Graduate Examinations

Reclassification / Qualifying Exam

Students in the PhD program must pass a "qualifying exam;" students in the MSc program who wish to transfer to the PhD program must pass a "reclassification exam." In the Department of Immunology, the purpose of the exam is the same in both cases, namely to assess the prospects that the student will complete a quality Ph.D thesis and will develop the ability to operate as an independent scientist. Accordingly, the prerequisites and procedures for the two exams are comparable, namely to prepare a research proposal and then to demonstrate sufficient specific and general knowledge in an oral exam. The format and criteria for these examinations are prescribed by the Department and are described below.

In conferring the PhD the Department of Immunology signifies that the student can function as an independent scientist. The mandate of our program is to train students in the principles and practice of good science, i.e. to develop individuals who can:

1. formulate interesting and experimentally answerable questions
2. design experiments to answer questions with appropriate controls
3. carry out experiments with appropriate controls
4. assimilate and respond to information from the literature
5. coherently describe the results orally and in writing

The reclassification/qualifying exam is intended to establish whether the faculty believe that the student will achieve the criteria listed above. In addition the examining committee looks to see that the proposed research framework is "likely" to yield a satisfactory doctoral thesis and a suitably prepared PhD candidate.

<u>Requirements for reclassification/qualifying examinations</u>

In order to continue in the PhD program of the Department of Immunology, the student must have completed Recent Advances Parts I and II with at least a B+ average.

<u>Criteria for passing the exam</u>

To pass the exam the student must:

1) demonstrate to the examiners that the student knows the relevant background literature and can integrate that knowledge into the written research proposal.

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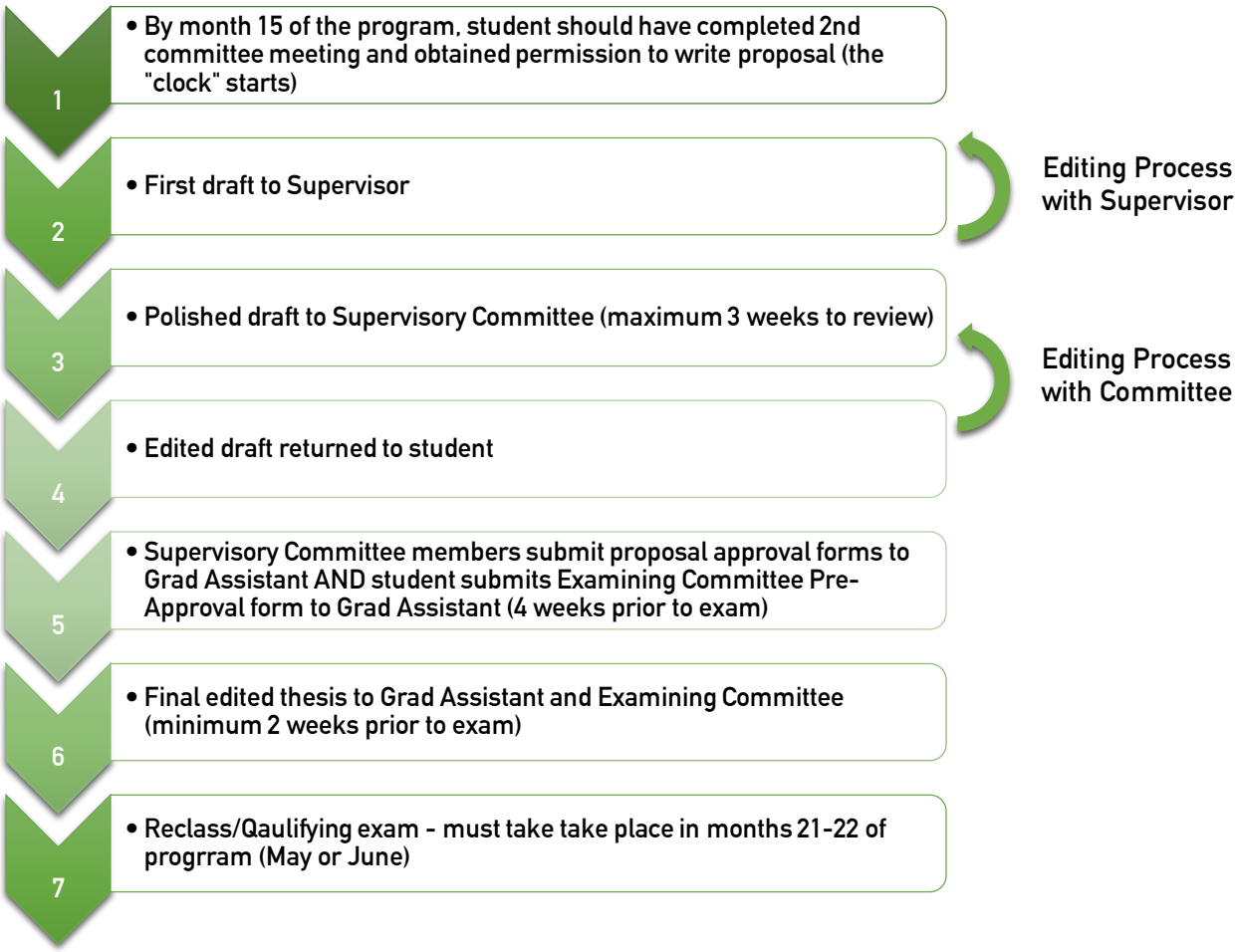
2) defend the proposal, i.e., demonstrate that the proposed experiments are well conceived with a reasonable chance of substantially advancing our understanding, that the student has thought through the limitations and controls and can discuss the significance of preliminary or anticipated results.
3) present experimental results showing an ability to design and execute well-controlled experiments and interpret the results. (It is not necessary or even expected that the student will have already completed a body of work that has been or could be published.)
4) demonstrate a general knowledge of immuno/molecular/cellular biology, such as is required in the Recent Advances courses.

Exam Timing

Irrespective of whether it is an MSc Reclass or PhD Qualifying Exam, the exam must take place in months 21-22 of the program (i.e. May or June for September admits).



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The only exception to this rule is for students in the PhD program who remain with the same supervisor that they had in the MSc program. These students who continue in the same lab are obliged to undergo their qualifying exam within six months of entering the PhD program.

Organization and preparation of the research proposal

- *Format*. The proposal should be no more than 15 double spaced pages, with a font size 12, not counting figures and references. Margins should be no less than ¾". References should be in the format of a journal such as Cell or Journal of Immunology, which includes full titles. Figures must be of publication quality, and figure legends must permit a complete understanding of how the experiment was done. Please consult http://www.cihr-irsc.gc.ca/e/29300.html for additional recommendations.

- *Content*. The exam requires that the proposal deal efficiently and clearly with proposed research. The proposal should be organized like a grant application, thus organized into four sections:
    - *Project objective*. There should be a clear statement as to the goal of the project. What is the hypothesis being tested? What is the knowledge being sought? The proposed research project must be scientifically sound and significant enough to be publishable in a high quality scientific journal.
    - *Introduction*. The introduction should include the relevant (usually recent) information which is not in textbooks and should document the assumptions underlying the proposed research.
    - *Preliminary Work*. The proposal should include the student's experimental results which are relevant to the proposed studies. This previous work should be described so that it illustrates that the candidate can carry out experiments with adherence to good scientific principles. (See below, Evaluation of Progress.)
    - *Proposed Experiments and Discussion*. The questions and experiments comprising the research and the significance of possible outcomes should be explicitly described. In proposed experiments, it again should be clear that the student understands and adheres to good scientific principles--that is, there must be an awareness of the limitations arising from the experimental system and reasonable experiments to clarify alternative interpretations of the observations should be included. The student should illustrate the feasibility of the experiments with a reasonable level of experimental detail including availability of reagents, sensitivity of the system etc. and also demonstrate the ability to judge or refute alternative interpretations of her/his possible observations.

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Composition of the examination committee

The reclassification/qualifying exam constitutes a very serious post-admission review of the student's suitability for a PhD Reflecting this importance, the examination committee will be six members: three of the examiners should be from outside the supervisory committee; one examiner should be a member of the Graduate Committee and may be a member of the supervisory committee if he/she is not the supervisor; one examiner should hold his/her primary appointment in an external department.

* (or any member of the DoI if Graduate Committee member is already a Supervisory Committee member)

- Maximum (and departmental recommendation) = 6 voting members

  If you have more than 3 committee members, all can attend but one must not vote (usually the supervisor)

Functions of the supervisory committee

The role of the supervisory committee members is complicated by the fact that they must function both as advisors and as evaluators. Thus, if the student wishes to continue in the PhD program, the full supervisory committee must reach an opinion

on whether the student meets the relevant expectations. The committee members should develop their opinion prior to the exam on the basis of their interactions with the student in committee meetings and elsewhere.

The examination

The student should give a 15-20 minute presentation summarizing relevant previous work and describing the proposed work. The candidate should remember that the examination committee has read the proposal, and so a longer speaking time is not necessary. Normally the student would not be interrupted during this talk.

The student will then be questioned to establish whether he/she shows the potential to become an independent scientist. Specifically, questions will be asked to determine the student's knowledge of the project and his or her general knowledge of immunology.

Evaluation of the project design. Typical questioning will take the line of evaluating whether the student can defend how the proposed experiments will test the hypothesis or answer the question posed; whether the student has designed appropriate controls and understands them; whether the student has basic knowledge of the majority of the assays, reagents, and equipment involved in performing the experiment. The student should be familiar with the theory and equations required to analyze the results. Typically the line of questioning might emphasize variables and parameters of measurement that could influence the results. The student should be questioned on the issue of alternative plans in case of disaster (technical, theoretical, or if the student is "beaten" by another lab).

Inevitably, the nature of the proposed experiments enters into the evaluation: a poorly conceived proposal may be taken as a sign that the student might have serious difficulties in completing the PhD requirements. Despite careful preparation and forethought it is possible that the proposed research will be flawed. If the project has been approved by the supervisory committee, and if the performance of the student otherwise merits continuation in the PhD program, the committee may pass the student but request a revision in the design of the thesis project. A proposal committee will then be appointed, including the supervisor, two other relevant faculty members, and the student, to draw up a thesis project with the changes suggested by the reclassification examining committee. The changes and hence the new project must be approved by the other examiners. With the agreement of all examiners, this approval may be obtained from each member without holding a formal exam. The final approval must be in place within the first 24 months of the program, typically within 6 weeks of the exam.

Evaluation of progress. In judging the work of the first 20 months the main emphasis should be placed on the way the work was planned, the quality of the work executed and whether thinking/design has evolved or improved. The examination should establish whether the student adhered to scientific principles and developed a scientific attitude towards research. These general principles are independent of whether or not the student has obtained "positive" or "negative" results in his/her experiments during these first 20 months as a graduate student. Indeed, "negative" results often generate a more detailed discussion of the potential project revealing perhaps more about the student's attitude and ability in science than do "positive" results.

Knowledge of the Project. The student should have a comprehensive but not necessarily exhaustive knowledge of the topic being investigated, reflecting the fact that the student is endeavoring to work at the cutting edge of science but is still in the early stage of training. The student should be able to relate his/her project to published data in the field, to discuss issues and be able to put results or theories in the context of the related current literature. He/she should be able to describe how the experiments were performed and what the limitations or flaws of these systems were and what comparisons are reasonable.

General knowledge. General knowledge questions will form an important part of every reclassification and qualifying examination. Students are responsible for a graduate level of knowledge as taught in the immunology program at the University of Toronto (i.e. IMM1016 & IMM1017). The emphasis in questioning at the examination will be on immunology, but students should also have an understanding of basic molecular biology, biochemistry, genetics and microbiology. It is not expected that students will have retained every detail of these courses but a broad understanding of the fundamentals of immunology, biochemistry and molecular biology is expected.

<u>The outcome.</u>

There are five possible outcomes of a reclassification/qualifying exam.

Outcome 1. *Pass*

Outcome 2. *Pass, but with requirement to develop a modified or alternative project* (see above)

Outcome 3. *Adjournment* - This outcome is chosen when the examiners determine that the student has shown some serious deficiencies but feel that the student can readily overcome these deficiencies. In this case the

examination committee will reconvene to conduct a second examination. This examination must be held within three months of the first examination, and no further examinations are permitted.

Outcome 4. *The student is not suited to the PhD program but may complete the MSc program*. This outcome is chosen when the examination committee feels that because of the student's deficiencies; the student should not go forward in the PhD program at this time. The student may, however, write and defend a MSc thesis, and depending on performance the student might be reassessed at that time for admission into the PhD program. (Entry into the PhD program by this route would still require the student to pass the qualifying exam 20 months after enrolment.) This outcome is not permitted for students who have already a MSc in a closely related discipline in the life sciences.

Outcome 5. *The student is not suited to either the MSc or the PhD program*. In this case the student must withdraw from the graduate program of the Immunology Department.

In the absence of the exam, as in the case of failure, the student may remain in (or transfer to) the MSc program. Note that "back transfers" from the PhD to the MSc program are not automatic, and must be approved by SGS. Those students who already have an MSc degree must leave the program.

How the vote is counted. If all, or all except one of the examiners vote for Outcome 1, the outcome is PASS and the candidate may enter the PhD program. If two or more examiners do not vote for Outcome 1, then outcome corresponds to the "highest" possibility that has fewer than two negative votes.