required research proposal.
- Committee meetings.
- MSc thesis research and defence.

4. *Professional capacity/autonomy:*

- Mentoring by supervisor, other faculty members, particularly advisory committee members, and postdoctoral and/or student colleagues.
- Although not required, we will encourage students to participate in "Expanding Horizons" and serve as student representatives on various committees.

5. *Communication skills:*

- Required student presentations for both BMED 897* as well as other courses involving oral discussion of scientific topics and/or the peer reviewed literature.
- MSc thesis research and defence.

6. *Awareness of limits of knowledge:*

- Seminar presentation and mentoring by thesis supervisor, colleagues, and other faculty members.
- MSc thesis research and defence.

PhD

1. *Depth and breadth of knowledge:*

- With the exception of the thesis (BMED 999 see below), students with an MSc from a related field will normally not be required to take additional courses as part of the PhD. The supervisor, in consultation with the field coordinator, will determine whether additional course work is required based on the student's background, previous coursework and/or field requirements for the MSc course work for each field (see pages 8-9). All students are encouraged to take additional graduate-level courses when appropriate.

- **Specific Field Course Requirements:**

Biochemistry and Cell Biology: No specific additional coursework requirements.

Experimental Medicine: No specific additional coursework requirements.

Microbes, Immunity, and Inflammation: No specific additional coursework requirements.

Reproduction and Developmental Sciences: No specific additional requirements.

Therapeutics, Drug Development, and Human Toxicology: If not taken during the MSc (or equivalent from another university), PhD students in this field must complete PHAR 811*.

- ANAT, BCHM, MICR, PHAR and PHGY 999 - Doctoral Thesis Research (will be revised to BMED 999 - PhD Thesis Research).
- Students report annually to an advisory committee comprised of three faculty members, which includes their supervisor (at least one member other than the supervisor must be a primary DBMS member). Additional committee members could be added to the advisory committee if the student, supervisor, or field coordinator deems it appropriate.

- All PhD must give an exit seminar prior to the final defense.

2. *Research and scholarship:*

- PhD proposal - PhD candidates must provide a thesis proposal within the first two terms of enrolment, that reviews the literature and demonstrates the ability to design experiments. This proposal is evaluated by their advisory committee members. If a student enters the PhD Program via a mini-MSc transfer, then the PhD proposal requirement will be waived.
- PhD comprehensive examination.
- PhD thesis research, exit seminar and defence.

3. *Application and knowledge:*

- Required research proposal.
- Committee meetings.
- PhD comprehensive examination.
- PhD thesis research, exit seminar and defence.

4. *Professional capacity/autonomy:*

- Mentoring by supervisor, other faculty members, particularly advisory committee members, and postdoctoral and/or student colleagues.
- Although not required, we encourage students to participate in "Expanding Horizons" and serve as student representatives on various committees.

5. *Communication skills:*

- PhD comprehensive examination.
- PhD thesis research, exit seminar and defence.

6. *Awareness of limits of knowledge:*

- Seminar presentation and mentoring by thesis supervisor, colleagues, and other faculty members.
- PhD comprehensive examination.
- PhD thesis research, exit seminar and defence.

1.4 Identify and provide descriptions for any Fields (academic plan) associated with the new Programs). [degree programs only]

The Department of Biomedical and Molecular Sciences will offer:

(i) A MSc (Anatomical Sciences), which will continue in the same manner under the Department of Biomedical and Molecular Sciences as it currently operates. This Master's program does not have fields.

(ii) A research thesis based MSc degree and (iii) a PhD degree. In both of these degree programs students would specialize in one of the following Fields which represent the current research strengths of the Department:

Biochemistry and Cell Biology: *Research in this field is focused on understanding the fundamental processes of life and human disease at the cellular and molecular level. Areas of expertise include protein structure/function analysis using biophysical techniques, NMR spectroscopy and X-ray crystallography, enzyme catalytic mechanisms, cell signalling pathways, cytoskeletal proteins, gene expression regulation and metabolism.*

Experimental Medicine: *Researchers in this field employ interdisciplinary methods to explore the processes responsible for both the normal and diseased state. This includes the mechanisms underlying disorders of the cardiovascular, gastrointestinal, nervous, respiratory, and urogenital systems, as well as cancer. Molecular, cellular- and/or systems-based approaches are used to investigate cellular or animal models of disease as well as patient populations.*

Microbes, Immunity, and Inflammation: *Research in this field focuses on fundamental questions at the cellular and molecular level involving viral and bacterial organisms and the immune system. Research areas include pathogenic and nonpathogenic organisms, inflammatory responses associated with infection, allergies, asthma, inflammatory bowel diseases, cancer and cardiovascular disease, and advances in therapeutic strategies including drug and vaccine development.*

Reproduction and Developmental Sciences: *Research in this field spans clinical and basic science, with a focus on fertilization and embryo implantation, perinatal health, women's health, pregnancy complications, sexual dysfunction, and fetal and maternal programming. Studies are conducted at the level of select patient populations, whole animal models, and in vitro systems.*

Therapeutics, Drug Development, and Human Toxicology: *The focus of this field is on the effects, both beneficial and deleterious, of chemicals including drugs and environmental contaminants, on human health. Studies are conducted at levels ranging from specific target molecules to intact organisms and can be directed towards specific diseases, organs, organ systems, or disease processes.*

1.5 Address the appropriateness of the proposed nomenclature (e.g., MA, MSc, MEng). [degree programs only].

The "MSc (Anatomical Sciences)" designation captures the distinctiveness of this degree in contradistinction to research (thesis-based) Master's degrees, which have a different structure and duration (4 terms vs 6 terms respectively). The Master of Science in Anatomical Sciences [MSc (AS)] alone requires specific courses in the teaching of anatomy and preparation of specimens. Degrees that have a more professional dimension typically receive a different degree designation than the research thesis-based Master's degrees (see for example in Rehabilitation Sciences, Nursing, Engineering) and we believe that this is relevant to this degree program. Similarly, the University of Western Ontario offers a similar program with the designation of MSc in Clinical Anatomy.

"MSc" is the appropriate designation for a Masters degree that emphasizes research-based inquiry learning that addresses a specific hypothesis.

"PhD" is the appropriate designation of a doctoral degree at Queen's University.

2. Program Regulations

2.1 **Admission Standards** - Provide the Programs' admission standards, including degree required and course requirements, and any other specific standards with reference to the learning outcomes and expectations of the Programs. Provide the rationale for standards that are in addition to those set by the School of Graduate Studies. If applicable, indicate policies/procedures to encourage applications from qualified under-represented groups (e.g. Aboriginal people, visible minorities or persons with disabilities). Comment if these are the same as those of each of the current Programs, and if not why they are different.

The minimum academic requirements for admission to the MSc (AS) and MSc programs are a BSc degree in science as outlined in the Calendar for the School of Graduate Studies and Research (SGS). The minimum acceptable average for admissions to these programs is B+ in the second, third and fourth years of the student's undergraduate program (all courses considered). Students applying from outside of North America are encouraged to submit GRE and TOEFL scores. The latter is mandatory for those whose native language is not English.

These standards are similar to those currently in place but have been standardized to include marks earned in the last three years (some programs used grades from last 2 years, others all 4 years).

Applications will be reviewed by field-level admission committees (Chaired by the field coordinator). Recommendations for acceptance will be based on academic strength (as indicated by marks, letters of application outlining education and career goals, letters of reference), availability of an appropriate supervisor, availability of financing and space, and possibly an interview assessment if there are large numbers of applicants. We will encourage applicants from under-represented groups through our program advertising, including the DBMS web site.

The minimum requirement for admissions to the PhD program is a master's degree. Students registered in the MSc program who show exceptional promise in their research may be promoted to the PhD program through the mini-masters route. Students with unquestionable superior standing in their honours bachelor's degree, or equivalent, may be considered for direct admission.

We will encourage applicants from under-represented groups through our program advertising, including the DBMS web site.

2.2 **Language Requirements** - If applicable, indicate any language requirements and provide a rationale for standards that exceed the minimum set by the School of Graduate Studies. Information about SGS' English language requirements are available at: <http://www.queensu.ca/sgs/forstudents/InternationalStudents/admissionreqs.html>

No additional language requirements beyond those set by SGS. The minimum standards are for the TOEFL iBT (Test of English as a Foreign Language Internet-based Test):

Section	Score (/30)
Writing Test	24
Speaking Test	22
Reading Test	22
Listening Test	20

For an overall minimum score of 88 (out of 120).

3. Program Structure and Requirements

Describe the Programs under the following headings (where applicable)

3.1 **General Program Requirements** – Describe each Programs' duration (max 24 months for Master's; 48 months for PhD), total number of courses, examinations (e.g. comprehensive, thesis defense, competency), progress reports, advisory committee and how curricula (MScAS, MSc and PhD) represent current state of the discipline and Fields of study.

MSc (AS)

The duration of this program is 16 months (4 terms). During all four term students take coursework and the practicum (See Appendix for sample schedule). During the first term, students start to plan their Independent Study Project, which progresses through the second and third terms and is then completed by the end of the fourth term. Immediately prior to the end of the fourth term students defend their Project and present their work to their peers and Faculty in a Symposium. Each MSc (AS) student meets every three weeks with their supervisor, every nine weeks with their Advisory Committee and every two months there is a "Class Business Meeting", to which all students attend and have the ability to provide input and feedback.

MSc

The typical duration will be 24 months. The first twelve months will involve course work, development of a research proposal, and the commencement of the research. Some course work may also be taken during the student's second year. Research on a topic of biomedical and molecular sciences will continue well into the second year. The final months will involve thesis writing and finally the MSc thesis examination. Thesis advisory committees, which will consist of the supervisor and at least two other members, will be formed within the first semester of the student's program. Members may include all regular and cross-appointed faculty members of DBMS, provided they are recognized as graduate faculty by the SGS. Advisory committee meetings (see below) must occur at least once a year and be documented with a mandatory progress report. These requirements represent the current state for an MSc student in biomedical and molecular sciences.

PhD

The typical duration will be 48 months. The first twelve months will involve course work, if required, development of a research proposal, and the commencement of the research. Preparation for, and completion of, the comprehensive examination will occur within 24 months of initial registration. In-depth research on a topic of biomedical and molecular sciences will continue after the completion of the comprehensive examination. The final 6 months will involve thesis writing, the exit seminar and finally the PhD thesis examination. Thesis advisory committees, which will consist of the supervisor and at least two other members, will be formed within the first semester of the student's term. Members may include all regular and cross-appointed faculty members of DBMS, provided they are recognized as graduate faculty by the SGS. Advisory committee meetings (see below) must occur at least once a year and be documented with a mandatory progress report. These requirements are consistent with and represent the current state for a PhD student in biomedical and molecular sciences.

3.2 **Course Requirements** – In the Tables below, list core (required) courses (including project or thesis), optional courses (e.g. select X from the following list) and elective courses (indicate level and disciplines) for the Master of Anatomical Sciences and for the Masters/PhD graduate Programs. Specify by Field if appropriate. Identify those courses that are also offered to undergraduate students and are listed in the undergraduate calendar. Explain the rationale for including them in the graduate Programs and confirm that at least 2/3 of courses taken to fulfill degree requirements are offered exclusively at the graduate level.

Table 1a. Course requirements for MSc (Anatomical Sciences) (add additional rows as needed; asterisk those courses that are new-

****NOTE: NO NEW COURSES FOR THIS PROGRAM**

Course/Credit (number and name)	(C)ore, (O)ptional or (E)lective	Undergraduate Enrolment (Y/N)	Instructor(s) / coordinators	Academic Unit
ANAT 812/6 credit units (Advanced Neuroanatomy)	O	Y	D. Andrew	DBMS
ANAT 814/6 credit units (Clinically Oriented Anatomy)	C	N	C. Reifel	DBMS
ANAT 817/ 3 credit units (Mammalian Embryonic Development)	O	Y	C. Reifel	DBMS
ANAT 831/3 credit units (Cell Structure and Basic Tissues)	C	Y	F. Kan	DBMS
ANAT 834/3 credit units (Principles and Techniques in the Teaching of Anatomical Sciences)	C	N	R. Easteal L. MacKenzie	DBMS
ANAT 835/3 credit units (Microteaching in Anatomical Sciences)	C	N	R. Easteal L. MacKenzie	DBMS
ANAT 836/3 credit units (Advanced Topics in Embryonic Development)	O	N	C. Reifel	DBMS
ANAT 837/3 credit units (Advanced Topics in Neuroanatomy)	O	N	D. Andrew	DBMS
ANAT 838/3 credit units (Advanced Histology and Staining Techniques)	C	N	L. MacKenzie S. Pang	DBMS
ANAT 847/3 credit units (Research Projects in Anatomy and Cell Biology)	C	N	L. MacKenzie, R. Easteal S. Pang, C. Reifel, others	DBMS
ANAT 889 (Practicum)	C	N	R. Easteal L. MacKenzie	DBMS

Table 1b. Course requirements for MSc and PhD (add additional rows as needed; asterisk those courses that are new to the proposed DBMS Programs).

FIELD LEGEND:

1. Biochemistry and Cell Biology
2. Experimental Medicine
3. Microbes, Immunity & Inflammation
4. Reproduction and Developmental Sciences
5. Therapeutics, Drug Development and Human Toxicology

Note: Students may take no more than one dual-numbered undergraduate course towards their additional credits. Students are encouraged to take additional graduate-level courses, and may be required to do so upon recommendation of their supervisory committee and/or depending upon participation in an interdisciplinary program.

Course/Credit (number and name)	(C)ore, (O)ptional or (E)lective	Field					Undergraduate Enrolment (Y/N)	Coordinator	Academic Unit
		1	2	3	4	5			
ANAT 808/3 credit units (Topics in Biology of Reproduction)	E		X		X		N	R. Oko	DBMS
ANAT 814/6 credit units (Clinically Oriented Anatomy)	E		X		X		Y	C. Reifel	DBMS
ANAT 816/3 credit units (Biology of Reproduction)	E		X		X		Y	F. Kan	DBMS
ANAT 817/ 3 credit units (Mammalian Embryonic Development)	E		X		X		Y	C. Reifel	DBMS
ANAT 818/3 credit units (Chemical Neuroanatomy)	E		X		X		Y	M. Kawaja	DBMS
ANAT 831/3 credit units (Cell Structure and Basic Tissues)	E		X		X		Y	F. Kan	DBMS
ANAT 833/3 credit units (Selected Topics in Mammalian Histology)	E		X		X		Y	M. Kawaja	DBMS
ANAT 836/3 credit units (Advances Topics in Embryonic Development)	E		X		X		N	C. Reifel	DBMS
ANAT 837/3 credit units (Advanced Topics in Neuroanatomy)	E		X		X		N	D. Andrew	DBMS
ANAT 839/6 credit units (Selected Topics in Pregnancy)	E		X		X		N	C. Tayade	DBMS
ANAT 840/3 credit units (Research Techniques in Cell and Molecular Biology)	E	X	X		X		N	S. Pang	DBMS
BCHM 810/3 credit units (Protein Structure and Function)	E	X	X	X	X		Y	A. Mak	DBMS
BCHM 811/3 credit units (Advanced Molecular Biology)	E	X	X	X	X		Y	C. Mueller	DBMS
BCHM 820/3 credit units (Advanced Topics in Molecular Biology)	E O (F1)	O	X	X	X		N	C. Mueller	DBMS
BCHM 822/3 credit units (Mechanisms of Metabolic Control)	E O (F1)	O	X	X	X		N	G. Cote	DBMS
BCHM 823/3 credit units (Advances in Protein Structure and Function)	E O (F1)	O	X	X	X		N	A. Mak	DBMS

BCHM 828/928/3 credit units (Research Project in Biochemistry)	O	X					N	G. Côté	DBMS
BCHM 832/3 credit units (Molecular Basis of Cell Function)	E	X	X	X	X		Y	G. Côté	DBMS
*BMED 836/3 credit units (Advanced Topics in Experimental Medicine) Replacing PHGY 836	E	X	X	X	X		N	N. Magoski	DBMS
*BMED 853/3 credit units (Cellular and Molecular Cardiovascular Sciences) Replacing ANAT/PHAR/PHGY 853	E O (F5)	X	X	X	X	O	N	B. Bennett/S. Pang/C. Ward	DBMS
*BMED 854/3 credit units (Cardiovascular Sciences) This course is replacing ANAT/PHAR/PHGY 854	E O (F5)	X	X	X	X	O	Y	M. Adams	DBMS
*BMED 860/3 credit units (Fundamentals of Academic Research and Research Proposal)	TBD	X	X	X	X	X	N	Primary DBMS Faculty member TBD	DBMS
*BMED 897/3 credit units (Biomedical Sciences Seminar Program)	C		X		X		N	N. Magoski	DBMS
BMED 899 (Master's Research Project)	C	X	X	X	X	X	N	Field Coordinators	DBMS
BMED 999 (PhD Research Project)	C	X	X	X	X	X	N	Field Coordinators	DBMS
MICR 835/3 credit units (Advanced Prokaryotic Structure and Function)	E O (F3)		X	O	X		Y	K. Jarrell	DBMS
MICR 836/3 credit units (Microbial Genetics)	E O (F3)		X	O	X		Y	K. Poole	DBMS
MICR 850/3 credit units (Principles of Molecular Virology)	E O (F3)		X	O	X		Y	E. Carstens	DBMS
MICR 851/3 credit units (Selected Topics in Viral Pathogenesis)	E O (F3)		X	O	X		Y	L. Raptis	DBMS
MICR 852/3 credit units (Virus Infection and Immunity)	E O (F3)		X	O	X		Y	B. Banfield/K. Gee	DBMS
MICR 860/3 credit units (Immunology)	E O (F3)		X	O	X		Y	M. Szewczuk	DBMS
MICR 920/3 credit units (Microbial Pathogenesis)	E O (F3)		X	O	X		N	N. Martin	DBMS
MICR 930/3 credit units (Advanced Bacteriology)	E O (F3)		X	O	X		N	K. Poole	DBMS
MICR 950/3 credit units (Advanced Virology)	E O (F3)		X	O	X		N	L. Raptis	DBMS
MICR 951/3 credit units (Advances in Virology)	E O (F3)		X	O	X		N	E. Carstens	DBMS
MICR 960/3 credit units (Advanced Immunology)	E O (F3)		X	O	X		N	M. Szewczuk	DBMS
MICR 970/3 credit units (Research Project in Microbiology)	C			X			N	B. Banfield	DBMS
NSCI 803/3 credit units (Magnetic Resonance Imaging)	E		X	X	X		N	P. Stroman	Engineering Physics & Astro
NSCI 825/6 credit units (Medical Neuroscience)	E		X	X	X		N	M. Kawaja	DBMS

NSCI 826/3 credit units (Current Concepts in Sensorimotor Integration)	E		X	X	X		N	M. Pare	DBMS
NSCI 829/3 credit units (Disorders of the Nervous System)	E		X	X	X		N	D. Andrew	DBMS
NSCI 850/3 credit units (Computational Approaches to Neuroscience)	E		X		X		N	G. Blohm	DBMS
PHAR 810/3 credit units (Advances in Neuropharmacology)	E O (F5)		X		X	O	N	J. Reynolds	DBMS
PHAR 811/3 credit units (Principles of Drug Discovery and Development)	E O (F5) C(PhD F5)		X	X	X	O C	N	T. Massey	DBMS
PHAR 815/3 units (Mechanistic Toxicology)	E O (F5)	X	X	X	X	O	N	T. Massey	DBMS
PHAR 840/3 credit units (Principles of General Pharmacology I)	E		X	X	X	X	Y	K. Nakatsu	DBMS
PHAR 850/3 credit units (Principles of General Pharmacology II)	E		X	X	X	X	Y	D. Maurice	DBMS
PHGY 810/3 credit units (Current Concepts in Physiology)	E		X	X	X		N	J. Fisher	DBMS
PHGY 814/6 credit units (Vertebrate Physiology; remedial)	E		X				Y	S. Iscoe	DBMS
PHGY 824/3 credit units (Ion Channels of Excitable Cells)	E	X	X			X	Y	N. Magoski	DBMS
PHGY 844/3 credit units (Gastrointestinal Physiology)	E		X	X	X	X	Y	M. Blennerhassett	DBMS
PHGY 855/3 credit units (Respiratory Physiology)	E		X	X	X	X	Y	J. Fisher	DBMS
PHGY 894/3 credit units (Neuroendocrinology)	E			X	X	X	Y	D. Van Vugt	DBMS

FIELD LEGEND:

1. Biochemistry and Cell Biology; 2. Experimental Medicine; 3. Microbes, Immunity & Inflammation; 4. Reproduction and Developmental Sciences; 5. Therapeutics, Drug Development and Human Toxicology

Comment on how current (proposed) teaching assignments relate to relevant workload document and comment on any anomalies

The Department of Biomedical and Molecular Sciences has a Workload document that is distributed to all primary DBMS faculty (Please see Appendices). There are no anomalies.

ANAT-808*  **Topics in Biology of Reproduction**

This seminar course will cover current topics in male and female reproduction and pregnancy. The format includes critiques of original publications and attendance of and reports on the interdepartmental reproductive seminar series. Credit value: 0.5, spread over Fall and Winter terms (every second year). Attendance and reporting of interdepartmental reproductive group seminars:12 h Overview lectures by professors on assigned topics:12 h Presentation and participation in student seminars:12 h, Minimal quota of students for course to run:4, Course Coordinator: R. Oko

ANAT-812*  **Advanced Neuroanatomy**

This course includes the study of the structure and general function of the nervous system and is given jointly with ANAT-312*. Special topics assigned for seminars and essay projects. Fall term; lectures, laboratories and seminars. R.D. Andrew Learning Materials \$40

ANAT-814  **Clinically Oriented Anatomy**

A detailed study of the gross and functional anatomy of the human body with emphasis on clinical application. The course is given jointly with part of Phase I of the medical curriculum. Additional work prescribed for graduate students. Full course; lectures, laboratories and tutorials. C.W.Reifel and Staff

ANAT-816*  **Biology of Reproduction**

A comprehensive overview of the cellular and molecular biology of mammalian reproduction. The first part of the course consists of lectures covering gametogenesis, fertilization, early embryo development and placentation. The second part involves student presentation of seminars and group discussion of current topics in reproductive biology. Clinical aspects of reproduction will also be covered. Offered jointly with ANAT-416*. Graduate students submit one major essay and give a seminar from a list of selected topics. Three hours lecture/seminar, Fall term. F.W.K. Kan
PREREQUISITE: ANAT-215*/216* or ANAT-311, or ANAT-309* or permission of the Department.

ANAT-817*  **Mammalian Embryonic Development**

Overview of mammalian development, emphasizing the cellular and molecular mechanisms that direct embryogenesis. The first 2/3 of the course consists of lectures on gastrulation, neurulation, establishment of the body axes, differentiation, sex determination, limb development, and organogenesis. The last 1/3 of the course involves student seminar presentations and group discussions of current topics in developmental biology and teratology. Offered jointly with ANAT-417*. Students submit a major essay and give a seminar from a selected list of topics. Three hours of lectures/seminars per week. Winter term. C.W. Reifel PREREQUISITE: ANAT-416*/816*, or permission of the Department.

ANAT-818*  **Chemical Neuroanatomy**

A contemporary and comprehensive assessment of the neurochemical features of the mammalian nervous system as they relate to development, function and disease. Winter term; 3 hour lecture/seminar. Offered alternate years. M.D. Kawaja. PREREQUISITE: ANAT-312* or LISC-322* or permission of the Department.

ANAT-831*  **Cell Structure and Basic Tissues**

For those with no histology background, an outline of basic vertebrate tissues. Extra assignments will be given to graduate students. Fall term. Lectures and laboratories in common with ANAT-309 in Fall Term. F.W.K. Kan
EXCLUSION: ANAT-311, ANAT-309 (** Note see course outline for ANAT-309)

ANAT-833*  **Selected Topics in Mammalian Histology**

Detailed histological assessment of selected organs and tissues. Winter Term, alternating years. Lectures and seminars. M.D. Kawaja.
PREREQUISITES: ANAT-215* and 216* or ANAT-311 or ANAT-309* or [ANAT-831*](#).

ANAT-834*  **Principles and Techniques in the Teaching of Anatomical Sciences**

A series of lectures and workshops illustrating modern teaching philosophy and technique specifically designed for teaching Anatomy in the Health Sciences. Fall Term. Drs. R.A. Easteal and L.W. MacKenzie.

ANAT-835* **Microteaching in Anatomical Sciences**

Microteaching as a technique for new and experienced teachers will involve the presentation of a series of 3-minute micro lectures with video recording and feed back sessions. Winter Term. Drs. R. A. Easteal and L. W. MacKenzie.

ANAT-836* **Advanced Topics in Embryonic Development**

This half-credit course will be offered to students who have completed ANAT-417* in their undergraduate studies in the Queen's Life Sciences Program. Through a series of tutorials and seminars, the course will focus on the most up-to-date discoveries in three areas of developmental biology. The areas reflect the expertise in the department. Winter Term. Dr C.W. Reifel. ** Note no course outline (seminar and essay)

ANAT-837* **Advanced Topics in Neuroanatomy**

This half-credit course will be offered to students who have completed ANAT-312* in their undergraduate studies in the Queen's Life Sciences Program. Through a series of tutorials and seminars, the course will focus on the most up-to-date discoveries in three areas of neuroanatomy. The areas reflect the expertise in the department. Fall Term. R.D. Andrew (** Note see course outline for ANAT-812*)

ANAT-838* **Advanced Histology and Staining Techniques**

An advanced mammalian histology course including advanced staining techniques in demonstrating various components of Histological sections. Winter Term. Drs. L.W. MacKenzie and S.C. Pang.

ANAT-839 **Selected Topics in Pregnancy**

The course has two components. A 7 week (26 hour) series of discussions on assigned readings, selected readings and a 45 minute presentation by each student on medical and ethical aspects of obstetrics, gynaecology, endocrinology, population and gender health and psychology. The second component is a 50 hour Human Placenta Research Summer Workshop. Summer Term. B.A. Croy and C. Tayade

ANAT-840* **Research Techniques in Cell and Molecular Biology**

This course is designed to equip graduate students with modern research techniques in Cell and Molecular Biology. This intense 2-week course consists of 2-3 hours of lecture and 6-8 hours hands-on laboratory exercise per day. Techniques include light microscopy and immunohistochemistry, electron microscopy and immunocytochemistry, RNA, DNA and protein isolation, Northern and Western blot analysis, probe design, and conventional and realtime PCR. Summer Term in odd years. S.C. Pang

ANAT-847* **Research Projects in Anatomy and Cell Biology**

An investigation into concepts and techniques in selected areas of research offered in the Department of Anatomy. Research projects carried out under the supervision of a staff member. Winter term. S.C. Pang, Staff

ANAT-853* **Cellular and Molecular Cardiovascular Sciences**

An advanced inter-disciplinary course studying the anatomy, pharmacology and physiology of the cardiovascular system at the molecular and cellular level. The course is comprised of lectures, discussion and student seminars based on recent literature. Winter term, 3 hour seminar. S.C. Pang
PREREQUISITE: Undergraduate degree in Life Science or equivalent or permission from department.

BCHM-810* **Protein Structure and Function****3L/T**

This course presents an integrated approach to the study of protein function. Topics include proteomic techniques in protein profiling, mass spectrometry, 2-D gel electrophoresis, yeast 2-hybrid analysis, protein chips, protein purification, imaging, surface plasmon resonance, calorimetry, bioinformatics and protein evolution, protein modifications and processing, interpretation and applications of 3-D structure, protein structure-function relationships. Three lecture hours per week; Fall. A. Mak. Offered jointly with BCHM-410* with additional work required. PRE-REQUISITES: BCHM-310 or 315*/316*/317* or permission of the instructor.
EXCLUSION: BCHM-410*

BCHM-811* **Advanced Molecular Biology****3L/T**

This course concentrates on the molecular biology of mammalian models particularly mechanisms involved in human diseases. The human genome project, forensic analysis, DNA diagnostics of human diseases, models of transcriptional and growth regulation and cancer, DNA repair, RNA processing and translation are all discussed. Emphasis on recent findings and course materials will be drawn from current reviews. Three lecture hours per week. Winter. C. Mueller. Offered jointly with BCHM-411* with additional work required.

PREREQUISITE: BCHM-310 or 315*/316*/317* or permission of the instructor
EXCLUSION: BCHM-411*.

BCHM-820*  **Advanced Topics in Molecular Biology**

Discussions and presentations on current topics in molecular biology. The emphasis will be on mammalian systems and will cover a wide range of topics relating to recent advances in molecular biology. Typical topics include gene regulation, replication, DNA repair, forensic analysis, human genomics and genetics. Marks are based on student presentations and essays typically in "News and Views" or Mini-Review formats. Three hours per week, presentations and discussions of original papers. Fall; Alternate years; C. Mueller.

BCHM-822*  **Mechanisms of Metabolic Control**

Lectures and discussions on mechanisms of metabolic control. Recent research on a wide range of specific metabolic systems is examined critically. Emphasis is placed on biochemical factors and principles which play a role in the integration and control of metabolism. Lectures and seminars, three hours per week; Winter; G.P.Côté.
PREREQUISITE: BCHM-431* or equivalent.

BCHM-823*  **Advances in Protein Structure and Function**

This course consists of weekly presentations and discussions of recent advances towards the understanding of protein structure and function. Topics of discussion include novel approaches, techniques and concepts in the discovery of protein functions. Students will develop skills in literature research, critical evaluation of published work, effective presentation and discussion of papers. A specific theme, such as cell motility, may be used to illustrate research approaches employed to study biological systems in general. Three lecture hours per week; Winter; Alternate years; A. Mak. Offered 2012-2013. PREREQUISITE: BCHM-410* or equivalent.

BCHM-828*/928*  **Research Project in Biochemistry**

This course is intended to provide the student with the opportunity to gain familiarity with their research field. Students will review the literature related to their proposed graduate research thesis project and write a series of essays on topics selected in consultation with their supervisor; these will be evaluated by a supervisory committee consisting of their supervisor and two other faculty members. They will also develop a written draft research proposal that will be presented to their supervisory committee and defended in a final oral examination. This course is not mandatory but is highly recommended to be taken by students in the first full term of the graduate program. G.P. Côté (course coordinator).

BCHM-832*  **Molecular Basis of Cell Function**

This course provides an introduction to the signaling pathways that regulate key cellular functions such as growth and motility. The biochemical and structural principles that underlie the regulation of enzyme and protein activity in cells are emphasized. Topics include protein kinases and phosphatases, ubiquitin modification, G-protein-coupled receptors, growth factor receptors, scaffold and adaptor proteins, Ras GTPases, phospholipases, oncogenes, cyclic nucleotides, phosphoinositides, isoprenoids and steroid hormones. Offered jointly with BCHM 432. Three lecture hours per week. Fall; G.P. Côté. PREREQUISITE: BCHM 310, or BCHM 315 and BCHM 316 and BCHM 317 for BCHM students; BCHM 310, or BCHM 315 and BCHM 316 for LISC students (or equivalent).
EXCLUSION: BCHM432 (BCHM 431, BCHM 433, BCHM 831* and BCHM 833*).

BMED-836*

Replacing PHGY-836*  **Advanced Physiology**

An advanced course for honours and graduate students in which selected areas of physiology are studied in depth. Two hours seminar. Fall or Winter. N. Magoski. PREREQUISITE: Eligibility for admission to this course will be determined by the student's experience in physiology and allied sciences.

BMED-853* To replace ANAT/PHAR/PHGY-853

 **Cellular and Molecular Cardiovascular Sciences**

An advanced inter-disciplinary course studying the anatomy, pharmacology and physiology of the cardiovascular system at the molecular and cellular level (same as [ANAT-853*](#), [PHAR-853*](#) and [PHGY-853*](#)). The course comprises lectures, discussion and student seminars based on recent literature. Winter; 3 hour seminar. Given in years with an odd number. B.M. Bennett PREREQUISITE: Undergraduate degree in Life Science or equivalent. Permission of the Graduate Program required. (** Note see course outline for LISC-853*)

**BMED-854* To replace
ANAT/PHAR/PHGY-853**

 **Cardiovascular Sciences: Tissues and Systems**

An advanced inter-disciplinary course studying the integrative aspects of the anatomy, pharmacology and physiology of the cardiovascular system at the tissue, organ and system level (same as [ANAT-854*](#), [PHAR-854*](#) and [PHGY-854*](#)).

The course comprises lectures, discussion and student seminars based on recent literature. Topics will include integrated short and long term control of the circulation, structure-function of the heart and blood vessels, characteristics and treatments of pathological conditions. Fall; 3 hour lecture/seminar. Given in years with an odd number. M.A. Adams PREREQUISITE: Undergraduate degree in Life Science or equivalent. Permission of Graduate Program required. (** Note see course outline for LISC-854*)

BMED-860* Fundamentals of Biomedical Research and Research Proposal

This mandatory course will introduce all graduate students to topics such as academic integrity, ethics in research, laboratory safety, proper record keeping, and use of library resources. Additionally, Students will write a thesis proposal that includes a review of the related literature. Fall and winter.

BMED-897* Biomedical and Molecular Sciences Seminar Program

Students will be required to attend the Departmental seminar program and present a seminar based upon their graduate thesis research. Enrolment extending over 6 terms (2 years); required for new M.Sc. graduate students. 1 hour seminar/week; Fall, Winter and Summer.

BMED-899* To replace ANAT/BCHM/MICR/PHAR/PHGY899 Master's Thesis Research

BMED-999* To replace ANAT/BCHM/MICR/PHAR/PHGY999 PhD Thesis Research

MICR-835* Advanced Prokaryotic Structure and Function

In-depth analysis of the genetics, biochemistry, assembly and function of the major structures of the prokaryotic cell. Emphasis on the experimental approaches in the current literature. (Offered in alternate years to MICR-836* and concurrently with MICR-435* with additional work required.) Winter term, two hours lecture, one hour tutorial. K. Jarrell.

MICR-836* Microbial Genetics

A detailed description of the processes of heredity in bacteria including a discussion of gene structure and evolution, gene expression and its control, the exchange of genetic material in the microbial world and genetic engineering and its applications. The laboratory component will emphasize modern approaches to genetic engineering. (Offered in alternate years to MICR-835* and concurrently with MICR-436* with additional work required.) Winter term, two hours lecture, one hour tutorial.

MICR-850* Principles of Molecular Virology

Further study of contemporary virology using the textbook as a guide to particles, genomes, replication, expression, infection, and pathogenesis. Emphasizing reading and writing to develop skills in observation and critical thinking, important attributes in understanding the scientific method. (Offered in alternate years to MICR-851* and concurrently with MICR-450* with additional work required.) Fall term, three lecture hours, three seminar hours. E. Carstens. EXCLUSION: MICR-450*

MICR-851* Selected Topics in Viral Pathogenesis

The nature of selected animal virus groups and their interactions with the host in disease production with special emphasis on the pathogenesis of tumor and human immunodeficiency viruses will be considered. (Offered in alternate to MICR-850* years and concurrently with MICR-451* with additional work required). Fall term, two lecture hours, two seminars hours, one tutorial hour. L. Raptis.

MICR-852* Virus Infection and Immunity

The molecular basis for virus pathogenesis including the host immune response to virus infection, and viral countermeasures. Emphasis will be on viral infections that result in gastrointestinal, haematological, neurological, and respiratory disease. Tutorials will focus on discussion of current and seminal literature. Offered jointly with MICR-452. Fall term. Offered 2012-2013. PREREQUISITES: MICR-221, MICR-360/860 or equivalents EXCLUSION: MICR-452.

MICR-860* Immunology

The general principles and mechanisms of immune reaction. Immunochemical and immunobiological aspects of antibody formation and cell-mediated immunity in health and disease will be considered. (Offered concurrently with MICR-360* with additional work required.) Fall term, three lecture hours. M. Szewczuk

MICR-920* Microbial Pathogenesis

A comprehensive course emphasizing the major microbial and viral groups occurring in human and animal disease. The basic mechanisms involved in host-parasite interrelationships as well as current effective methodology used in their control will be studied. Winter term. N. Martin.

MICR-930* Advanced Bacteriology

An integrated course dealing with microbial physiology as approached from biochemical, genetic and ecological perspectives. The course will also stress microbial diversity. Fall term. Three lecture hours. K. Jarrell.

MICR-950* 

Advanced Virology

Advanced general virology with a special emphasis on virus structure, replication patterns under permissive conditions and in persistent infections. Molecular aspects of gene duplication, expression and modulation are emphasized, as well as a consideration of viruses as expression vectors. Fall term. Three lecture hours. L. Raptis.

MICR-951* 

Advances in Virology

Selected topics in advances in virology. An advanced course on current research in virology, based on recent research literature. For detailed information, consult the course coordinator. Winter term; three lecture hours. E. Carstens.

MICR-960* 

Advanced Immunology

An advanced course emphasizing the main areas of contemporary immunology. Fall term. M. Szewczuk.

MICR-970* 

Research Project in Microbiology

Students will complete essays on central questions related to their research program. The intent of this course is to promote an early appreciation of the literature and/or experimental approaches germane to the student's proposed studies and/or address weaknesses/gaps in the student's prior studies that might impede his/her undertaking the proposed work. Offered all terms. B. Banfield.

NSCI-803*

Magnetic Resonance Imaging

This course is designed for graduate students who want to learn the theory and practice of magnetic resonance imaging (MRI) for anatomical imaging, imaging of dynamic physiological processes, and MRI to detect neuronal function (functional MRI, fMRI). The course will allow the student to gain an understanding of the principles that underlie the applications of MRI and fMRI as a research tool. Three hour lecture/week; fall. P. Stroman
PREREQUISITES: Introductory courses in Chemistry, Mathematics and Physics. Permission of the Instructor

NSCI-825 

Medical Neuroscience

A multidisciplinary graduate level course exposing students to the clinical aspects of neuroscience. Didactic lectures cover detailed organization of the nervous system with clinical implications. Laboratories review basic neuroanatomy and pathology. Clinical demonstrations expose students to several neurological disorders. Fall term; didactic lectures, laboratories, and clinical cases (up to 20 hr/week; 9 weeks total). D. Munoz, J. Reynolds, R. Andrew. NOTE: Classes will begin in late August. PREREQUISITES: Enrolment in graduate faculty and involvement in neuroscience research.

NSCI-826* 

Current Concepts in Sensorimotor Integration

(Replacing ANAT/PHGY 826)

A course for graduate students to explore more advanced concepts of sensorimotor integration in the nervous system. This is a multi-disciplinary lecture/seminar course with active student participation expected. The course will consist of weekly sessions focusing on specific concepts such as feature detection, population coding, sensorimotor transformations, reflexes versus voluntary control, central pattern generators. Normally offered concurrently with PSYC-924*. Not offered 2012-2013. PREREQUISITE: NSCI-322* or equivalent.
EXCLUSION: PSYC-924*. (** Note see course outline for PHGY-826*)

NSCI-829* 

Disorders of the Nervous System

A multi-disciplinary course exploring advanced concepts of clinical neuroscience. Topics can include stroke, traumatic brain and cord injuries, neurodegenerative disorders, epilepsy, schizophrenia, depression, deep brain stimulation, pain and placebo effects, normal and abnormal aging, stem cells. Students will learn to critically evaluate scientific literature and present these concepts to classmates during student-led seminars. Enrolment is limited. PREREQUISITE NSCI 322* or NSCI 323* or ANAT 312* or PSYC 271* or permission of instructors/
EXCLUSION NSCI 429*

NSCI-850* 

Computational Approaches to Neuroscience

This course will provide an overview and hands on experience of the most important computational approaches in Neuroscience. The main topics covered include single cell and neural network modelling, Bayesian approaches, State Space modelling and Optimal Control Theory. More specific modelling approaches will also be discussed as well as some widely used computational data analysis methods. PREREQUISITE permission of course director

PHAR-810* **Advances in Neurpharmacology**

Recent advances in understanding neurotransmission and pharmacology in the central nervous system will be discussed. The current literature describing progress in understanding molecular, cellular and behavioural aspects of brain function, and the impact of drugs and disease, will be examined. Winter; seminars and tutorials. Given in years ending with an uneven number. J.F. Brien PREREQUISITE: Permission of the Graduate Program required. Restricted enrollment.

PHAR-811* **Principles of Drug Discovery and Development**

An advanced course in which various aspects of the drug discovery and development process, from molecules to community, will be studied. The course comprises lectures, discussion and student seminars, based on recent literature. Topics encompass medicinal chemistry approaches to drug discovery, receptor theory, mechanisms of drug action, drug metabolism, pharmacokinetics, pharmacogenetics, drug resistance, clinical trials, and regulatory affairs. Fall, 3 hour seminar. Given in years ending with an even number. T.E. Massey PREREQUISITE: Permission of the Graduate Program required.

PHAR-815* **Mechanistic Toxicology**

An advanced, problem-based course focusing on current approaches to the study of mechanisms of chemical toxicity. Winter; 3 hour seminars and tutorials. Given in years ending with an even number. T.E. Massey PREREQUISITE: PHAR-416* or equivalent. Permission of the Graduate Program required.

PHAR-840* **Principles of General Pharmacology I**

Lectures, tutorial sessions, laboratory project, and self-directed critical analysis of a current research area in Pharmacology. Topics include: principles of drug action, autonomic and autacoid pharmacology, and toxicology. Fall; 3 lecture hours and 3 laboratory hours. K. Nakatsu EXCLUSION: PHAR-340*. Permission of the Graduate Program required.

PHAR-850* **Principles of General Pharmacology II**

Lectures, tutorial sessions, laboratory projects, drug literature evaluation, and self-directed critical analysis of a current research area in Pharmacology. Topics include: neuropsychopharmacology, cardiovascular-renal pharmacology, agents acting on the endocrine system, and chemotherapy. Winter; 3 lecture hours and 3 laboratory hours. D.H. Maurice EXCLUSION: : PHAR-450*. Permission of the Graduate Program required.

PHGY-810* **Current Concepts in Physiology**

An advanced course on current research of selected areas of physiology. This course is comprised of critical lectures and discussion based on recent literature. Compulsory for all new M.Sc. students in Physiology. 3 hour seminar. Fall or Winter. PREREQUISITE: PHGY-214/812 or equivalent or permission of the course supervisor. Enrolment is limited with priority given to Physiology graduate students.

PHGY-814 **Vertebrate Physiology**

An individual reading course for new graduate students with backgrounds in other disciplines. Topics include the function and integrated control of the central and autonomic nervous systems, and the renal, cardiovascular, respiratory, endocrine, and digestive systems. Students will be evaluated by regularly scheduled tests on assigned topics, laboratory reports, and take-home exams. Three, 1-hour lectures. Fall and Winter. PREREQUISITE: ANAT-311 or equivalent. The student must normally have taken or be taking concurrently BCHM-310 or equivalent.

PHGY-824* **I on Channels of Excitable Cells**

The electrophysiology and biophysics of neuronal and cardiac membranes; molecular biology, structure, and function of ion channels. Students will learn to critically evaluate scientific literature. Instructional format is primarily student-led seminars. Enrolment is limited. (Offered even years only jointly with PHGY-424). Not offered 2012-2013. PREREQUISITES: PHGY-214 (or equivalent) with a minimum of 65 percent (or equivalent) or permission of the course supervisor.

PHGY-844* **Gastrointestinal Physiology**

The mechanisms and regulation of motor, secretory, digestive and absorptive functions of the gastrointestinal tract are considered. Students will be required to prepare and present reviews of original literature. Fall/winter terms. (Enrolment in both terms is required to achieve credit.) One hour lecture/week; 1 hour seminar alt. wks. M. Blennerhassett. Offered jointly with PHGY-444. PREREQUISITE: PHGY-214 or equivalent. Enrolment is limited.

PHGY-855* **Respiratory Physiology**

An advanced course examining respiratory mechanics, gas exchange, acid-base balance and the neural control of breathing. Students are required to prepare and present reviews of literature and interpret results of laboratory

experiments. 2 hours lecture/seminar or 6 hours laboratory. Offered jointly with PHGY-355. Winter. J.T. Fisher and S. Iscoe. PREREQUISITE: A minimum of C (2.0) in PHGY-214 or equivalent.

PHGY-894* 

Neuroendocrinology

Students are exposed to an in-depth study of selected topics in neuroendocrinology and neuroendocrine techniques. Neuroendocrinology refers to the neural control of endocrine and autonomic function. Areas of focus will include CNS control of cardiovascular function, reproduction, and appetite. In addition, students will learn to critically evaluate scientific literature. Instructional format is primarily student- led seminars. Winter. D. Van Vugt. PREREQUISITE: PHGY-214 or equivalent.

3.4 **Exam Requirements** – For the MSc and PhD Programs, describe the structure of comprehensive and Master's/Doctoral thesis examinations. Specify any Field differences and provide assurances of standardized rigour across Fields if differences exist

The structure of the MSc (AS), MSc and Doctoral thesis examination is described in Section 4.3.

PhD Comprehensive Examination:

Purpose and Objectives

The goal of the PhD comprehensive examination is to determine whether a student has acquired those characteristics, which the program believes should be exhibited by a doctoral candidate. The examination will evaluate the candidate's ability to explore and comprehend the fundamental knowledge in his/her field of specialization, and to use this knowledge to inform research approaches, ultimately ensuring a solid foundation exists upon which the student will progress towards being considered an expert in that field upon degree completion.

The objectives of the examination are to ensure that PhD candidates have:

- the ability to express themselves clearly and concisely in both written and oral formats
- the ability to seek out primary and secondary sources of information to support an argument
- the ability to defend, logically and clearly, his/her reasoning
- an understanding of the principles of scientific enquiry, including the ability to efficiently and effectively gather relevant information
- an awareness of what constitutes ethical behaviour in scientific research
- knowledge of the historical basis and current organizing concepts in the sub-discipline which encompasses the thesis topic
- a sound background in the broad aspects of their field of specialization, as well as more detailed knowledge in their chosen area of research

Time lines and Examination Committee

The comprehensive examination normally should be administered no later than 24 months into a candidate's PhD program. The actual examination should be completed over the course of no more than six weeks (see Format for details). Approximately one month prior to the examination, the Field Coordinator shall establish (in consultation with the student and supervisor) a Comprehensive Examining Committee, consisting of at least 4 faculty members including the student's supervisor, plus the Field Coordinator or delegate, who shall both chair the committee and approve its membership.

Format Options

The comprehensive examination has one of two formats; specifically, Option 1 - Research Proposal, consisting of a written research proposal followed by an oral defence of that proposal and Option 2 - Essay Questions, consisting of three essay questions followed by an oral defence of those answers. Which option is available to the candidate depends on their field of specialization.

Option 1 only: Microbes, Immunity, & Inflammation

Option 2 only: Therapeutics, Drug Development, & Human Toxicology

Either Option: Biochemistry and Cell Biology, Experimental Medicine and Reproduction and Developmental Sciences

A detailed description of the process is found in the Appendices.

Rigor: Standardized rigour between comprehensive examinations will be achieved by maintaining transparent policies and cross-field participation in examinations.

3.5 **Program Timelines** – Comment on the usual progress through to completion and the timing of milestones for each of the three graduate Programs. **NOTE: Tables assume a Fall term start**

Expected program progression through to degree completion for MSc (AS)

Year 1			Year 2 (Fall)
Fall	W	SS	
ANAT 812* or 837*, ANAT 814, ANAT 831*, ANAT 835*, ANAT 847*, Practicum, Start planning project	ANAT 817* or 836*, ANAT 814, ANAT 838*, ANAT 834*, ANAT 835*, ANAT 847*, Practicum, Project research	ANAT 838*, ANAT 834*, ANAT 847*, Practicum, Project research	ANAT 834*, ANAT 835*, ANAT 847*, Practicum, Complete Project, Project defense

Expected program progression through to degree completion for MSc

Year 1			Year 2		
Fall	W	SS	F	W	SS
BMED 860*, BMED 897*, other coursework; Literature review; Start research	BMED 860*, BMED 897*; Other coursework; Research	BMED 860*, Research FHS Research Day Progress report	BMED 897*; Other coursework; Research	BMED 897*; Finish coursework; Research Start thesis draft	Finish thesis draft; Complete research; Progress report; FHS Research Day Thesis defense

Expected program progression through to degree completion for PhD

Year 1			Year 2			Year 3			Year 4		
Fall	W	SS	F	W	SS	F	W	SS	F	W	SS
BMED 897*; If needed other coursework including research proposal; Start research	BMED 897*; Research; Courses if needed	Research; Progress Report; FHS Research Day	BMED 897*; Research	Research Comps; Progress Report; FHS Research Day		BMED 897*; Research	Research Progress Report; FHS Research Day		Research BMED 897*	BMED 897* Thesis draft; Exit Seminar; Progress Report	Thesis defense

3.6 **Part-Time Studies** - If any of the Programs is offered on a part-time basis, describe how the delivery differs from that of the full-time Programs and summarize the pathway to completion.

N/A

3.7 **Progress Evaluation** - Describe the frequency and method of monitoring student progress and how it will be administered, distinguishing between each of the graduate Programs

MSc (AS)

All MSc (AS) students enrolled in the program will meet every three weeks with their supervisor, every nine weeks with their Advisory Committee and every two months at a “Class Business Meeting”, to which all students attend and have the ability to provide input and feedback. For nine-week Advisory Committee meetings students must provide a summary of their progress in advance. Students then receive oral feedback on their progress from their Committee at the meeting.

MSc

All students enrolled in the MSc program will report to individual supervisory committees, comprised of at least three faculty members. Each student is required to meet with their committee once every year to review progress and the state of their research. The student must prepare a written summary of progress (usually 2-4 pages) to be distributed to the committee members at least five working days prior to each

meeting.

PhD

The frequency, and administration of all PhD student progress will be as described above for MSc students with the additional component of the comprehensive examination as a mechanism of assessing the students' progression.

Method of monitoring (applicable to all programs):

A committee report (available from the Graduate Assistant) must be filed with the Graduate Assistant after each committee meeting, summarizing the student's academic and research progress and plans for the future. Progress reports must be signed by all members of the committee and dated. On each report the student's progress to date must be indicated as "Satisfactory", "Conditional" or "Unsatisfactory". "Satisfactory" indicates that the student has received an acceptable grade on graduate courses and that the thesis research is progressing well and on schedule. "Conditional" indicates that due to unacceptable course grades or lack of research progress the student is not performing at a level that would allow the planned program to be completed successfully within the expected period. In such cases, another committee meeting must be held within four months to further evaluate the student's progress and to assess any conditions imposed at the previous meeting. In some cases, this follow-up meeting might have to be delayed for up to eight months if a course has to be taken. At this second meeting the student's progress must be indicated as either "Satisfactory" or "Unsatisfactory" only. If an "Unsatisfactory" rating is indicated, another committee meeting must be held within two months to further evaluate the student's progress and again only a "Satisfactory" or "Unsatisfactory" rating can be given. Students receiving a second consecutive "Unsatisfactory" rating may be asked to withdraw from the program. All "Conditional" and "Unsatisfactory" ratings from committee meetings will be brought to the attention of the Graduate Studies Committee which may recommend further courses of action to the student and/or supervisory committee. Examples of possible action include repeating a course, taking a substitute course and/or stringent monitoring of research progress (possibly through the establishment of weekly research updates).

A final meeting is required prior to thesis submission to ensure that sufficient progress has been made to approve submission of the thesis. At any time during the student's degree, the Field coordinator may require additional meetings to discuss any issues that have arisen due to performance in courses or problems encountered with theses or reports.

3.8 **Other** - Comment on any special matters and innovative features (e.g., the Programs will be fully accredited by Canadian Association of Schools of Nursing) and identify any unique curricular and program innovations or creative components for each of the Programs.

The amalgamation and restructuring of the existing five graduate programs under DBMS allows for the revision and refinement of a limited number of discipline-based fields in which graduate training both fits with the research identities of the faculty members associated with them, and provides students with opportunities for training in areas that are particularly well suited for the career paths anticipated for the foreseeable future (i.e. academia is no longer the principal target employer, but rather a continuing shift to industry and government). The MSc and PhD programs include a new field in Reproductive and Developmental Sciences, which has emerged as a specific strength within DBMS and Queen's. The new Experimental Medicine field is an exceptionally flexible field that will be attractive for students who wish to pursue transdisciplinary thesis research, or whose research projects and supervisors' expertise/interests do not fall within one of the more specialized fields. For example, in the Experimental Medicine field, the curriculum will strive to cultivate students who are capable of not only measuring a particular biochemical or physiological variable(s), but also examining the structure of the cells and/or tissues that constitute the preparation, investigating the nature of the proteins and/or genes which give rise to or influence the variable(s) in question, as well as apply computer analysis and/or modeling to better understand the mathematical underpinnings of the biomedical phenomena.

Major program innovations include the establishment of: 1) the move to common seminar courses for all

students in the MSc and PhD graduate programs; this will encourage the inter-disciplinary nature of the programs, and provide a forum for students to present their thesis research to both experts and other biomedical scientists and trainees from complementary fields; 2) the "Fundamentals of Academic Biomedical Research" and "Creation of a Research Proposal" courses, which will introduce all graduate students to topics such as ethics in research, laboratory safety, proper record keeping, and drafting a research grant application; 3) a series of thematically based hands-on methods courses that will allow students to have direct experience with state of the art research techniques; these will be available to students in all program fields as well as to students from outside of the Department.

3.9 **Academic Integrity** - Explain how the Programs educate students on the importance and role of academic integrity, and describe any training, development and educational opportunities for instructional staff and faculty on academic integrity policies and procedures.

DBMS considers academic integrity to be a fundamental and critical element of all activities undertaken by faculty, staff and students. As indicated above all new MSc and PhD graduate students will be required to take a "Fundamentals of Academic Biomedical Research" course which will include a session on academic integrity. This session will cover both issues associated with the student's own coursework and research and academic issues that may arise during their teaching assistantships.

Academic integrity is continuously highlighted in the "Class Business Meetings" for MSc (AS) students. All aspects of professionalism are core to the MSc (AS) program.

All policies concerning academic integrity will be disseminated at Departmental meetings to ensure that all Faculty are aware and have a consistent understanding of University regulations.

4. Assessment of Teaching and Learning

4.1 **Degree Level Expectations (DLE)*** – In Table 3 below, summarize how each of the Programs' structures and requirements address each DLE listed as well as any additional program-specific DLEs (Refer to Graduate Degree Learning Outcomes GDLE, page 34 of QUQAPs for more information about graduate DLEs). Separate tables are needed for each degree offered (e.g. Table 3a, 3b, 3c.)

Table 3a. Mapping curriculum and degree level expectations (DLEs) MSc (Anatomical Sciences) (add rows as needed)

DLE	Learning Outcomes	Relevant Courses, Academic Requirement	Indicators of Achievement
<i>Depth and breadth of knowledge</i>	Graduating MSc (AS) students will demonstrate a sound command of knowledge in the area of anatomical sciences (gross anatomy, neuroanatomy, embryology and histology) which will support the student's future academic teaching activities. Graduating students will also demonstrate a critical awareness of the current issues in anatomical sciences.	ANAT 812/6 credit units (Advanced Neuroanatomy) ANAT 814/6 credit units (Clinically Oriented Anatomy) ANAT 817*/ 3 credit units (Mammalian Embryonic Development) ANAT 831*/3 credit units (Cell Structure and Basic Tissues) ANAT 834*/3 credit units (Principles and Techniques in the Teaching of Anatomical Sciences) ANAT 835*/3 credit units (Microteaching in Anatomical Sciences) ANAT 838*/3 credit units (Advanced Histology and Staining Techniques) ANAT 847*/3 credit units (Research Projects in Anatomy and Cell Biology) ANAT 889 (Practicum)	Successful completion of course requirements. Positive feedback from instructors and advisory committee on progress. Demonstrated depth of knowledge in the anatomical sciences as evidenced by performance in practise lectures including ability to field questions and defend a well-written MSc (AS) project.

		<p>All MSc (AS) students enrolled in the program will report bimonthly to a committee comprised of the four core faculty members to review progress.</p> <p>A defensible, well written MSc (AS) project.</p>	
<i>Research and scholarship</i>	<p>Graduating MSc (AS) students will have a firm understanding of current methods in anatomical sciences and the ability to teach these aspects.</p>	<p>Mandatory committee meetings (every nine weeks).</p> <p>MSc (AS) project research and defense.</p>	<p>Positive feedback from instructors and advisory committee on progress.</p> <p>Demonstrated ability to present lectures and field questions.</p>
<i>Application of knowledge</i>	<p>Graduating MSc (AS) students will have the ability to make informed judgments on complex issues in the area of anatomical sciences.</p>	<p>Required coursework.</p> <p>Mandatory committee meetings (every nine weeks).</p> <p>MSc (AS) project and defense.</p>	<p>Successful performance in courses.</p> <p>Successful performance during project oral defense.</p>
<i>Communication skills</i>	<p>Graduating MSc (AS) students will have the ability to communicate anatomy and cell biology, both orally and in written format to undergraduates, colleagues and diverse audiences.</p>	<p>Required student presentations and other ANAT courses.</p> <p>MSc (AS) project defense.</p>	<p>Positive feedback from instructors and advisory committee on quality of required presentations.</p> <p>Demonstrated ability to communicate appropriately in their capacity as a teaching assistant to undergraduate students.</p> <p>Successful performance during oral project defense.</p>
<i>Autonomy and professional capacity</i>	<p>Graduating MSc (AS) students will possess the qualities and transferable skills necessary for employment training, including the self-confidence to take initiatives and responsibilities during decision-making situations. Graduating students will also possess the intellectual independence to actively engage in continuing professional development; the ethical behaviour consistent with academic integrity and the use of appropriate guidelines and procedures for responsible conduct of research. Students will also have the ability to appreciate the broader implications of applying knowledge to the anatomical sciences.</p>	<p>Mentoring by supervisor, colleagues and other faculty members.</p> <p>Although not required, we encourage students to participate in "Expanding Horizons" and serve as student representatives on various committees.</p>	
<i>Awareness of Limits of knowledge</i>	<p>Graduating MSc (AS) students will gain an appreciation for the breadth of ever-expanding information found in all science and accept that there are always different ways of interpreting science. Graduating students will also have the ability to accept and act on constructive criticism</p>		<p>Reasoned response to questioning during presentations that demonstrate a knowledge and understanding of the potential contributions of other interpretations, methods, and disciplines.</p>

Table 3b. Mapping curriculum and degree level expectations (DLEs) Master of Science <i>(add rows as needed)</i>			
DLE	Learning Outcomes	Relevant Courses, Academic Requirement	Indicators of Achievement
<i>Depth and breadth of knowledge</i>	<p>Graduating MSc students will demonstrate a sound command of knowledge in the area of biomedical and molecular sciences which will support the student's future academic activities or professional practice within government, private or civil society sectors (e.g. biotechnology companies, Health Canada regulatory affairs, clinical trials). Graduating students will also demonstrate a critical awareness of the current issues in biomedical and molecular sciences.</p>	<p>The Biomedical and Molecular Sciences MSc requires the completion of 12 units at the graduate level (at the minimum). BMED 860* and BMED 897* or equivalent (i.e. other seminar courses) are mandatory. Additional required units are specified by some of the Field Specialization (see below).</p> <p>Specific Field Course Requirements:</p> <p><u>F1: Biochemistry and Cell Biology:</u> MSc Students in this field must complete 6 credit units from: BCHM 820*, BCHM 822*, or BCHM 823*.</p> <p><u>F2: Experimental Medicine:</u> MSc students in this field can choose from any of the courses listed in Table 1 to complete the remaining required 6 units of coursework.</p> <p><u>F3: Microbes, Immunity, and Inflammation:</u> MSc students in this field can choose from any of the courses listed in Table 1 to complete the remaining required 6 units of coursework.</p> <p><u>F4: Reproduction and Developmental Sciences:</u> MSc students in this field can choose from courses covering reproduction and development, or if appropriate other courses listed in Table 1 to complete the remaining required 6 credit units of coursework.</p> <p><u>F5: Therapeutics, Drug Development, and Human Toxicology:</u> MSc Students in this field must complete 3 credit units from available Method Module offerings. In addition, students must complete three units from one of PHAR 810*, PHAR 811*, PHAR815*, PHAR 853*, or PHAR 854*; the specific course will be determined in consultation with the supervisor. In cases where students do not have the necessary background in core pharmacology, PHAR 840* and PHAR 850* may also be required.</p> <p>BMED 860* - (Fundamentals of Academic Research and Research Proposal) This mandatory course will introduce all graduate students to topics such as academic integrity, ethics in research, laboratory safety, proper record keeping, and use of library resources. Additionally, students will write a thesis proposal</p>	<p>Successful completion of course requirements.</p> <p>Positive feedback from supervisor and advisory committee on progress.</p> <p>Demonstrated depth of knowledge in biomedical and molecular sciences as evidenced by performance in required seminars, including ability to field questions related to biomedical and molecular sciences and a defensible well-written MSc thesis.</p>

		<p>that includes a review of the related literature. The thesis proposal prepared by students requires that they start to review the literature and design experiments upon entry into the program. Similarly, the proposal is read by their committee members, which streamlines the feedback process and puts students in contact with a diversity of expertise as quickly as possible.</p> <p>BMED 897* – (Biomedical and Molecular Sciences Seminar Program) or equivalent seminar course. Students are required to attend weekly seminars and present their research in seminar format to a broad yet knowledgeable audience. Presenting their ideas and research in formal seminars not only provides an opportunity for additional feedback, but allows faculty, particularly supervisory committee members, to track student progress.</p> <p>ANAT, BCHM, MICR, PHAR and PHGY 899 - Master's Thesis Research (will be revised to BMED 899 - Master's Thesis Research).</p> <p>New modules for Interdisciplinary Methods are being developed. The goal of these modules is to familiarize graduate students with the principles and practice of cutting edge technologies used in biomedical and molecular sciences research.</p> <p>Required annually advisory committee meetings.</p>	
<i>Research and scholarship</i>	<p>Graduating MSc students will have a firm understanding of current methods in biomedical and molecular sciences and the ability to utilize them to test a specific novel research hypothesis. Graduating students will have an understanding of the current literature so as to make informed conclusions on the interpretation of their research results. These results should be published or publishable in peer-reviewed journals.</p>	<p>BMED 860* - (Fundamentals of Academic Research and Research Proposal)</p> <p>BMED 897* – (Biomedical and Molecular Sciences Seminar Program) or equivalent seminar course.</p> <p>Additional course work requirements.</p> <p>MSc thesis research and defence.</p>	<p>Positive feedback from supervisor and student advisory committee on progress following required annual committee meetings.</p> <p>Demonstrated ability to field questions related to their research methods, rationale and conclusions during required seminars, including ability to defend their MSc thesis.</p>
<i>Application of knowledge</i>	<p>Graduating MSc students will have the ability to make informed judgments on complex issues in the area of biomedical and molecular sciences. Through the application of knowledge, graduates will demonstrate competence in the research process by using available current literature to guide and critically analyze a novel research hypothesis.</p>	<p>Required course work, including required research proposal.</p> <p>Committee meetings.</p> <p>MSc thesis research and defence</p>	<p>Successful performance in courses.</p> <p>Appropriately designed experiments resulting in presentation/publication of their research results.</p> <p>Successful performance during MSc oral defense.</p>
<i>Communication skills</i>	<p>Graduating MSc students will have the ability to clearly articulate their</p>	<p>Required student presentations for both BMED 897* (or equivalent seminar</p>	<p>Positive feedback from supervisor and advisory</p>

	research findings, their ideas, and their opinions both orally and in written format to colleagues as well as non-professionals.	course) as well as other courses involving oral discussion of scientific topics and/or the peer reviewed literature. MSc thesis research and defence.	committee on quality of required coursework presentations. Successful presentation of research progress in seminars and potentially publications. Demonstrated ability to communicate appropriately in their capacity as a teaching assistant to undergraduate students. Successful performance during oral MSc defense.
<i>Autonomy and professional capacity</i>	Graduating MSc students will possess the qualities and transferable skills necessary for employment training, including the self-confidence to take initiatives and responsibilities during decision-making situations. Graduating students will also possess the intellectual independence to actively engage in continuing professional development; the ethical behaviour consistent with academic integrity and the use of appropriate guidelines and procedures for responsible conduct of research. Students will also have the ability to appreciate the broader implications of applying knowledge to new contexts.	Mentoring by supervisor, other faculty members, particularly advisory committee members, and postdoctoral and/or student colleagues. Although not required we will encourage students to participate in "Expanding Horizons" and serve as student representatives on various committees.	Successful research project design and management. Successful presentation of research results and interpretation. Appropriate supervision of undergraduate 499 and BCHM project students.
<i>Awareness of Limits of knowledge</i>	Graduating MSc students will demonstrate an appreciation for the limitations of their research methods and potential biases of their interpretations of results.	Seminar presentation and mentoring by thesis supervisor, colleagues, and other faculty members. MSc thesis research and defence.	Seminar presentation and mentoring by thesis supervisor, colleagues and other faculty members.

Table 3c. Mapping curriculum and degree level expectations (DLEs) PhD <i>(add rows as needed)</i>			
DLE	Learning Outcomes	Relevant Courses, Academic Requirement	Indicators of Achievement
<i>Depth and breadth of knowledge</i>	<p>Graduating PhD students will demonstrate a thorough command of knowledge in the area of biomedical and molecular sciences which will support the student's future academic activities or professional practice within government, private or civil society sectors (e.g. biotechnology companies, Health Canada, hospitals, teaching or research positions at colleges, universities or research institutes, postdoctoral fellowships, further studies in MBA, medicine, law). Graduating students will also demonstrate an expert knowledge of current practice, concepts and issues in their field of study.</p>	<p>With the exception of the thesis (BMED 999 see below), students with an MSc from a related field will normally not be required to take additional courses as part of the PhD. The Graduate Admission Committee will determine whether additional course work is required and will be based on the student's background, previous coursework and/or field requirements and will be in line with the requirements for the MSc course work for each field (see page 7). All students are encouraged to take additional graduate-level courses when appropriate.</p> <p>Specific Field Course Requirements:</p> <p><u>F1: Biochemistry and Cell Biology:</u> No specific additional coursework requirements.</p> <p><u>F2: Experimental Medicine:</u> No specific additional coursework requirements.</p> <p><u>F3: Microbes, Immunity, and Inflammation:</u> No specific additional coursework requirements.</p> <p><u>F4: Reproduction and Developmental Sciences:</u> No specific additional requirements.</p> <p><u>F5: Therapeutics, Drug Development, and Human Toxicology:</u> If not taken during the MSc, PhD students in this field must complete PHAR 811*.</p> <p>ANAT, BCHM, MICR, PHAR and PHGY 999 - Doctoral Thesis Research (will be revised to BMED 999 - PhD Thesis Research).</p> <p>Required annually advisory committee meetings.</p> <p>Completion of comprehensive examination.</p>	<p>Successful completion of any course requirements.</p> <p>Positive feedback from supervisor and advisory committee on progress.</p> <p>Successful completion of the comprehensive PhD examination, which will require demonstration of a thorough understanding of the principles of biomedical and molecular sciences to a level sufficient for medical and graduate student teaching.</p> <p>Demonstrated depth of knowledge in biomedical and molecular sciences as evidenced by performance in required exit seminar, including the ability to field questions related to biomedical and molecular sciences.</p> <p>A defensible, well-written PhD thesis.</p>
<i>Research and scholarship</i>	<p>Graduating PhD students will have the ability to conceptualize, design and implement research for the generation of new knowledge regarding biomedical and molecular sciences. Graduating students will have an understanding of the current literature to make informed conclusions on the interpretation of their research results. These results must be published or publishable in peer-reviewed journals.</p>	<p>Mandatory annual committee meetings.</p> <p>Mandatory PhD comprehensive examination.</p> <p>PhD thesis research and defense.</p>	<p>Positive feedback from supervisor and student advisory committee on progress following required annual committee meetings.</p> <p>Successful completion of the comprehensive PhD examination, which will require demonstrated ability to integrate knowledge and solve</p>

			<p>experimental problems and knowledge of methods applicable to biomedical and molecular sciences.</p> <p>Demonstrated ability to field questions related to their research methods, rationale and conclusions during required exit seminar, including the ability to defend their PhD thesis.</p>
<i>Application of knowledge</i>	<p>Graduating PhD students will have an in depth understanding of the literature broadly relevant to their research area that informs the process of applying pre-existing knowledge to the creation and interpretation of new data.</p> <p>Graduating students will demonstrate competence in the research process using existing literature and their own preliminary results to formulate a novel hypothesis and the critical experiments to test this hypothesis.</p> <p>Graduating students will have an awareness of the importance of translation research and the application of basic research knowledge to improve human health. Graduating students will demonstrate integrity and honesty in the scientific process.</p>	<p>Mandatory annual committee meetings.</p> <p>Mandatory PhD comprehensive examination.</p> <p>PhD thesis research and defense.</p>	<p>Successful performance in courses (if applicable).</p> <p>Appropriately designed experiments resulting in presentation/publication of their research results.</p> <p>Successful completion of the comprehensive PhD examination, which will require demonstrated ability to integrate knowledge and solve experimental problems and knowledge of methods applicable to biomedical and molecular sciences.</p> <p>Successful performance during exit seminar and PhD oral defense.</p>
<i>Communication skills</i>	<p>Graduating PhD students will have the ability to clearly articulate their research findings, their ideas, and their opinions both orally and in written format to both colleagues and non-professionals (including diverse audiences).</p>	<p>Mandatory PhD comprehensive examination.</p> <p>PhD thesis research and defense.</p>	<p>Positive feedback from supervisor and advisory committee on quality of required presentations.</p> <p>Successful presentation of research progress in seminars and potentially publications.</p> <p>Demonstrated ability to communicate appropriately in their capacity as a teaching assistant to undergraduate students.</p> <p>Successful completion of the comprehensive PhD examination, which will require demonstration of appropriate communication skills.</p> <p>Successful performance during oral PhD defense.</p>
<i>Autonomy and professional capacity</i>	<p>Graduating PhD students will possess the attributes necessary to support academic, personal and professional success, including mentoring, knowledge transfer, management, leadership and interpersonal skills.</p> <p>Graduating students will demonstrate the intellectual independence and self-</p>	<p>Mentoring by supervisor, colleagues and other faculty members.</p> <p>Although not required we encourage students to participate in “Expanding Horizons”, serve as student representatives on various committees</p>	<p>Successful research project design and management.</p> <p>Successful presentation of research results and interpretation.</p> <p>Appropriate supervision of</p>

	learning skills required for continued professional development. Graduating students will have a solid grasp of ethical principles and practices so that they can make sound decisions and judgment with respect to academic integrity and the responsible conduct of research. Graduating students will also have the ability to appreciate the broader implications of applying knowledge to new contexts.	and participate in the student organized graduate journal clubs.	undergraduate 499 and BCHM project students.
<i>Awareness of Limits of knowledge</i>	Graduating PhD students will demonstrate an understanding of the assumptions upon which their research is based, the limitations of their research methods and possibility of alternative interpretations of their results. Graduating students will also demonstrate an awareness that science, while in principle a simple act of pursuing fact, is in reality far more complex and subject to the pitfalls of any process involving human judgement. Graduating students will have the ability to accept and act on constructive criticism.	Seminar presentation and mentoring by thesis supervisor, colleagues and other faculty members. Mandatory PhD comprehensive examination. PhD thesis research and defense.	Reasoned response to questioning during presentations (including exit seminar) and the PhD comprehensive examination that demonstrate a knowledge and understanding of research limitations and of the potential contributions of other interpretations, methods, and disciplines.

4.2 *Describe how the methods of assessing student achievement relate to the Programs' learning outcomes and degree level expectations.*

The methods of assessing student achievement in the MSc (AS) program include:

1. Performance in Course Work: Course work will involve a mix of assessment methods including assignment writing, literature searches, critical thinking and problem solving. The assessment will confirm that the student demonstrates a sound command of knowledge in the area of anatomical sciences (gross anatomy, neuroanatomy, embryology and histology), which will support the student's future academic teaching activities.
2. Quality of Performance in Practicum: This component of assessment will address the student's understanding of current methods in anatomical sciences and confirm the ability to teach these aspects.
3. Advisory Committee Meetings: See Section 3.7. This component of assessment will address all of the identified Program learning outcomes (see Section 1.2) and the DLEs (Table 3a).
4. Final Seminar: MSc (AS) students will be required to give a final seminar presentation to their peers and faculty members. In addition, all students will be encouraged to participate in the Health Sciences Trainee Research Day, held annually. This assessment will address all of the identified Program learning outcomes (see Section 1.2) and the DLEs (Table 3a).
5. Project research and oral defense: The ability to defend a well-written MSc (AS) project requires students to explore and defend their research approach, process, results and conclusions and recommendations. This component of the assessment process will also address all learning outcomes and DLEs.

The methods of assessing student achievement in the MSc program include:

1. Performance in Course Work: Course work will involve a mix of assessment methods including assignment writing, literature searches, critical thinking and problem solving. The assessment will confirm that the student demonstrates a sound command of knowledge in the area of biomedical and molecular sciences which will support the student's future academic activities or professional practice within government, private or civil society sectors (e.g. biotechnology companies, Health Canada regulatory affairs, clinical trials).
2. Quality of Research Proposal: This component of assessment will address the student's understanding of current methods in biomedical and molecular sciences and the ability to utilize them to test a specific novel research hypothesis.
3. Advisory Committee Meetings: See Section 3.7. This component of assessment will address all of the identified Program learning outcomes (see Section 1.2) and the DLEs (Table 3b).
4. Seminars: Performance in required seminars will assess the MSc students' ability to clearly articulate their research findings, their ideas, and their opinions orally to colleagues as well as non-professionals. In addition, all students will be encouraged to participate in the Health Sciences Trainee Research Day, held annually. This assessment will address all of the identified Program learning outcomes (see Section 1.2) and the DLEs (Table 3b).
5. MSc thesis and oral defense: The ability to defend a well-written MSc thesis will address all of the identified Program learning outcomes (see Section 1.2) and the DLEs (Table 3b).

The methods of assessing student achievement in the PhD program include:

1. Quality of Research Proposal: This component of assessment will address the student's understanding of current methods in biomedical and molecular sciences and the ability to utilize them to test a specific novel research hypothesis. This component of assessment will address all of the identified Program learning outcomes (see Section 1.2) and the DLEs (Table 3c).
2. Advisory Committee Meetings: See Section 3.7. This component of assessment will address all of the identified Program learning outcomes (see Section 1.2) and the DLEs (Table 3c).
3. Performance in Comprehensive Examination: The assessment of a candidates' performance during the comprehensive examination will address all of the identified Program learning outcomes (see Section 1.2) and the DLEs (Table 3c).
4. Seminars: Performance in required exit seminar will assess the PhD students' ability to clearly articulate their research findings, their ideas, and their opinions orally to colleagues as well as non-professionals. In addition, all students will be encouraged to participate in the Health Sciences Trainee Research Day, held annually. This assessment will address all of the identified Program learning outcomes (see Section 1.2) and the DLEs (Table 3b).
5. PhD thesis and oral defense: The ability to defend a well-written PhD thesis will address all of the identified Program learning outcomes (see Section 1.2) and the DLEs (Table 3c).

4.3	<p><i>Outline the plans for documenting, monitoring, and demonstrating the level of performance of students (must be consistent with the OCAV's Graduate Degree Level Expectations). [Refer to Graduate Degree Learning Outcomes GDLE, page 34 of QUQAPs]</i></p>
	<ol style="list-style-type: none"> 1. Course Evaluation: Performance in course work will be documented by faculty grading assignments, methods assignment, seminars, project presentations, and examinations (All programs; please see attached course outlines). 2. Feedback on lectures given by MSc (AS) students. 3. Progress: As outlined in Section 3.7, each program has a detailed process for monitoring students' progress. These procedures are designed to track the student's progress on achieving degree level expectations and to provide the student an opportunity to have input into their own learning objectives. 4. Seminars: Feedback from faculty will be received by the student following each seminar presentation with copies forwarded to the supervisor. (all students) 5. Performance in comprehensive examination: The conceptual and theoretical understanding of issues related to biomedical and molecular sciences, will be evaluated by the Comprehensive Examining Committee. (PhD students only, see section 3.4) 6. Documentation and demonstration of the level of performance during the final MSc (AS) project defense will follow the guidelines outlined in the Faculty of Health Sciences Graduate manual and will include a Chair, the Head (or Delegate), two examiners and the supervisor(s). At least one faculty member must be external to the program [MSc (AS) students only]. 7. Documentation and demonstration of the level of performance during the final MSc oral defense will follow the guidelines outlined in the Faculty of Health Sciences Graduate manual and will include a Chair, the Head (or Delegate), two examiners and the supervisor(s). At least one faculty member must be external to the Field. (MSc students only) 8. Documentation and demonstration of the level of performance during the final PhD oral defense will follow General Regulations of the SGS and will include written evaluations from an examiner external to the University, an examiner internal to the University, and examiners from DBMS including the Head (or delegate). (PhD students only)

5.	Mode of Delivery
5.1	<i>If students may take the same course(s) in two or more different modes of delivery, indicate how consistency in requirements and standards is assured (including regular interactions among faculty and students)</i>
	N/A
5.2	Distance Delivery - <i>Where students may take the same Program, or elements of it, in two different modes of delivery, indicate how consistency in Program requirements and standards will be assured. Describe how a learning community will be fostered, how regular interactions with faculty, students, etc., will be assured, and comment on access to materials, resources, and technology.</i>
	N/A

6. Enrolment

6.1 Describe the recruitment strategy for each of the three Programs.

Recruitment of students to the DBMS graduate programs will involve both graduate school and career information sessions for undergraduates (held once or twice a year), as well as research information sessions for medical students and residents (held once a year) at various locations around the Queen's campus. In addition, a poster advertisement in the lobby of Botterell Hall and pamphlets for distribution, will detail the entrance requirements, application deadlines, program and course requirements, as well as the research interests of faculty. Finally, the Department will have a web site (adapted from the current discipline-based program sites) showing all faculty, research themes, courses, and program information. Getting traffic to the site is likely the best action to increase enrolment. Including a QR code for smart phone scanning on all distributed documentation and posters will further this goal. The site address will also be distributed to participating faculty, who will be encouraged to provide it to all fourth-year undergraduates.

6.2 Summarize applications and enrolment to the current Master's and PhD Programs by degree level (last 8 years) in Table 4 and comment on expected future enrolment in DBMS by Field below.

The current discipline-based programs had a 2012-2013 enrolment of 34 new MSc (AS) and MSc students and 7 new PhD students. The current total number of MSc (AS) students is 24, the total MSc students is 51 and the current PhD total is 61 students (136 graduate students in total). It is reasonable to expect that the Biomedical and Molecular Sciences graduate program will enrol a similar total number of additional MSc (AS), MSc and PhD students per year. Since these graduate programs are replacing the existing programs within the DBMS, it is unlikely that any other department would have to accommodate new students.

Table 4. Intake and enrolment in Programs

Current Programs	Anatomy			Biochemistry		Micro		Pharm		Physiology	
	MSc (AS)	MSc	PhD	MSc	PhD	MSc	PhD	MSc	PhD	MSc	PhD
2006 Intake	11	4	0	10	7	5	4	6	4	6	5
Enrol	11	11	6	22	27	11	9	11	13	11	15
2007 Intake	10	5	3	10	6	9	3	13	0	14	1
Enrol	21	14	8	21	27	14	7	21	10	22	15
2008 Intake	12	1	5	8	4	6	3	5	2	2	1
Enrol	13	7	10	20	30	18	8	20	12	16	9
2009 Intake	12	5	1	8	3	7	4	2	6	7	1
Enrol	25	7	10	18	26	14	10	11	13	14	7
2010 Intake	11	2	4	7	4	5	3	4	3	7	2
Enrol	24	7	10	16	20	11	9	10	13	17	7
2011 Intake	12	5	2	5	2	9	1	4	2	3	2
Enrol	24	8	10	14	17	13	8	10	14	11	7
2012 Intake	12	3	4	5	2	5	1	3	2	7	2
Enrol	25	8	13	10	16	15	8	8	15	10	9

7. Resources

Provide evidence that the Academic Unit(s) has the necessary resources to implement and deliver the proposed new Programs under the following headings (where applicable).

7.1 Faculty - Comment on the adequacy of the faculty complement to teach and/or supervise in the Programs and by Field as appropriate AND complete Table 5a and 5b below.

Submit completed CV modules for all faculty listed.

Table 5a. Faculty associated with the proposed Programs (add rows as needed)

FIELD LEGEND:

1. Biochemistry and Cell Biology, 2. Experimental Medicine, 3. Microbes, Immunity & Inflammation, 4. Reproduction and Developmental Sciences, 5. Therapeutics, Drug Development and Human Toxicology

Faculty Member	Rank/Status (Tenured, tenure track, cont adj, term adj, special appt, emeritus, etc.)	Home Unit	Contribution Level and supervisory privileges** B=both undergrad and grad	Program involvement			Field 1	Field 2	Field 3	Field 4	Field 5
				MSc	MSc	PhD (AS)					
Mike Adams	Professor / tenured	DBMS	B, Full	x	x	x		x			x
John Allingham	Assistant Professor/ tenure track	DBMS	B, Full		x	x	x	x			
Bruce Banfield	Associate Professor / tenured	DBMS	B, Full		x	x	x		x		
Sam Basta	Associate Professor / tenured	DBMS	B, Full		x	x			x		
Brian Bennett	Professor / tenured	DBMS	B, Full		x	x		x			x
Michael Beyak	Assistant Professor/ special cross-appointment	Medicine	B, Full		x	x		x			
Michael Blennerhassett	Associate Professor/ special cross-appointment	Medicine	B, Full		x	x	x	x	x		
James Brien	Professor / tenured	DBMS	B, Full		x	x					x
Eric Carstens	Professor / tenured	DBMS	B, Full		x	x			x		
Susan Cole	Professor / tenured	Path Mol Med	B, Full		x	x	x				x
Graham Côté	Professor / tenured	DBMS	B, Full		x	x	x				
Andrew Craig	Associate Professor / tenured	DBMS	B, Full		x	x	x	x			
Anne Croy	Professor / tenured	DBMS	B, Full		x	x		x	x	x	
Peter Davies	Professor / tenured	DBMS	B, Full		x	x	x				
Eric Dumont	Associate Professor / tenured	DBMS	B, Full		x	x		x			
Ron Easteal	Associate Professor / tenured	DBMS	B, Full	x							
Anne Ellis	Associate Professor / tenured	Medicine	B, Full		x	x		x	x		x
Alastair Ferguson	Professor / tenured	DBMS	B, Full		x	x		x			
John Fisher	Professor / tenured	DBMS	B, Full		x	x		x			
Colin Funk	Professor / tenured	DBMS	B, Full		x	x		x			
Katrina Gee	Assistant Professor/ tenure track	DBMS	B, Full		x	x			x		
Ian Gilron	Professor / tenured / cross-appointment	Medicine	B, Full		x	x		x			x
Charles Graham	Professor / tenured	DBMS	B, Full	x	x	x		x		x	
Bruce Hill	Professor / tenured	DBMS	B, Full		x	x	x				
Steve Iscoe	Professor / tenured	DBMS	B, Full		x	x		x			
Ken Jarrell	Professor / tenured	DBMS	B, Full		x	x			x		
Zongchao Jia	Professor/ tenured	DBMS	B, Full		x	x	x				
Fred Kan	Professor / tenured	DBMS	B, Full	x	x	x	x			x	
Michael Kawaja	Professor / tenured	DBMS	B, Full		x	x					
Alan Lomax	Associate Professor / special appointment	Medicine, DBMS	B, Full		x	x		x			

Diane Lougheed	Professor / tenured	Medicine	B, Full		x	x		x			
Les Mackenzie	Associate Professor / tenured	DBMS	B, Full	x							
Neil Magoski	Associate Professor / tenured	DBMS	B, Full		x	x		x			
Alan Mak	Professor / tenured	DBMS	B, Full		x	x	x	x			
Nancy Martin	Associate Professor / tenured	DBMS	B, Full		x	x			x		
Thomas Massey	Professor / tenured	DBMS	B, Full		x	x					x
Don Maurice	Professor / tenured	DBMS	B, Full		x	x		x			
Chris Mueller	Professor / tenured	DBMS	B, Full		x	x		x			
Kanji Nakatsu	Professor / tenured	DBMS	B, Full		x	x					x
Christopher Nicol	Assistant Professor / tenure track	Path Mol Med	B, Full		x	x		x			x
Denis O'Donnell	Professor / tenured / cross-appointment	Medicine	B, Full		x	x		x			
Richard Oko	Professor / tenured	DBMS	B, Full		x	x	x			x	
Terence Ozolinš	Assistant Professor/ tenure track	DBMS	B, Full		x	x				x	x
Stephen Pang	Professor / tenured	DBMS	B, Full	x	x	x		x		x	
Elaine Petrof	Assistant Professor / tenured	Medicine	B, Full		x	x		x	x		x
Keith Poole	Professor / tenured	DBMS	B, Full						x		
Conrad Reifel	Professor/ tenured	DBMS	B, Full	x						x	
Steve Smith	Professor / tenured	DBMS	B, Full		x	x	x				
Myron Szewczuk	Professor / tenured	DBMS	B, Full						x		x
Chandra Tayade	Assistant Professor / tenured track	DBMS	B, Full	x	x	x		x		x	
Dean Van Vugt	Professor / tenured	ObGyn	B, Full		x	x		x			
Virginia Walker	Professor / tenured / cross-appointment	Biology	B, Full		x	x	x		x		
Christopher Ward	Associate Professor / tenured	DBMS	B, Full		x	x		x			
Louise Winn	Professor/ tenured	DBMS and ENSC	B, Full		x	x				x	x
Shetuan Zhang	Associate Professor / tenured	DBMS	B, Full		x	x		x			

*specify tenured, tenure-track (new or renewed), emeriti.

**Indicate level of program contribution (U, undergraduate only; G, graduate only; B, both U and G). Indicate also supervisory privileges (Full or MSc only). Use space below to comment on table 5a

A large majority of the faculty listed in Table 5a currently supervise graduate students in one of the existing discipline-based graduate programs and/or the Neuroscience graduate program. As such, the faculty complement is fully capable of meeting the supervisory and teaching demands of DBMS graduate programs. There is a small minority of primary faculty who also supervise students through programs offered by other units, namely, Biology, Kinesiology, Pathology and Molecular Medicine, and Psychology. However, the overall participation in those programs is small, and as a consequence the impact of the DBMS programs is expected to be neutral since this would continue to occur.

Table 5b. Faculty associated with the proposed Programs (add rows as needed)

Faculty Member	Total Undergrad Teaching	Total graduate teaching in new Programs <i>*Note: Percent is based on team teaching and percent contribution</i>	Total theses supervised (MSc/PhD)	Current theses supervised (MSc/PhD)
Mike Adams	5-3U (100%,30%,10%,10%,10%)	1-3U (50%)	19/11	0/4
John Allingham	3-3U (50%,35%,10%)	Participate in seminar	4/2	2/2
Bruce Banfield	1-3U (66%)	2-3U (100%, 30%)	0/4	2/1
Sam Basta	3-3U (90%,25%,35%)	1-3U (100%)	3/3	0/1
Brian Bennett	3-3U (50%,15%,5%)	1-6U (5%)	16/6	1/1
Michael Beyak	1-3U (20%)	1-3U (20%)	2/1	0/1
Michael Blennerhassett	2-3U (100%,25%)	1-3U (100%)	8/2	3/0
James Brien	Guest lectures	1-3U (17%), 1-6U (4%)	17/10	0/1
Eric Carstens	2-3U(100%,33%)	3-3U (100%, 30%,30%)	14/6	1/0
Susan Cole	2-3U (10%,10%)	2-3U (10%,10%)	15/15	0/2
Graham Côté	3-3U (50%,20%,20%)	1-3U (50%)	10/6	0/1
Andrew Craig	4-3U (100%,38%,25%,8%)	2-3U (33%,15%)	4/2	1/1
Anne Croy	2-3U (33%, 8%)	1-3U (90%)	21/7	2/2
Peter Davies	1-3U (90%), 1-6U (50%)	1-3U (50%)	16/21	2/4
Eric Dumont	2-3U (50%,100%)	1-3U (100%)	4/1	2/0
Ron Easteal	6-3U (100%,100%,50%,50%,20%,10%)	3-3U (50%,25%,10%)	21/0	6/0
Anne Ellis	Guest Lectures	Guest Lectures	2/0	1/0
Alastair Ferguson	2-3U (25%,33%)	2-3U (33%,33%)	21/11	3/1
John Fisher	2-3U (50%,15%)	2-3U (50%,50%)	10/2	2/1
Colin Funk	2-3U (33%,25%)	Participate in seminar	3/4	0/1
Katrina Gee	3-3U (30%,30%,100%)	1-3U (100%)	1/2	2/0
Ian Gilron	Guest Lectures	Guest Lectures	1/4	0/0
Charles Graham	3-3U (25%,25%,25%)	1-3U (25%)	15/4	3/2
Bruce Hill	3-3U (25%,50%,50%)	1-3U (30%)	14/2	1/0
Steve Iscoe	5-3U (20%,20%,20%,20%,20%)	Participate in seminar	3/1	0/0
Ken Jarrell	2-3U (50%,100%)	1-3U (100%)	7/7	1/2
Zongchao Jia	2-3U (25%,17%)	2-3U (10%,10%)	7/16	2/1
Fred Kan	4-3U (100%,43%,33%,33%)	2-3U (100%,33%)	9/6	0/3
Michael Kawaja	2-3U (20%)	1-3U (5%)	10/3	2/2
Alan Lomax	2-3U (50%,10%)	1-3U (20%)	5/0	1/1
Diane Lougheed	1-3U (10%)	1-3U (10%)	5/0	2/0
Les Mackenzie	6-3U (100%,100%,50%,50%,20%,10%)	3-3U (50%,25%,10%)	54/0	14/0
Neil Magoski	4-3U (10%,10%,30%,40%)	3-3U (100%,30%,40%)	5/0	1/3
Alan Mak	5-3U (50%,20%,10%,10%,10%)	2-3U (50%,20%)	8/4	0/0
Nancy Martin	1-3U (88%)	1-3U (100%),1-2U (100%)	15/2	1/0
Thomas Massey	5-3U (22%,20%,8%,3%,3%), 2-6U (20%,4%)	3-6U (20%,20%,15%)	17/13	1/4
Don Maurice	4-3U (100%,35%,25%,8%)	3-3U (20%,20%,20%)	10/7	4/2
Chris Mueller	1-3U (80%)	1-3U (60%)	17/5	1/0
Kanji Nakatsu	1-3U (60%)	1-3U (16%)	22/10	1/2
Christopher Nicol	3-3U (10%,10%,20%)	5-3U (50%,15%,15%,15%,15%,15%)	2/0	1/2
Denis O'Donnell	1-3U (5%)	-	3/0	1/0
Richard Oko	3-3U (33%,25%,25%)	2-3U (33%,25%)	15/9	0/3
Terence Ozolinš	5-3U (17%, 50%, 8%,8%,8%)	2-3U (17%,8%), 1-6U (25%)	1/0	1/1
Martin Paré	-	-	10/1	2/3
Stephen Pang	4-3U (100%,12%,5%,5%)	3-3U (95%,100%,33%)	36/8	6/0
Marty Petkovich	1-3U (50%)	1-3U (50%)	10/13	1/1
Elaine Petrof	3-3U (10%)	2-3U (10%)	4/0	4/0
Keith Poole	2-3U (50%,25%)	3-3U (10%,15%,50%)	10/16	1/3
Conrad Reifel	6-3U (100%,100%,50%,50%,20%,10%)	3-3U (50%,25%,10%)	22/0	3/0
Steve Smith	5-3U (90%,25%,17%,8%,4%)	1-3U (10%)	3/4	1/1

Myron Szewczuk	2-3U (33%,33%)	1-3U (50%)	9/12	2/1
Chandra Tayade	3-3U (30%,20%,10%)	1-3U (50%)	3/0	4/2
Dean Van Vugt	2-3U (33%,15%),1 6U (16%)	1-3U (33%)	9/3	1/0
Virginia Walker	Guest lectures	Guest Lectures	9/21	2/3
Christopher Ward	3-3U (100%,30%,20%),1-6U (100%)	1-3U (30%)	10/2	0/1
Louise Winn	4-3U (50%,40%,5%,5%)	2-3U (5%,10%)	11/3	4/2
Shetuan Zhang	3-3U (40%,10%,10%)	2-3U (33%, 14%)	4/0	4/0

Use the space below to comment on Table 5b as needed.

Note this does not include 499 projects or BCHM421/422 undergraduate supervision.

7.2 Comment on any faculty awards or honours received in the last 8 years. Provide summary, specifying if award/honour is for research or teaching, as appropriate.

The table below gives *examples* of the competitiveness of our Faculty in obtaining recognition for both their research and teaching. The complete data can be found in the Faculty CVs.

YEAR	Award	Type (R= research; T=teaching)
2012	M. Adams: Distinguished Service Award, Hypertension Canada M. Adams: Faculty of Health Sciences Education Award S. Cole: Queen Elizabeth II Diamond Jubilee Medal A. Croy: Canadian Academy of Health Sciences (Elected Fellow) A. Craig: Young Investigator Award (Canadian Cancer Society) L. MacKenzie: Educational Award (AACA) S. Scott: GSK-CIHR Chair in Neurosciences C. Tayade: Early Researcher Award	R T R R R T R R
2011	M. Adams: Aesculapean Society Teaching Award J. Brien: Pfizer Senior Scientist Award S. Cole: Canadian Academy of Health Sciences (CAHS) C. Funk: Career Investigator Award (Heart and Stroke Foundation of Ontario) I. Gilron: Distinction, Dr. Merskey Award (Canadian Pain Society) Z. Jia: Canada Research Chair (Tier I-Renewal) Z. Jia: Queen's Prize for Excellence in Research Z. Jia: Killam Research Fellow L. MacKenzie: The Canadian Medical Hall of Fame, Discovery Day (workshops voted among the top workshops offered across Canada in 2011) C. Tayade: J Christian Herr Award (American Society Reproductive Immunology) V. Walker: Queen's University Graduate Supervision Award L. Winn: Women in Toxicology Mentoring Award (Society of Toxicology)	T R R R R R R R T R T T
2010	M. Adams: Jean-Francois Ginestie Prize A. Croy: Tier 1 Canada Research Chair for Reproduction, Development and Sexual Function (Renewal) P. Davies: Tier 1 Canada Research Chair in Protein Engineering (Renewal) A. Ferguson: Alumnus of the Year (Hotchkiss Brain Institute/and University of Calgary) I. Gilron: 25 th Annual Gunn-Loke Visiting Professorship (University of Washington) A. Lomax: CIHR New Investigator Salary Award A. Lomax: Early Researcher Award L. MacKenzie: Life Sciences Pillar Award N. Magoski: Stephenson Award (Canadian Physiology Society) K. Rose: Life Sciences Pillar Award D. Van Vugt: Senior authors of best clinical paper V. Walker: Top 10 Finalist "TVO Best Lecturer" Award L. Winn: F. Clarke Fraser New Investigator Award of the Teratology Society	R R R R R R R T R T R T R
2009	M. Adams: Most Engaging Lecturer Award A. Craig: Biochemistry Teaching Award I. Gilron: CIHR Mid-Career Investigator Award I. Gilron: David Power Memorial Professorship (University of Ottawa) L. MacKenzie: Alumi Award for Excellence in Teaching N. Magoski: Mihran and Mary Basmajian Award for Excellence in Health Research T. Massey: Faculty of Health Sciences Education Award	T T R R T R T
2008	S. Cole: Pfizer Senior Scientist Award A. Craig: Biochemistry Teaching Award J. Fisher: Distinguished Merit Award (Ontario Lung Association/Ontario Thoracic Society) C. Funk: Killam Research Fellowship Award M. Kawaja: Most Engaging Lecturer Award T. Ozolins: F. Clarke Fraser New Investigator Award of the Teratology Society K. Rose: Barbara Turnbull Award C. Tayade: Larry Ewing Memorial Award (Society Study of Reproduction Canada) S. Vanner: Research Excellence Award (Canadian Association of Gastroenterology) D. Van Vugt: Presidents Award (Ass. of Professors of Obstetrics and Gynecology)	R T R R T R R R R R T

	L. Winn: Chancellor's Research Award S. Zhang: CIHR New Investigator Award	R R
2007	M. Adams: Most Prolific Inventor (PARTEQ) S. Cole: NCIC Diamond Jubilee Award R. Eastea: Chancellor's A. Charles Baillie Teaching Award L. Mackenzie: Finalist for University Teaching Award N. Magoski: CIHR New Investigator Award L. MacKenzie: Most Engaging Lecturer Award L. MacKenzie: Faculty of Health Sciences Education Award S. Smith: Early Researcher Award S. Smith: Mihran and Mary Basmajian Award for Excellence in Health Research M. Szewczuk: Pillar Award L. Winn: Velyien E. Henderson Award (Society of Toxicology of Canada)	R R T T R T T R R T R
2006	A. Croy: Blackwell Munsgaard Publication Award R. Eastea: Life Sciences Teaching Award A. Ferguson: Elected to the QURFC Hall of Fame C. Funk: Career Investigator Award (Heart and Stroke Foundation of Ontario) K. Gee: Outstanding Guest Lecturer Award S. Smith: CIHR New Investigator Award M. Szewczuk: Education Award L. Winn: Mihran and Mary Basmajian Award for Excellence in Health Research	R T R R T R T R
2005	S. Cole: Robert L. Noble Prize (Canadian Cancer Society/NCIC) R. Eastea: Recognized as one of the most popular teachers at Queen's (Maclean's Magazine) A. Ferguson: Dedicated Service Award (Heart and Stroke) A. Ferguson: Rick Gallop Award for Excellence (Heart and Stroke) L. MacKenzie: Recognized as one of the most popular teachers at Queen's (Maclean's Magazine) I. Gilron: Mihran and Mary Basmajian Award for Excellence in Health Research K. Poole: Queen's University Prize for Excellence in Research	R T R R T R R

7.3 Staff - Comment on the adequacy of the staff complement to support the Programs (administrative, technical, IT, laboratory, etc.).

Students will be supported by staff in DBMS. On the administrative side this includes: Anita Lister (Manager, Administration), Anne Tobin (Program Co-ordinator), Pamela Armitage (Financial Co-ordinator), Jackie Moore (Administrative Assistant), Beth Magee (Financial Analyst), Jan McGraa (Financial Assistant), Program Assistants (Denise Cameron, Wendy Cumpson, Janet LeSarge, Marilyn McAuley and Diane Sommerfeld) and Departmental Secretary (Alana Korczynski). On the technical side this includes: Chris Boer (Manager, Laboratories), Rick Hunt (Supervisor, Teaching Laboratories), Hans Metz (Laboratory Special Projects), Xiaohu Yan (Histology/Electron Microscopy Technician) and Jerry Dering (Glass/Washer Autoclave).

7.4 Space Requirements - Describe the work space, laboratory space, office, classroom and equipment available to support students' scholarship and research activities.

Students in the DBMS graduate program will have access to infrastructure and expertise from 58 primary DBMS faculty members, which includes 5 Tier I and 3 Tier II Canada Research Council Chairs, in the Centre for Cardiac, Circulation, and Respiratory Science, the Gastrointestinal Disease Research Unit, the Centre for Neuroscience Studies, the Research Group in Reproduction, Development, and Sexual Function, the Protein Function and Discovery Facility and the Divisions of Cardiology, Gastroenterology, Emergency Medicine, Neurology and Respiratory in the Faculty of Health Sciences. The majority of the laboratory and student space is located in Botterell Hall, and consists of over 5,000 square metres on floors B2, 2, 3, 4, 5, 6, 7, 8, and 9. Much of this area is devoted to wet- or bench-lab infrastructure with associated equipment. In addition, there is ample space both within individual laboratories as well as in general dry-lab areas on floors 2, 4, 5, and 9 to accommodate desk space requirements for all students. Additionally, there are several lunch and meeting rooms to which students have full access.

Since the Biomedical and Molecular Sciences graduate program is within DBMS and encompasses many

faculty with offices and primary laboratory space throughout Botterell Hall, essentially all of the Department resources are at hand for students and supervisors to carry out research. In addition to the unique equipment found in the laboratories of participating faculty, resources include a common animal care facility, common autoclaves, common and individual bacterial incubators, common and individual centrifuges, common cold rooms, common confocal microscopes, common and individual fluorescent microscopes, common dark rooms, common and individual gel documentation systems, a common electron microscopy suite, and a common stores.

7.5 **Information Technology** - Describe the information technology available to support students' scholarship and research activities. Indicate the resource implications for hardware, software/internet, audio-visual, telecommunications, etc.

All graduate students are provided with an email account on University servers with one GB of storage. The account provides access to electronic mail, web-based searches, as well as on-line statistical software, graphics software, computer language compilers, and mathematical software. In addition, each laboratory of participating faculty supplies access to desk top computers and relevant specialized software for the data acquisition, analysis, and presentation. Electronic access is also provided to electronic scientific journals via the University library system, in particular the Bracken Health Sciences Library. The library offers over 2000 full-text electronic journals through either direct subscription or the Ontario Consortium of University Libraries. In addition, the Department also has a web developer (Brandon Thorn).

7.6 **Library** - Provide information about library support holdings, availability of and access to library resources relevant to the proposed Program(s).

Please see attached Library Appendix.

7.7 Indicate if any **new** library resources will be needed (e.g. journals, print monographs, audio-visual material, historical documents, electronic databases, statistical/geospatial data)

We do not anticipate the need for any NEW library resources above and beyond the need in our current programs.

7.8 **Research Funding** - Provide evidence of adequate research funding to sustain the research activities of faculty and graduate students AND complete Table 6 (below).

Faculty participating in the Department of Biomedical and Molecular Sciences graduate program (as listed in Table 6), receive funding from a diversity of sources including (but not limited to): Canadian Institutes for Health Research (CIHR), Canada Foundation for Innovation (CFI), Heart and Stroke Foundation, Ontario Research Fund (ORF), Natural Sciences and Engineering Research Council of Canada (NSERC), National Institutes of Health (NIH), Crohn's and Colitis Foundation, Ontario Pork, and Ontario Ministry of Agriculture. Faculty research funding for 2012 was in excess of \$8.3 million; thus, we are confident that we can sustain the research activities of faculty and graduate studies with the Biomedical and Molecular Sciences graduate program.

Table 6. Research Funding

2006	Grand Total: \$19260052
Agencies	167323
Canadian Foundations	1994378
Canadian Industry	99724
Government of Canada	16107971
Other Governments	590166
Province of Ontario	140000
Queen's Internal Funds	70490
US Government	90000
2007	Grand Total: \$10925709
Agencies	156865
Canadian Foundation	509550
Canadian Foundations	4435813
Canadian Industry	116002
Government of Canada	5200400
Non-Canadian Industry	78550
Province of Ontario	45000
Queen's Internal Funds	109037
US Government	274492

2008	Grand Total: \$12538314
Canadian Foundations	2319118
Canadian Industry	199290
Government of Canada	8154496
Municipal Government	15000
Non-Canadian Industry	94168
Other Governments	22000
Province of Ontario	139999
Queen's	100000
Queen's Internal Funds	484225
US Government	1010018
2009	Grand Total: \$12678587
Agencies	148490
Canadian Foundations	1011446
Canadian Industry	199833
Government of Canada	10580842
Municipal Government	27000
Non-Canadian Foundations	25000
Province of Ontario	407197
Queen's	172500
Queen's Internal Funds	106279
2010	Grand Total: \$11695447
Agencies	453187
Canadian Foundations	1377591
Canadian Industry	233885

Government of Canada	9070026
Non-Canadian Industry	26320
Other Provinces	34663
Province of Ontario	140000
Queen's Internal Funds	66855
U.S. Government	292920
2011	Grand Total: \$7178241
Canadian Foundations	113267
Canadian Industry	56014
Government of Canada	3529620
Non-Canadian Foundations	499500
Province of Ontario	2940000
Queen's Internal Funds	39840
2012	Grand Total: \$8378643
Agencies	69719
Canadian Foundations	751134
Canadian Industry	20000
Government of Canada	7174432
Non-Canadian Foundations	6000
Non-Canadian Industry	7300
Province of Ontario	150000
Queen's	2213
Queen's Internal Funds	173845
U.S. Government	24000

7.9 **Student Funding** - Indicate if graduate students in the new Programs will receive funding packages. If yes, state the minimum annual funding support (by program) and describe how the funding commitments will be met.

Thesis based graduate students enrolled in the DBMS graduate program will receive funding packages to assist with living expenses and coverage of tuition: MSc - \$19,000 minimum stipend; PhD - \$21,000 minimum stipend. Funding commitments will be met by having stipends being inclusive of internal awards (eg, McLaughlin/Bracken Fellowship, Graduate Entrance Tuition Award), external awards (eg, Ontario Graduate Scholarship, Canadian Institutes of Health Research Studentship, Natural Sciences and Engineering Research Council Studentship, Heart and Stoke Foundation of Ontario Studentship), Queen's Graduate Awards, and teaching assistantships, with the remainder being the responsibility of the supervisor and typically provided from research grants.

Although students will be strongly encouraged to apply for external awards, all faculty fully understand and accept that ultimately it is the responsibility of the supervisor to ensure adequate investigator-derived funding to support their student. Supervisors will be required to acknowledge this as such in writing prior to acceptance of a student into the program. Students will not be fully accepted into the program without a supervisor agreeing to take them into their laboratory. Finally, the program will have sufficient flexibility to allow supervisors the opportunity to offer stipends above the minimum.

While there is no guaranteed funding package for MSc (AS) students, they do receive QGA and TA ships, which on average totals approximately \$5,000 (see below) and are encouraged to apply for OGS and other scholarships.

In Table 7 below, summarize the approximate dollar amounts associated with each source of funding as well as Tri-council scholarships for which students may apply.

Table 7. Projected financial support for students by Program
(report on each of the current Master's/PhD Programs)

Table 7a. Financial Support for Master of Science (Anatomical Sciences Students – 8 year summary)

Year	\$ Amount of Support From* (# students) ¹						Students Funded	
	External Scholarships (#)	University Scholarships (#)	TAs (#)	RAs (#)	Other* (#)	Total \$	# (%) ²	Average \$ ³
2012-13	0	0	12	0	12	\$62,408	12 (100%)	\$5,201
	1 (OGS-\$10,000)	0	12	0	12	\$60,515	12 (100%)	\$5,043 ^a
2011-12	0	0	12	0	12	\$73,383	12 (100%)	\$6,115
	0	0	11	0	11	\$47,555	11 (100%)	\$4,323
2010-11	0	0	11	0	11	\$60,016	11 (100%)	\$5,456
	0	0	12	0	12	\$58,492	12 (100%)	\$4,874
2009-10	0	0	12	0	12	\$65,472	12 (100%)	\$5,456
	0	0	12	0	12	\$65,472	12 (100%)	\$5,456
2008-09	0	0	12	0	12	\$73,884	12 (100%)	\$6,157
2007-08	0	0	10	0	10	\$67,876	10 (100%)	\$6,788
	0	0	11	0	11	\$58,456	11 (100%)	\$5,314
2006-07	0	0	11	0	10	\$70,980	11 (100%)	\$6,453
2005-06	Not applicable – program commenced 2006-2007.							

¹Give the number of students supported in each category in (). ²Indicate the nature of the total population against which the % is calculated – e.g. all students, all full-time students, all full-time students in the first 'X' year(s) of the Program, etc. ³Average funding per funded student.

Use space below for comments on Table 7a Master of Anatomical Sciences [e.g. comment on guaranteed minimums, competitiveness, etc.; indicate whether students may hold any of these forms of support concurrently]

*Other: Queen's Graduate Award (QGA).

a Average \$ (2012-13): One student in Year 2 received an OGS (\$10,000) which raises the average; the other 11 students received an average of \$4,312.

The M.Sc. Program in Anatomical Sciences is a 16-month program, running from September to the end of December, except for 2007-2008 where the program ran from May to the end of August.

Where one number is indicated for an academic year, it is for students in Year 1 of their program.

Where two numbers are indicated for an academic year, the first number is for students in Year 1 of their program and the second number is for students in Year 2 of their program.

**Table 7a. Financial Support for Master of Science Students – 8 year summary
Anatomy and Cell Biology**

Year	§ Amount of Support From* (# students) ¹						Students Funded	
	External Scholarships (#)	University Scholarships (#)	TAs (#)	RAs (#)	Other* (#)	Total \$	# (%) ²	Average \$ ³
2012-13	0	3 \$35,000	4 \$5,170	7 \$73,812	7 \$26,096	\$140,078	7 (100%)	\$20,011.14
2011-12	1 \$15,000	2 \$16,258	3 \$4,030	7 \$80,211	6 \$24,500	\$140,000	7 (100%)	\$20,000.00
2010-11	3 \$44,000	0	9 \$11,648	6 \$48,350	7 \$25,958	\$129,956	7 (100%)	\$18,565.14
2009-10	1 \$12,500	1 \$10,000	7 \$10,192	6 \$55,508	6 \$23,800	\$112,000	6 (100%)	\$18,666.67
2008-09	1 \$18,000	1 \$10,000	1 \$14,500	5 \$47,497	8 \$30,815	\$120,812	5 (100%)	\$20,135.33
2007-08	1 \$15,000	3 \$30,000	1 \$17,940	12 \$89,300	1 \$60,200	\$211,990	12 (100%)	\$17,665.83
2006-07	3 \$27,442	0	17 \$29,456	9 \$86,497	1 \$56,002	\$199,397	9 (100%)	\$22,155.22
2005-06	1 \$15,000	3 \$25,000	35 \$43,808	17 \$221,940	18 \$50,360	\$356,108	18 (100%)	\$19,783.78

¹Give the number of students supported in each category in (). ²Indicate the nature of the total population against which the % is calculated – e.g. all students, all full-time students, all full-time students in the first ‘X’ year(s) of the Program, etc. ³Average funding per funded student.

Use space below for comments on Table 7a MSci [e.g. comment on guaranteed minimums, competitiveness, etc.; indicate whether students may hold any of these forms of support concurrently]

Table 7b. Financial Support for Anatomy and Cell Biology Doctoral Students – 8 year summary

Year	§ Amount of Support From* (# students) ¹						Students Funded	
	External Scholarships (#)	University Scholarships (#)	TAs (#)	RAs (#)	Other* (#)	Total \$	# (%) ²	Average \$ ³
2012-13	2 \$45,000	3 \$30,000	6 \$7,652	11 \$133,335	12 \$52,229	\$268,216	12 (100%)	\$22,351.33
2011-12	5 \$75,000	3 \$35,000	7 \$10,860	13 \$82,719	18 \$68,600	\$276,479	14 (100%)	\$19,748.50
2010-11	4 \$67,000	2 \$20,000	22 \$28,160	7 \$71,854	10 \$34,372	\$221,386	10 (100%)	\$22,138.60
2009-10	3 \$60,000	1 \$10,000	8 \$21,927	5 \$57,788	12 \$50,800	\$200,515	8 (100%)	\$25,064.38
2008-09	2 \$45,000	0	16 \$24,445	5 \$66,349	12 \$54,574	\$190,368	8 (100%)	\$23,796.00
2007-08	3 \$75,000	1 \$10,000	6 \$12,835	2 \$6,240	6 \$19,459	\$123,534	6 (100%)	\$20,589.00
2006-07	2 \$45,000	2 \$20,000	17 \$26,467	3 \$10,960	5 \$19,450	\$121,877	5 (100%)	\$24,375.40
2005-06	6 \$11,300	0	26 \$35,045	5 \$38,350	8 \$27,110	\$213,505	8 (100%)	\$26,688.13

¹Give the number of students supported in each category in (). ²Indicate the nature of the total population against which the % is calculated – e.g. all students, all full-time students, all full-time students in the first ‘X’ year(s) of the Program, etc. ³Average funding per funded student.

Use space below for comments on Table 7b PhD [e.g. comment on guaranteed minimums, competitiveness, etc.; indicate whether students may hold any of these forms of support concurrently]

Table 7a. Financial Support for Biochemistry Master of Science Students – 8 year summary

Year	\$ Amount of Support From* (# students) ¹						Students Funded	
	External Scholarships (#)	University Scholarships (#)	TAShips (#)	RAs (#)	Other* (#)	Total \$	# (%) ²	Average \$ ³
2012-13	\$12,750 CIHR \$12,750	\$51,258 GETA \$6,258 QEII \$15,000 2 McL, Brkn \$30,000	14 \$26,516	13 \$144,833.32	8 \$51,000 QGA \$40,000 2 QGA ITA \$10,000 Nesheim \$1,000	\$286,357.32	13 (100%)	\$22,027.48
2011-12	2 NSERC \$17,500 CIHR \$11,750	3 GETA \$6,258 2 McL, Brkn, Car \$40,000	10 \$19,219.80	15 \$152,268.19	14 \$68,800 QGA \$62,800 ITA \$5,000 Nesheim \$1,000	\$315,795.99	15 (100%)	\$21,053.06
2010-11	\$5,833.33 1/3 NSERC	\$41,258 GETA \$6,258 McL,Brkn,OGSST \$35,000	11 \$22,568	17 \$166,408.33	14 \$92,675 QGA \$87,025 ITA \$5,000 Nesheim \$650	\$328,742.66	17 (100%)	\$19,337.80
2009-10	\$36,000 CIHR \$17,500 H&S \$18,500	\$36,015 GETA = 6,015 McL, Brkn, Car \$30,000	9 \$17,381	21 \$175,872	20 \$109,083.33 QGA \$88,433.33 2 ITA \$10,000 QGA ITA \$5,000 Nesheim \$650 Tri-C \$5,000	\$374,351.33	21 (100%)	\$17,826.25
2008-09	\$18,000 H&S \$18,000	\$40,574 GETA \$5,574 McL, OGSST \$35,000	8 \$17,076.25	23 \$221,100	19 \$95,284 QGA \$87,967 ITA \$5,000 1/3 ITA \$1,667 Nesheim \$650	\$392,034.25	23 (100%)	\$17,045
2007-08	\$32,240 NSERC \$17,300 H&S \$14,940	\$35,160 GETA \$5,160 2 McL \$20,000 Carm \$10,000	6 \$12,299.25	23 \$279,093.32	16 \$98,616.67 QGA \$97,966.67 Nesheim \$650	\$457,409.24	23 (100%)	\$19,887.35
2006-07	3 \$51,033	20 \$160,094	12 \$35,765	21 \$224,308	1 \$4,500	\$475,700	21 (100%)	\$22,652.38
2005-06	2 \$34,800	20 \$129,192	12 \$37,055	24 \$350,965	6 \$19,330	\$571,342	26	\$21,974.69

¹Give the number of students supported in each category in (). ²Indicate the nature of the total population against which the % is calculated – e.g. all students, all full-time students, all full-time students in the first 'X' year(s) of the Program, etc. ³Average funding per funded student.

Use space below for comments on Table 7a MSci [e.g. comment on guaranteed minimums, competitiveness, etc.; indicate whether students may hold any of these forms of support concurrently]

One student (MSc) - Fully Gov't Funded 2007-2008, 2008-2009, 2009-2010 (not included in count)
 One student (MSc) - Fully Self-Funded 2008-2009, 2009-2010 (not included in count)
 One student (MSc) - Registered but Off-Campus, No Funding 2007-2008, 2008-2009 (not included in count)
 One student (PhD) - Fully Gov't Funded 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011 (not included in count)
 One student (PhD) – Registered but Off-Campus, No Funding 2007-2008 (not included in count)

Table 7b. Financial Support for Biochemistry Doctoral Students – 8 year summary

Year	Amount of Support From* (# students) ¹						Students Funded	
	External Scholarships (#)	University Scholarships (#)	TAships (#)	RAs (#)	Other* (#)	Total \$	# (%) ²	Average \$ ³
2012-13	3 2 OGS \$30,000 NSERC \$21,000	2 2 Wil, Bau \$35,000	10 \$22,159.80	11 \$143,400	12 3 ITA \$15,000 Jellinck-Ltl \$2,000 QGA \$28,400	\$296,959.80	11 (100%)	\$26,996.35
2011-12	6 3 NSERC \$63,000 3 OGS \$45,000	4 Wil, Bau, Holl, QEII \$50,000	12 \$25,750.80	19 \$168,908.22	17 2 ITA \$10,000 QGA \$62,550	\$425,209.02	19 (100%)	\$22,379.42
2010-11	6 H&S \$21,000 5 NSERC \$119,000	2 2 Wil, Bau, Carr, McL, OGSST \$70,000	15 \$31,522.40	20 \$212,825	21 2 ITA \$10,000 QGA \$57,175	\$521,522.40	21 (100%)	\$24,834.40
2009-10	9 4 NSERC \$98,000 2 H&S \$42,000 CBCF \$37,500 2 OGS \$30,000	4 Wil, Bau, McL, Carm, OGSST \$90,000	16 \$29,165.50	26 \$199,750	23 QGA \$51,167 2 QGA ITA \$10,000	\$587,582.50	28 (100%)	\$20,985.10
2008-09	9 5 NSERC \$133,000 H&S \$21,000 CIHR \$25,000 OGS \$15,000 1/3 OGS \$5,000	7 2 McL, 3 Wil, 2 Bau, Brkn, Hunt Wil \$95,000	23 \$46,699.05	29 \$304,759.34	16 QGA \$80,400 ITA \$3,333	\$729,211.39	32 (100%)	\$22,787.23
2007-08	5 3 NSERC \$73,500 CIHR \$25,000 1/3 OGS \$5,000	8 2 Bau, 3 Wil, McL, ½ Brkn, Carr, 2 OGSST \$95,020	28 \$54,855	24 \$249,783.32	17 QGA \$75,983.33 2 Tri-Coun \$10,000 3 Tuition Burs \$16,326	\$605,467.65	25 (100%)	\$24,218.70
2006-07	5 \$73,000	26 \$293,522	23 \$80,959	27 \$251,345	5 \$14,125	\$712,952	27 (100%)	\$26,405.59
2005-06	5 \$86,000	25 \$249,746	20 \$75,262	26 \$279,314	2 \$13,375	\$703,697	27 (100%)	\$26,062.85
<p>¹Give the number of students supported in each category in (). ²Indicate the nature of the total population against which the % is calculated – e.g. all students, all full-time students, all full-time students in the first ‘X’ year(s) of the Program, etc. ³Average funding per funded student.</p>								
<p>Use space below for comments on Table 7b PhD [e.g. comment on guaranteed minimums, competitiveness, etc.; indicate whether students may hold any of these forms of support concurrently]</p>								
<p>2012-13: 5 PhD students beyond funding eligible years (not included in count), each received some funding in the range of \$5674-7566.</p>								

**Table 7a. Financial Support for Master of Science Students – 8 year summary
Microbiology & Immunology**

Year	Amount of Support From* (# students) ¹						Students Funded	
	External Scholarships (#)	University Scholarships (#)	TAs (#)	RAs (#)	Other* (#)	Total \$	# (%) ²	Average \$ ³
2012-13	3 NSERC \$17,500 (X2) OGS \$15,000	4 QEII \$15,000 McLaughlin \$10,000 Bracken \$10,000 GETA \$6,258	10 \$25,569	9 \$26,143.66	20 \$116,404.20 Incr \$43,500 ITA \$1,700 QGA \$71,204.20	\$259,374.86	14 (100%)	\$18,526.78
2011-12	2 NSERC \$17,500 OGS \$15,000	5 QEII \$15,000 Carm, Brk, Mcl \$10,000 (X3) GETA \$6,258	7 \$19,593	10 \$63,210.20	11 \$68,800 Tri Top Up \$5,000 QGA \$63,800	\$235,361.20	11 (100%)	\$21,396.47
2010-11	2 CIHR \$17,500 NSERC \$17,300	3 Bracken \$10,000 McLaughlin \$10,000 GETA \$6,258	8 \$21,840	6 \$22,015	13 QGA \$48,200 Incr \$29,100	\$182,213	11 (100%)	\$16,564.82
2009-10	4 NSERC \$17,500 OGS \$15,000 OGSST \$15,000	5 McLaughlin \$10,000 (X3) McLaughlin \$3,400 GETA \$6,000	6 \$16,380	7 \$30,333	13 \$84,167	\$217,780	12 (100%)	\$18,148.33
2008-09	5 OHTN \$21,000 NSERC \$17,300 OGS \$15,000 CIHR \$17,500 OGSST \$15,000	4 GETA \$5,574 R Suth \$10,000 McLaughlin \$10,000 (X2)	10 \$25,704.25	13 \$76,086.34	19 ITA \$10,000 Incr \$4,935 QGA \$81,400	\$319,499.59	16 (100%)	\$19,968.72
2007-08	1 CIHR \$17,500	4 GETA \$5,160 FELL \$10,000 (X2) OGSST \$15,000	7 \$17,595.00	8 \$55,187.49	16 QGA \$75,500 ITA \$5,000 Incr \$31,437	\$242,379.49	14 (100%)	\$17,312.82
2006-07	2 OGS \$15,000 OGSST \$15,000	3 McLaughlin \$10,000 (X2) Bracken \$10,000	8 \$20,182.50	4 \$7,900	13 QGA \$47,124 ? \$38,376	\$173,382.50	10 (100%)	\$17,338.25
2005-06	2 NSERC \$17,300 OGSST \$15,000	3 ? \$ 3,833.33 ? \$10,000 ? \$10,000	7 \$16,917.50	5 \$14,460.00	9 QRA \$10,000 VMA \$10,000 QGA \$38,425	\$145,935.83	8(100%)	\$18,241.98

¹Give the number of students supported in each category in (). ²Indicate the nature of the total population against which the % is calculated – e.g. all students, all full-time students, all full-time students in the first ‘X’ year(s) of the Program, etc. ³Average funding per funded student.

Use space below for comments on Table 7a MSci [e.g. comment on guaranteed minimums, competitiveness, etc.; indicate whether students may hold any of these forms of support concurrently]

2005-06: 5 M.Sc. students not included in count (1 M.Sc.1 fully-funded by Government and 4 M.Sc.3 with no funding support)
 2006-07: 2 M.Sc. students not included in count (1 M.Sc.2 fully-funded by Government and 1 M.Sc.4 with no funding support)
 2008-09: 1 M.Sc.3 student not included (no funding support)
 2009-10: 1 M.Sc.3 student not included (no funding support)
 2010-11: 5 M.Sc. students not included in count (1 M.Sc.1 fully-funded by Government, 3 M.Sc.3 with no funding support and 1 M.Sc.3 on parental leave)
 2011-12: 3 M.Sc. students not included in count (2 M.Sc.1 fully-funded by Government and 1 M.Sc. 3 with no funding support)
 2012-13: 2 M.Sc. students not included in count (1 M.Sc. 2 fully-funded by Government and 1 M.Sc. 3 with no funding support)

**Table 7b. Financial Support for Doctoral Students – 8 year summary
Microbiology & Immunology**

Year	\$ Amount of Support From* (# students) ¹						Students Funded	
	External Scholarships (#)	University Scholarships (#)	TAs (#)	RAs (#)	Other* (#)	Total \$	# (%) ²	Average \$ ³
2012-13	2 CIHR \$12,750 CIHR \$35,000	3 Wilson \$10,000 Carm \$10,000 Simpson \$1,800	5 \$13,636.80	7 \$42,128.53	8 ITA \$5,000 QGA \$16,000 Incr \$22,500	\$168,815.33	8 (100%)	\$21,101.92
2011-12	5 OGS \$15,000 (X2) NSERC \$21,000 Vanier \$50,000 CIHR Fox \$12,750	1 Simpson \$4,000	5 \$13,435.20	7 \$57,614.96	7 ITA \$5,000 QGA \$16,500	\$210,300.16	8 (100%)	\$26,287.52
2010-11	3 Vanier \$50,000 NSERC \$21,000 OGS \$15,000	4 McLaughlin \$10,000 Wilson \$10,000 (X2) Wilson \$1,600	5 \$11,102	6 \$20,817	13 QGA \$36,100 ITA \$5,000 (X2) Incr \$16,832.17	\$212,451.17	10 (100%)	\$21,245.12
2009-10	2 OHTN \$21,000 NSERC \$21,000	5 Wilson \$10,000 (X4) Wilson \$3,200	5 \$11,102	7 \$29,358	18 QGA \$54,533 ITA \$5,000 (X3) TB \$5,442 TCRRA \$5,000 Incr \$12,133.66	\$217,768.66	10 (100%)	\$21,776.87
2008-09	2 OGS \$10,000 NSERC \$21,000	2 Wilson \$10,000 (X2)	1 \$1,438.00	5 \$28,700.67	6 QGA \$13,500 ITA \$5,000 (X2) TB \$5,574	\$110,212.67	6 (100%)	\$18,368.78
2007-08	2 OGS \$5,000 NSERC \$21,000	2 Wilson \$5,800 Fell \$10,000	3 \$7762.50	2 \$3,812.00	3 QGA \$4,600 TB \$5,442	\$63,416.50	3 (100%)	\$21,138.83
2006-07	3 OGSST \$15,000 NSERC \$21,000 (X2)	2 GETA \$5,442 (X2) Rbt J Wilson \$10,000 (X2)	6 \$15,525.00	2 \$9,300.00	6 QGA \$25,558	\$138,267.00	6 (100%)	\$23,044.50
2005-06	3 NSERC \$21,000 (X2) CCFF \$793.92	1 ? \$10,000	3 \$7,537.50	4 \$10,418.08	5 QRA \$14,000 QGA \$10,588	\$95,337.50	5 (100%)	\$19,067.50

¹Give the number of students supported in each category in (). ²Indicate the nature of the total population against which the % is calculated – e.g. all students, all full-time students, all full-time students in the first 'X' year(s) of the Program, etc. ³Average funding per funded student.

Use space below for comments on Table 7b PhD [e.g. comment on guaranteed minimums, competitiveness, etc.; indicate whether students may hold any of these forms of support concurrently]

2005-06: 1 Ph.D. student not included in count (fully-funded by Government)
 2006-07: 3 Ph.D. students not included in count (2 fully-funded by Government and 1 Ph.D. year 5 with no funding support)
 2007-08: 4 Ph.D. student not included in count (2 fully-funded by Government, 1 withdrew and 1 on maternity leave)
 2008-09: 2 Ph.D. students not included in count (fully-funded by Government)
 2010-11: 1 Ph.D. student not included in count (fully-funded by Government)

**Table 7a. Financial Support for Master of Science Students – 8 year summary
Pharmacology and Toxicology**

Year	\$ Amount of Support From* (# students) ¹						Students Funded	
	External Scholarships (#)	University Scholarships (#)	TAs (#)	RAs (#)	Other* (#)	Total \$	# (%) ²	Average \$ ³
2012-13	0	2 \$20,000	9 \$2,651.60	7 \$55,219	6 \$57,130	\$135,000.60	7 (100%)	\$19,285.80
2011-12	2 \$30,000	0	14 \$4,291.80	7 \$52,841	7 \$68,135	\$155,267.80	7 (100%)	\$22,181.11
2010-11	3 \$35,000	0	\$9,900	5 \$28,784	7 \$44,763	\$118,447	7 (100%)	\$16,921
2009-10	4 \$64,800	1 \$6,015	18 \$8,299	7 \$38,401	7 \$36,500	\$154,015	7 (100%)	\$22,002.14
2008-09	5 \$79,600	4 \$28,974	47 \$30,158	18 \$107,184	18 \$134,300	\$380,216	18 (100%)	\$21,123.11
2007-08	6 \$105,500	2 \$15,160	36 \$20,048	19 \$97,109	19 \$145,100	\$382,916	19 (100%)	\$20,153.53
2006-07	3 \$43,000	2 \$20,000	\$27,300	8 \$32,800	10 \$67,467	\$190,567	10 (100%)	\$19,056.70
2005-06	6 \$102,800	4 \$40,000	29 \$38,022.3 3	17 \$81,177.50	8 \$62,084	\$324,083.83	18 (100%)	\$18,004.66

¹Give the number of students supported in each category in (). ²Indicate the nature of the total population against which the % is calculated – e.g. all students, all full-time students, all full-time students in the first ‘X’ year(s) of the Program, etc. ³Average funding per funded student.

Use space below for comments on Table 7a MSci [e.g. comment on guaranteed minimums, competitiveness, etc.; indicate whether students may hold any of these forms of support concurrently]

2010-11: 4 M.Sc. students not funded; beyond funding eligible years (not included in count)
 2011-12: 2 M.Sc. students (1 part-time) not funded; beyond funding eligible years (not included in count)
 2012-13: 1 M.Sc. student (part-time) not funded; beyond funding eligible years (not included in count)

Table 7b. Financial Support for Doctoral Students – 8 year summary (Pharm and Tox)

Year	\$ Amount of Support From* (# students) ¹						Students Funded	
	External Scholarships (#)	University Scholarships (#)	TAs (#)	RAs (#)	Other* (#)	Total \$	# (%) ²	Average \$ ³
2012-13	9 \$203,500	4 \$36,258	20 \$6,288	12 \$79,029	13 \$55,372	\$380,447	14 (100%)	\$27,174.79
2011-12	10 \$229,500	4 \$36,258	22 \$9,777.84	10 \$64,240	14 \$49,700	\$389,475.84	14 (100%)	\$27,819.70
2010-11	7 \$138,000	2 \$20,000	14 \$14,414	7 \$44,692	13 \$57,244	\$274,350	13 (100%)	\$21,103.85
2009-10	6 \$124,500	4 \$40,000	28 \$16,871	11 \$66,796	13 \$58,700	\$306,867	13 (100%)	\$23,605.15
2008-09	5 \$101,250	3 \$30,000	18 \$18,339	8 \$47,328	13 \$45,700	\$242,617	13 (100%)	\$18,662.85
2007-08	5 \$88,000	5 \$50,000	26 \$13,320	8 \$49,186	10 \$19,500	\$220,006	10 (100%)	\$22,000.60
2006-07	5 \$87,000	5 \$50,000	27 \$27,300	8 \$24,900	10 \$27,800	\$217,000	10 (100%)	\$21,700.00
2005-06	6 \$123,000	3 \$30,000	16 \$15,945	7 \$27,364.41	1 \$8,472	\$204,781.41	10 (100%)	\$20,478.14

¹Give the number of students supported in each category in (). ²Indicate the nature of the total population against which the % is calculated – e.g. all students, all full-time students, all full-time students in the first ‘X’ year(s) of the Program, etc. ³Average funding per funded student.

Use space below for comments on Table 7b PhD [e.g. comment on guaranteed minimums, competitiveness, etc.; indicate whether students may hold any of these forms of support concurrently]

2011-12: 1 Ph.D. student not funded; beyond funding eligible years (not included in count)
 2012-13: 1 Ph.D. student not funded; beyond funding eligible years (not included in count)

**Table 7a. Financial Support for Master of Science Students – 8 year summary
Physiology**

Year	\$ Amount of Support From* (# students) ¹						Students Funded	
	External Scholarships (#)	University Scholarships (#)	TAs (#)	RAs (#)	Other* (#)	Total \$	# (%) ²	Average \$ ³
2012-13	0	4 \$32,516	7 \$5,834	9 \$104,880	9 \$64,629	\$207,859	12 (100%)	\$17,321.58
2011-12	3 \$50,000	2 \$20,000	14 \$5,856.28	6 \$7,720.00	7 \$35,667	\$119,243.28	7 (100%)	\$17,034.75
2010-11	5 \$77,500	2 \$26,258	24 \$22,272.43	11 \$101,687	9 \$48,600	\$276,317.43	15 (100%)	\$18,421.16
2009-10	3 \$52,500	1 \$6,015	11 \$17,267.43	10 \$80,746	9 \$47,666	\$204,194.43	11 (100%)	\$18,563.13
2008-09	4 \$66,000	3 \$25,574	14 \$22,010	15 \$141,216	8 \$55,400	\$310,200.00	15 (100%)	\$20,680.00
2007-08	1 \$15,000	3 \$35,160	20 \$30,894	17 \$188,772	1 \$2,010	\$271,836.00	18 (100%)	\$15,102.00
2006-07	1 \$15,000	1 \$5,162	7 \$11,102	8 \$83,447	0	\$114,711.00	8 (100%)	\$14,338.88
2005-06	2 \$20,800	1 \$1,000	12 \$18,290.88	10 \$65,468.77	9 \$56,700	\$162,259.6	13 (100%)	\$12,481.51

¹Give the number of students supported in each category in (). ²Indicate the nature of the total population against which the % is calculated – e.g. all students, all full-time students, all full-time students in the first ‘X’ year(s) of the Program, etc. ³Average funding per funded student.

Use space below for comments on Table 7a MSci [e.g. comment on guaranteed minimums, competitiveness, etc.; indicate whether students may hold any of these forms of support concurrently]

2005-06: 2 M.Sc. students not funded (1 part-time status) (not included in count)
 2008-09: 1 M.Sc. student on full scholarship from Saudi Arabia (not included in count)
 2009-10: 2 M.Sc. students on full scholarships from Saudi Arabia (not included in count)
 2010-11: 2 M.Sc. students on full scholarships from Saudi Arabia(not included in count)
 2011-12: 2 M.Sc. students on full scholarships from Saudi Arabia (not included in count)
 2012-13: 2 M.Sc. students on full scholarships from Saudi Arabia (not included in count)

Table 7b. Financial Support for Doctoral Students – 8 year summary
Physiology

Year	\$ Amount of Support From* (# students)¹						Students Funded	
	External Scholarships (#)	University Scholarships (#)	TAs (#)	RAs (#)	Other* (#)	Total \$	# (%) ²	Average \$ ³
2012-13	5 \$108,000	1 \$10,000	2 \$3,258	5 \$41,408	4 \$25,071	\$187,737.00	8 (100%)	\$23,467.13
2011-12	4 \$91,000	1 \$10,000	6 \$5,112.84	4 \$8,321.17	4 \$23,333	\$137,767.01	6 (100%)	\$22,961.17
2010-11	2 \$55,000	1 \$10,000	4 \$5,022.11	2 \$26,727	3 \$17,900	\$114,649.11	5 (100%)	\$22,929.82
2009-10	1 \$30,000	2 \$20,000	6 \$8,133.22	4 \$65,821	3 \$11,100	\$135,054.22	7 (100%)	\$19,293.46
2008-09	3 \$64,000	0	2 \$2,174	5 \$69,231	4 \$28,800	\$164,205.00	9 (100%)	\$18,245.00
2007-08	3 \$65,000	3 \$30,000	6 \$6,796	7 \$87,120	1 \$3,000	\$191,916.00	9 (100%)	\$21,324.00
2006-07	3 \$51,000	3 \$30,000	9 \$12,486	7 \$84,057	0	\$177,543.00	7 (100%)	\$25,363.29
2005-06	2 \$26,000	3 \$30,000	\$9,690.03	8 \$131,504.08	3 \$10,850	\$208,044.11	10 (100%)	\$20,804.41

¹Give the number of students supported in each category in (). ²Indicate the nature of the total population against which the % is calculated – e.g. all students, all full-time students, all full-time students in the first ‘X’ year(s) of the Program, etc. ³Average funding per funded student.

Use space below for comments on Table 7b PhD [e.g. comment on guaranteed minimums, competitiveness, etc.; indicate whether students may hold any of these forms of support concurrently]

2005-06: 3 Ph.D. students not funded (1 part-time status; 1 off campus status) (not included in count)
 2006-07: 5 Ph.D. students not included (3 students funding data unavailable, 2 students beyond funding eligibility)
 2010-11: 1 Ph.D. student on full scholarship from Saudi Arabia (not included in count)
 2011-12: 1 Ph.D. student on full scholarship from Saudi Arabia (not included in count)
 2012-13: 1 Ph.D. student on full scholarship from Saudi Arabia (not included in count)

8. Other Matters	8.1 <i>Discuss the anticipated impact of the merger on student demand for the Programs and describe how this information was obtained.</i>
	<p>The merger is not anticipated to have a negative impact on student demand. All existing programs currently receive more applications than available spaces (see Table 4). We anticipate that the benefits of the merger which include: facilitating access to graduate students for all members of the Department as well as for members from other Faculty of Health Science research centres, groups and clinical divisions, and members from other Faculties within the University; reducing curricular overlap that currently exists between programs; allowing faculty to carry out work that may be better accommodated in an interdisciplinary setting; facilitating collaborations between scientists; providing students access to an interdisciplinary environment where they can pursue interest that may not align with a single discipline (that is, one of the 5 original programs); and, through the implementation of core competencies and common elements, encouraging student-student interactions, will overall lead to a higher student demand for the programs.</p> <p>We actively sought input from current graduate students, graduate faculty and the School of Graduate Studies, all of whom were supportive of these integrated programs.</p>
8.2	<i>Explain how the Programs will fulfill societal need. Comment on similar Programs offered elsewhere and why the proposed Programs will be attractive to applicants (include any unique or innovative elements/features) and future employers.</i>
	<p>The amalgamation and restructuring of the existing five graduate programs under DBMS allows for the revision and refinement of a limited number of discipline-based fields in which graduate training both fits with the research identities of the associated faculty members, and provides students with opportunities for training in areas that are well suited for anticipated career paths anticipated (i.e. no longer academia as the principal target employer, but rather a continuing shift to industry and government). It also includes a new field in Reproductive and Developmental Sciences (see Section 1.4), which has emerged as a specific strength within DBMS and Queen's. Importantly, the new Experimental Medicine field is exceptionally flexible, and will attract students who wish to pursue transdisciplinary thesis research, or whose research projects and supervisors' expertise and interests do not fall within one of the more specialized fields. For example, in the Experimental Medicine field, the curriculum will strive to cultivate students who are capable of not only measuring a particular biochemical or physiological variable(s), but also examining the structure of the cells and/or tissues that constitute the preparation, investigating the nature of the proteins and/or genes which give rise to or influence the variable(s) in question, as well as apply computer analysis and/or modelling to better understand the mathematical underpinnings of the biomedical phenomena. In general, the availability of specific Fields (see Section 1.4) will allow students the choice of specializing in given areas based on their research and career aspirations.</p> <p>While other universities in Canada offer graduate degrees in similar areas, our programs are unique in their structure and benefits (see Section 8.1 above).</p>
8.3	<i>For research-focused graduate Programs, provide a clear indication of the nature and appropriateness of the major research requirements for Program completion.</i>
	<p>The proposed research-focused MSc and PhD programs will include extensive original research. The research to be undertaken by students in the proposed programs will focus on questions related to biomedical and molecular sciences. The programs will require students to critically examine and extend a variety of methods in their research. Students will need to demonstrate their ability to access and understand relevant literature, and to communicate their research findings. It is expected that through their research, students will appreciate the complexity of biomedical and molecular sciences. The research will result in the submission of a thesis that is subject to a formal defense.</p>

9. Student Attributes and Satisfaction

9.1 Include times to completion and attrition data for each of the current Programs (flow through tables by program) and comment on the data (including any anticipated changes with new Programs)

Below is a summary of times to completion. More detailed data for the current programs can be found in the Appendices. Overall, the data demonstrates that DBMS has very good times to completion and we do not anticipate any changes with the new Programs.

Graduate Student Completion Rate and Time to Completion

	Cohort	N	Degree Completion rates	Average Terms to Completion
		DBMS	DBMS	DBMS
Masters 5 years	2002	47	68.1%	7.1
	2003	51	56.9%	7.9
	2004	47	68.1%	7.0
	2005	28	60.7%	7.1
	2006	29	65.5%	6.2

Doctoral 5 Years	2001	18	88.9%	11.6
	2002	13	61.5%	11.4
	2003	12	66.7%	12.1
	2004	13	69.2%	11.7
	2005	19	73.7%	12.0
	2006	20	60.0%	12.5

Doctoral 9 Years	1997	8	100.0%	13.5
	1998	19	73.7%	13.0
	1999	27	92.6%	12.4
	2000	15	93.3%	14.0
	2001	18	94.4%	11.9
	2002	14	92.9%	13.9

Note: Doctoral cohort sizes for 5-year graduation and 9-year graduation cohorts may show discrepancies for the same cohort year due to different sources of data. Beginning in 2012, the Masters and PhD 5-year cohorts (2006) and the 9-year PhD cohort (2002) were derived through PeopleSoft.

9.2 Provide a summary of scholarly output (publications, presentations, awards) of students

The vast majority of our MSc students publish a research paper and present at national and international conferences. The vast majority of our PhD students publish several peer-reviewed papers and also present at several national and international conferences. Below are *selected* publications from students for 2012 only as an example of their productivity. Students are indicated in **bold**. The full list of publications can be found in the attached faculty CV forms.

Department of Biomedical and Molecular Sciences Peer-Reviewed Articles Date Range: 2012 to 2012

Michael A. Adams

Published:

1 - Bourque SL, Whittingham HA, **Brien SE**, Davidge ST, Adams MA, Role of endothelin-1 in the hyper-responsiveness to nitrovasodilators following acute nitric oxide synthase inhibition, Pending Approval, Br J Pharmacol

2 - Hannan JL, Cheung GL, Blaser MC, Pang JJ, Pang SC, Webb RC, Adams MA., Characterization of the vasculature supplying the genital tissues in female rats., 1-2012, J Sex Med, Vol. 9, 136-147

3 - Bourque SL, Komolova M, McCabe K, Adams MA, Nakatsu K., Perinatal iron deficiency combined with a high-fat diet causes obesity and cardiovascular dysregulation, 3-2012, Endocrinology, Vol. 153, 1174-1182

4 - Bourque SL, Whittingham HA, **Brien SE**, Davidge ST, Adams MA, Role of endothelin-1 in the hyper-responsiveness to nitrovasodilators following acute NOS inhibition, 6-2012, Br J Pharmacol, Vol. 165, 1992-1999

5 - Maio TM, Hannan JL, Komolova M and Adams MA, Caloric Restriction Prevents Visceral Adipose Tissue Accumulation and Maintains Erectile Function in Aging Rats, 9-2012, J. Sex. Med, Vol. 9, 2273-2283

In Press:

1 - Hannan JL, Blaser MC, Pang JJ, Adams SM, Pang SC, Adams MA, Impact of Hypertension, Aging and Antihypertensive Treatment on the Morphology of the Pudendal Artery, Pending Approval, Journal of Sexual Medicine

2 - Hannan JL, Cheung GL, Blaser MC, Pang JJ, Pang SC, Webb RC, Adams MA., Characterization of the vasculature supplying the genital tissues in female rats., 1-2012, J Sex Med, Vol. 9(1):136-147

3 - Bourque SL, Komolova M, McCabe K, Adams MA, Nakatsu K, Perinatal Iron Deficiency Combined with a High-Fat Diet Causes Obesity and Cardiovascular Dysregulation, Pending Approval, Endocrinology

4 - Shobeiri N, Pang JJ Adams MA, Holden RM, Cardiovascular Disease in an Adenine-Induced Model of Chronic Kidney Disease; The Temporal Link Between Vascular Calcification and Hemodynamic Consequences, Pending Approval, J. Hypertension

John Allingham

Published:

1 - Delorme C, Joshi M, Allingham JS, Crystal structure of the Candida albicans Kar3 kinesin motor domain fused to maltose-binding protein., 11-2012, Biochemical and biophysical research communications, Vol. 428(4):427-32

2 - Duan D, Jia Z, Joshi M, Brunton J, Chan M, Drew D, Davis D, Allingham JS, Neck rotation and neck mimic docking in the noncatalytic Kar3-associated protein Vik1., 11-2012, The Journal of biological chemistry, Vol. 287(48):40292-301

3 - Kwok E, Everingham S, Zhang S, Greer PA, Allingham JS, Craig AW, FES kinase promotes mast cell recruitment to mammary tumors via the stem cell factor/KIT receptor signaling axis., 7-2012, Molecular cancer research : MCR, Vol. 10(7):881-91

4 - Duan D, Hnatchuk DJ, Brenner J, Davis D, Allingham JS, Crystal structure of the Kar3-like kinesin motor domain from the filamentous fungus Ashbya gossypii., 4-2012, Proteins, Vol. 80(4):1016-27

In Press:

1 - Da Duan, Daniel J. Hnatchuk, Jillian Brenner, Darlene Davis and John S. Allingham, Crystal structure of the Kar3-like kinesin motor domain from the filamentous fungus Ashbya gossypii, 3-2012, Proteins, Vol. DOI: 10.10

Bruce W Banfield**Published:**

1 - Guzzo C, Ayer A, Basta S, Banfield BW, Gee K, IL-27 enhances LPS-induced proinflammatory cytokine production via upregulation of TLR4 expression and signaling in human monocytes., 1-2012, Journal of immunology (Baltimore, Md. : 1950), Vol. 188(2):864-73

2 - Finnen RL, Pangka KR, Banfield BW, Herpes simplex virus 2 infection impacts stress granule accumulation., 8-2012, Journal of virology, Vol. 86(15):8119-30

3 - Le Sage V, Banfield BW, Dysregulation of autophagy in murine fibroblasts resistant to HSV-1 infection., 12-2012, PloS one, Vol. 7(8):e42636

4 - Guzzo C, Jung M, Graveline A, Banfield BW, Gee K, IL-27 increases BST-2 expression in human monocytes and T cells independently of type I IFN., 12-2012, Scientific reports, Vol. 2, 974

Sam Basta**Published:**

1 - Guzzo C, Ayer A, Basta S, Banfield BW, Gee K, IL-27 Enhances LPS-Induced Proinflammatory Cytokine Production via Upregulation of TLR4 Expression and Signaling in Human Monocytes., 1-2012, Journal of immunology (Baltimore, Md. : 1950), Vol. 188(2):864-73

2 - Gambhir V, Yildiz C, Mulder R, Siddiqui S, Guzzo C, Szewczuk M, Gee K, Basta S, The TLR2 agonists lipoteichoic acid and Pam3CSK4 induce greater pro-inflammatory responses than inactivated Mycobacterium butyricum., 12-2012, Cellular immunology, Vol. 280(1):101-107

James F. Brien**Published:**

1 - Shea KM, Hewitt AJ, Olmstead MC, Brien JF, Reynolds JN, Maternal ethanol consumption by pregnant guinea pigs causes neurobehavioral deficits and increases ethanol preference in offspring., 2-2012, Behavioural pharmacology, Vol. 23(1):105-12

2 - Dobson CC, Mongillo DL, Poklewska-Koziell M, Winterborn A, Brien JF, Reynolds JN, Sensitivity of modified Biel-maze task, compared with Y-maze task, to measure spatial learning and memory deficits of ethanol teratogenicity in the guinea pig., 7-2012, Behavioural brain research, Vol. 233(1):162-8

3 - Dobson CC, Mongillo DL, Brien DC, Stepita R, Poklewska-Koziell M, Winterborn A, Holloway AC, Brien JF, Reynolds JN, Chronic prenatal ethanol exposure increases adiposity and disrupts pancreatic morphology in adult guinea pig offspring., 12-2012, Nutrition & diabetes, Vol. 2, e57

4 - Kenna K, Sozo F, De Matteo R, Hanita T, Gray SP, Tare M, Moritz K, Bertram JF, Black MJ, Brien JF, Parkington HC, Walker DW, Harding R, Alcohol exposure during late gestation: multiple developmental outcomes in sheep, 4-2012, Journal of developmental origins of health and disease, Vol. 3, 224-236

Eric B. Carstens**Published:**

1 - Yu M, Carstens EB, Choristoneura fumiferana multiple nucleopolyhedrovirus LEF-3-P143 complex can complement DNA replication and budded virus in an AcMNPV LEF-3-P143 double knockout bacmid., 2-2012, The Journal of general virology, Vol. 93(Pt 2):383-8

Graham P. Côté**Published:**

1 - Hyndman BD, Thompson P, Bayly R, Cote GP, Lebrun DP, E2A proteins enhance the histone acetyltransferase activity of the transcriptional co-activators CBP and p300., 5-2012, Biochimica et

Andrew Craig

Published:

1 - Mali RS, Ma P, Zeng LF, Martin H, Ramdas B, He Y, Sims E, Nabinger S, Ghosh J, Sharma N, Munugalavadla V, Chatterjee A, Li S, Sandusky G, Craig AW, Bunting KD, Feng GS, Chan RJ, Zhang ZY, Kapur R, Role of SHP2 phosphatase in KIT-induced transformation: identification of SHP2 as a druggable target in diseases involving oncogenic KIT., 9-2012, Blood, Vol. 120(13):2669-78

2 - Kwok E, Everingham S, Zhang S, Greer PA, Allingham JS, Craig AW, FES kinase promotes mast cell recruitment to mammary tumors via the stem cell factor/KIT receptor signaling axis., 7-2012, Molecular cancer research : MCR, Vol. 10(7):881-91

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Anne Croy

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Peter L. Davies

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Alastair V. Ferguson

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Katrina Gee**Published:**

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Kenneth F. Jarrell

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Frederick W.K. Kan

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Alan E G Lomax

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Neil S. Magoski

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Richard J. Oko

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Stephen C. Pang

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R. Keith Poole

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Conrad Reifel

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Steven P. Smith

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Myron R. Szewczuk

Published:

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Chandrakant Tayade

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Christopher A. Ward

Published:

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Louise M. Winn

Published:

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2 - Tung EW, Philbrook NA, Macdonald KD, Winn LM, DNA double-strand breaks and DNA recombination in benzene metabolite-induced genotoxicity., 4-2012, Toxicological sciences : an official journal of the Society of Toxicology, Vol. 126(2):569-77

Shetuan Zhang

Published:

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9.3 *Comment on student satisfaction with the current Programs (Exit survey data) and placement of graduates. Use subheadings as appropriate.*

The sample size of the School of Graduate Studies exit surveys is too small to use.

10. Equity, Diversity and Accessibility

10.1 Describe how the current Programs have addressed the University's equity goals including the mechanisms by which the Program(s) addresses equity issues; any identified inequities; the most recent equity audit; relevant questions from Exit Polls. Also, provide information about approaches to achieve equitable representation for equity-seeking groups within the Programs, including within the student body as well as staff and faculty complements. [\[Click here for Text Examples\]](#) What changes (if any) are expected with the new Programs?

The Strategic Plan for Queen's University names diversity and equity amongst key values and principles that define the Queen's community. Diversity includes, but is not limited to, "a diverse range of experience, nationalities and ethnicities, sexual orientation and gender identity, income levels, ages and cultures".

A recent report from the Queen's Equity office (January 24, 2013) states that when comparing the representative percentage unit in DBMS with the Canadian Population, the designated groups in DBMS that are most-under-represented are visible minorities and persons with disabilities with respect to staff positions and women with respect to faculty positions. When evaluating research positions all of the designated groups are represented. The report also identified that women, under the National Occupational Code (NOC) 4121, University Professors, is the most under-represented group in DBMS.

With respect to the *Accessibility for Ontarians with Disabilities Act, 2005 (AODA)* 72.5% of our Department is in compliance with the accessible customer training requirements and we are working hard at achieving 100% compliance.

10.2 Provide information about the approaches to achieve equitable representation rates of members of designated groups within the Programs including students, faculty members and staff.

Our Department strives to promote a positive climate that respects diversity and equity, and a welcoming climate for all students and we will ensure equitable admissions practices. Most of our primary faculty have taken the Appointments and Renewal, Tenure and Promotion Equity Training Workshop, and several have taken Employment Equity Representative Workshop. This training signifies the Department's commitment to equity.

We employ several approaches to try to achieve equitable representation of designated groups within students and staff members including the evaluation of potential students and staff in a fair and consistent manner, ensuring accessibility and coordinating any accommodations requirements.

Faculty recruitment always starts with consultation with the Office of the University Advisor on Equity, the establishment of a diverse appointment committee and an interview process that follows the processes outlines on the Queen's Equity website including: the evaluation of potential candidates in a fair and consistent manner (including consistent interview questions), ensuring accessibility and coordinating any accommodations requirements.

11. Quality and Other Indicators

11.1 *Comment on overall quality and availability of graduate supervision and mentorship*

Our Department has internationally recognized expertise in biomedical and molecular sciences. Our faculty members are actively engaged in research, and have been successful in obtaining extensive research funds. The capabilities and contributions of the faculty members are also recognized nationally and internationally as demonstrated by publications in international peer-reviewed journals and books, invited presentations and involvement in scientific societies and expert panels and workshops. Research activities involve numerous collaborations among disciplines, within the university, nationally and internationally.

Our faculty member's research programs have been recognized nationally and internationally through numerous awards (see Table 7 and CV Modules).

Our Faculty continue to improve their teaching and over the last 8 years have attended the following number of workshops offered by the Center for Teaching and Learning:

Department	Participants	Workshops
Anatomy and Cell Biology	84	130
Biochemistry	74	103
Microbiology and Immunology	48	51
Pharmacology and Toxicology	16	69
Physiology	29	67
Biomedical and Molecular Sciences	1	2

Laboratories participating in the Department of Biomedical and Molecular Sciences graduate programs have numerous research techniques and approaches available, including biochemistry (one- and two-dimensional gel electrophoresis, immunoblotting, high performance liquid chromatography, phosphokinase assay, nucleotide metabolism assay, radioimmunoassay, NMR), computer and mathematical modelling, electrophysiology (single- and multi-unit recording, sharp electrode, whole-cell and single-channel recording), epithelial function assays (transepithelial resistance monitoring), histology and microscopy (electronmicroscopy, histo- and cytochemistry, immunohisto- and immunocytochemistry, upright and inverted phase microscopy, fluorescent microscopy, confocal microscopy, ratiometric imaging), magnetic resonance imaging, molecular biology (standard and real time PCR, in situ hybridization, sub-cloning, Northern and Southern blotting), muscle function assays (organ bath smooth and cardiac muscle preparation), optical tracking, tissue culture (bacterial, mammalian and non-mammalian), radiotelemetry, transgenic mice, monitoring of human and animal physiological variables (blood pressure, blood flow, caloric expenditure, respiration, temperature, ultrasound).

11.2 *Comment on the key changes (Fields, curriculum requirements,...) associated with the merging of current Programs into a single Academic Unit*

Major program innovations include the establishment of: 1) common seminar courses; this will encourage the inter-disciplinary nature of the programs, and provide a forum for students to present their thesis research to both experts and other biomedical scientists and trainees from complementary fields; 2) a "Fundamentals of Academic Biomedical Research and Research Proposal" course which will introduce all graduate students to topics such as ethics in research, laboratory safety, proper record keeping, and drafting a research grant application; 3) a series of thematically based hands-on methods courses that will allow students to have direct experience with state of the art research techniques; these will be available to students in all program fields as well as to students from outside of the Department.

11.3 *Comment on aspects of the structures of the new Programs and faculty research that contribute to the intellectual quality of the student experiences.*

As indicated above we are confident that the structures of the new programs will benefit students. Our faculty are internationally recognized experts in biomedical and molecular sciences and that we have sufficient research funds that will significantly contribute to student experiences.

The excellence of our Faculty will benefit students through their expertise, mentorship in courses and research projects and initiatives for securing financial support.

12. Implementation issues

12.1 Describe how continuing students in the existing Programs will be followed and supported in their respective Programs through to completion. If students' registration will be converted to DBMS, describe how and when this will be done. Will all students be affected (detail)? Explain how all students will be consulted and have input.

Students in existing Programs will be "Grandparented" under the current guidelines and regulations for those Programs and their level of support will remain the same as it currently is. All students registering in September 2014 will fall under the new Programs regulations.

Supporting documentation - Unit(s) Input

If documents are .pdf documents, it is essential that they are first converted to Word documents using Adobe Acrobat Software to avoid loss of resolution and formatting. If you do not have Adobe Acrobat, please consult your faculty office.

[This is not necessarily a complete list, and is not intended to be prescriptive but rather provide guidance; additional documents and data summaries can be added as needed].

- Unit Strategic and/or Staffing Plan
- Academic Regulations
- Course Offerings for the past 3 years (G)
- Calendar Course Descriptions (G)
- Summary of Base Budget (optional)
- Faculty Workload Documents
- Faculty Teaching Assignments for the past 5 years
- Graduate Student Manuals (as applicable)
- Postdoctoral Fellows Policy and/or Program (as applicable)
- Laboratory or Research Computing Equipment
- Major Laboratory Equipment and/or Facilities
- Accreditation Reports (as applicable)
- Examples of national and/or international Programs which provide useful reference points for comparison (together with the rationale for the choice)

Supporting Documentation – Input from OIRP, SGS, Library (and other sources external to the Unit)

Below is additional information / documentation that may be pertinent to the Program(s) and support the data tables and narratives in Part B (Sections 1-14).

- SGS Exit Survey
- Library Report
- Student Diversity and Designated Groups
- Current Faculty Profile
- Graduate Student Financial Support
- Graduate Student Time to Completion and Completion Rate
- SGS Flow-through data
- *Multiyear Enrolment Profile*

Part C – Administration & Government Reporting Information

Part C is to be completed by the Department/Faculty in consultation with the Office of the University Registrar and the School of Graduate Studies.

12. Information for and/or from the Office of the University Registrar and/or the School of Graduate Studies Registrar													
12.1. Academic Administration													
Academic Career	GRAD												
Department(s)													
Biomedical and Molecular Sciences													
Proposed Start Date <u>09/2014</u> <small>mm/yyyy</small>	Program duration <u>16 months, 24 months and 48 months</u>												
Expected enrolment													
<table style="width: 100%; border: none;"> <tr> <td style="width: 30%;"><i>Initial Year:</i> _____</td> <td style="width: 30%;"><i>Steady State</i> <u>140 total</u></td> <td style="width: 40%;"></td> </tr> <tr> <td><i>16 new MSc (AS)</i></td> <td><i>25 MSc (AS)</i></td> <td></td> </tr> <tr> <td><i>25 new MSc</i></td> <td><i>51 MSc</i></td> <td></td> </tr> <tr> <td><i>20 new PhD</i></td> <td><i>61 PhD</i></td> <td></td> </tr> </table>		<i>Initial Year:</i> _____	<i>Steady State</i> <u>140 total</u>		<i>16 new MSc (AS)</i>	<i>25 MSc (AS)</i>		<i>25 new MSc</i>	<i>51 MSc</i>		<i>20 new PhD</i>	<i>61 PhD</i>	
<i>Initial Year:</i> _____	<i>Steady State</i> <u>140 total</u>												
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<i>25 new MSc</i>	<i>51 MSc</i>												
<i>20 new PhD</i>	<i>61 PhD</i>												
Program Names: Degree <small>(max 50 characters) (e.g. Master of Applied Science)</small>	Degree Codes <small>(max 5 characters) (e.g., MASC)</small>												
Master of Science Doctor of Philosophy Master of Science in Anatomical Sciences	Master of Science: MSC Doctor of Philosophy: PHD Master of Science in Anatomical Sciences: MSCAS												
Academic Plan <small>(e.g. Chemical Engineering)</small>	Academic Sub-Plan <small>(e.g. Specialization in Collaborative Biomedical Engineering)</small>												
Biomedical and Molecular Sciences													
Collaborative Program Sub-Plan													
<i>List all departments/plans that may admit students into the Collaborative Sub-Plan. Indicated department with <u>primary responsibility for Sub-Plan (underline)</u></i>													
Some DBMS research M.Sc. or PhD students may also be enrolled in the Cancer Research Collaborative program). Some DBMS research M.Sc. or PhD students may also be enrolled in the MD/PhD, MD/Master's Collaborative programs.													
Pattern of Study <small>(Master's programs only; choices: Pattern I, II, III)</small>	M.Sc.: Pattern I M.Sc. (A.S.): Pattern II												
12.2. Complete the following:													
Will students be admitted part-time?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												
Will all or part of the program be offered at the BISC campus?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												
Will all or part of this program be offered via distance learning (e.g. online or blended learning?)	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No												

13. Course Information	
New Courses with new subject code required?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
If yes, suggested Subject Code	BMED _____

14. Tuition and Student Activity Fees	
Tuition Fee	Same as for all other M.Sc./Ph.D students
Fee Assessment Protocol <i>(Annual? Per term Or per course?)</i>	Annual
Student Activity Fees <i>GRAD - SGPS</i>	Same as for all other M.Sc./Ph.D students
Non-Tuition Fees	Same as for all other M.Sc./Ph.D students

15. Government Reporting	
Proposed FORPOS	n/a
Program Weight (BIUs)	n/a
Proposed CIP Code	n/a

Part D - Authorizations

Part D is to be completed by the SGS following GSEC approval.

<i>Date Approved by GSEC</i>	April 18, 2013 _____	
<i>Department Head(s)</i>	 _____ <i>Signature</i>	April 30, 2013 _____ <i>Date</i>
<i>Faculty Dean(s) or delegate(s)</i>	 _____ <i>Signature</i>	May 2, 2013 _____ <i>Date</i>
<i>University Librarian</i>	_____ <i>Signature</i>	_____ <i>Date</i>
<i>University Registrar</i>	_____ <i>Signature</i>	_____ <i>Date</i>
<i>Chief Information Officer and Associate VP (Information Technology Services)</i>	_____ <i>Signature</i>	_____ <i>Date</i>
<i>Vice-Provost and Dean, School of Graduate Studies</i>	_____ <i>Signature</i>	_____ <i>Date</i>
<i>Vice-Provost (Planning and Budgeting)</i>	_____ <i>Signature</i>	_____ <i>Date</i>
<i>Provost and Vice-Principal (Academic)</i>	_____ <i>Signature</i>	_____ <i>Date</i>