

## Graduate Program in Neuroscience Policies and Procedures for the Qualifying Exam (AY 2018-2019)

**DISCLAIMER.** All Qualifying Examinations must meet the minimum standards set forth by the Graduate School of Biomedical Sciences (GSBS). This document is intended to clarify and expand upon the GSBS Standards for the Qualifying Exam, and to provide Program-specific information regarding the detailed mechanics and intent of the Exam process. (The GSBS instructions for the Qualifying Exam are contained within the student handbook at <https://www.umassmed.edu/globalassets/graduate-school-of-biomedical-sciences/documents/gsbs-student-handbook.pdf>).

If this document and the GSBS standards are in conflict, the GSBS standards supercede. If you identify an apparent contradiction, please let Dave Weaver know.

**Overview.** The Qualifying Examination is intended to determine whether a student has sufficient ability and preparation to undertake independent research leading to a Ph.D. degree. The Exam is also an opportunity for the student to learn how to develop a novel research proposal.

The Qualifying Examination in the Program in Neuroscience will consist of developing and defending an original research proposal that addresses a research problem. The research problem will usually be related to the student's thesis project and may be the thesis project itself, although a topic unrelated to the field of thesis research is acceptable. After choosing the topic, the student will prepare a **Specific Aims** Page describing the hypothesis to be tested and the experimental approach(es) to be taken. A **Specific Aims meeting** (formerly called Abstract Meeting) is held to review the scope of the proposal and determine whether the approaches chosen can reasonably address the hypotheses proposed. Upon approval of the Specific Aims by the Qualifying Examination Committee, the student will prepare a **6-page written QE proposal** including background, proposed experiments, and interpretations of probable and alternative outcomes. The document must include citations to appropriate literature and a reference section, which is outside the 6-page length limit. An **oral Qualifying Examination** will then be held, in which the student will defend the proposal and answer questions from the Committee on any subject with which the student should be familiar, whether directly related to the subject of the research proposal or not.

**Guidance.** The Director of the Program in Neuroscience (Dr. David Weaver, LRB-723, 508-856-2495) will advise students on Examination policies, approve composition of Qualifying Exam Committees, and will ensure that deadlines are met, both by students and Committees.

**Timing of the Qualifying Exam.** The Exam may be taken in the Fall or Spring semester of the second year of study. For students that affiliate with their thesis lab “on time” (e.g., in June at the end of their first year), the **initial Qualifying Examination defense must occur by May 15** of the second year of study. Students affiliating after June 1 and those taking the Introduction to Neuroscience course in the Spring semester of their second year may request a slightly delayed timeline from Dr. Weaver and Dean Lane. All students must complete the QE process before the start of the Fall semester of their third year.

### **Step-by-Step Procedures.**

#### **1. Select the Research Topic**

**Topic.** All Programs in the Graduate School of Biomedical Sciences allow students to write on their thesis research problem. A student may write on an unrelated (but Neuroscience-based) topic instead if they choose.

**Scope.** For the purposes of the Qualifying Exam, the scope of the research proposal must be narrow enough to ensure that all elements (i.e., Specific Aims, Background, Rationale, Experimental Design, Expected Results and Interpretation) can be included in the written proposal in detail adequate for evaluation by the QE Committee. Additionally, it is expected that the proposal will represent a reasonable project for one graduate student (e.g., rather than a proposal that would require an entire lab's efforts for several years).

**Faculty Role in Proposal Development.** The student will select the topic in consultation with the PI, and may have discussions with the PI and other faculty members in developing the ideas reflected in the Aims. *The intention is to have **the student** learn how to develop an idea into a research proposal.* Faculty members represent a critical resource for the student and should be available to participate in the Aims development process, but **the student must play the major role.** Faculty may assist by assigning/recommending reading material, indicating areas of the abstract that may not seem feasible or well-connected to the remainder of the proposal, providing insight on strategy (“don’t make Aims 2 and 3 dependent upon the success of Aim 1”) suggesting alternative approaches the student should investigate, and indicating areas where further development of ideas is necessary. **Faculty should not be providing Aims** or playing a major role in developing ideas for inclusion, except by providing feedback on the student’s ideas.

It is expected that the student will not have access to a research grant from the thesis advisor’s lab that overlaps with the content of the QE proposal. If the student does have such access, the student’s proposed studies must not overlap significantly with the studies proposed in the grant. The background and introduction for the qualifying exam always must be the student’s synthesis, not that of the Thesis Advisor. The student may develop original experiments to extend the Thesis Advisor’s proposed research, but may not simply revise experiments developed by the Thesis Advisor.

Students are required to disclose whether they have prepared any research proposals with the Thesis Advisor, to describe the roles of the student and the Thesis Advisor in that proposal, and their relationship to the work proposed in the Qualifying Exam proposal.

## **2. Form the Qualifying Exam Committee (QEC)**

An experienced “General Examiner” will be assigned to each student’s QE Committee by the Graduate School.

QE Committees in the Program in Neuroscience will consist of 5 members (The General Examiner, the Chair, and three additional members). The student and mentor will develop a list of 4-6 candidates for the Committee, including a Chair, based on familiarity with the research topic. The Chair and at least one other member of the Committee must be members of the Neuroscience Program. The proposed QE topic and the list of candidates will be reviewed by the Graduate Program Director (Dave Weaver), who will approve a Chair candidate, three additional candidates, and potential alternate members to serve on the QEC.

After the proposed QEC members are approved by Dr. Weaver, the student should ask the potential Committee members if they are willing to participate. This request should be accompanied by a brief indication of the proposed topic.

(I suggest asking the prospective Chair to agree to this role first, before asking other faculty. If the ‘desired’ Chair does not agree to this role, then another member of the committee can be asked to be Chair without knowing they were the second choice).

Once the QEC composition is defined, upload the names of the members and Chair to **Blackboard** (or deliver this information to the GSBS Office) as soon as possible.

### **3. The Specific Aims Page**

a. A Specific Aims Meeting (formerly called Abstract Meeting) provides the student with the opportunity to become familiar with the process of presenting to the Committee and to get direct feedback from the committee members.

Prior to the Specific Aims Meeting, the student should develop a Specific Aims Page. The Specific Aims Page will provide a brief introduction to the area of investigation, the problem to be investigated, and the major methods of study. These Specific Aims should address one or more specific hypotheses. The Specific Aims document should consist of:

- (i) a **Title Page** listing the title, Student name, thesis advisor, committee members, and the date and location of the Specific Aims Meeting,
- (ii) The **Specific Aims page** (limited to **one page** of text, single-spaced.)
- (iii) **Citations** to published literature should be included in the Aims, and a list of references cited should be included as an additional page, e.g., the Reference List is not included in the one-page limit. Be consistent in reference format.

**Page Definition.** For the purposes of Graduate Program in Neuroscience QE Abstracts and Written Qualifying Exams, a “page” is defined using the NIH criteria: a page is an 8.5 x 11 inch sheet with 0.5 inch borders (not containing type) all around, e.g., a printed area of 7.5 x 10 inches. Fonts for text must be no smaller than 11 point. Preferred fonts are Times New Roman, Arial, Helvetica, Georgia and Palatino Linotype. Fonts for figure legends and text in figures may be smaller than 11 point but must be readily legible at 100% magnification. Symbol fonts may be used as needed. (Advice: Saving the document as a pdf helps symbol fonts display properly on other computers, while Word documents are more variable in preserving symbol font).

b. Procedure for Aims Page Submission and Pre-Approval: The Specific Aims Page should be sent first to the QEC Chair. The Chair may provide feedback or request revision. Once the Chair has approved the Aims Page, the Chair or student sends it to the Committee members, and the Specific Aims Meeting should be scheduled.

### **4. The Specific Aims Meeting**

a. Scheduling the Specific Aims Meeting. The Aim Meeting should be scheduled for **1-1.5** hours. Scheduling is usually accomplished by polling with Doodle or “When is good.” The student should propose dates/times to the QEC and the Thesis Advisor (if the Advisor wishes to attend). It may help to ask the member(s) with the busiest travel schedules to block out unavailable dates first. Once you have secured a date, reserve a room. Tracey Rae or Jean Shelton in the Department of Neurobiology can help with room reservations, if needed.

An Aims meeting may proceed even if not all committee members are able to attend, but the General Examiner and Chair are required. The student should meet individually with any member that cannot attend the Aims meeting to obtain their feedback.

b. Notify GSBS through Blackboard. When you have scheduled your Specific Aims meeting, please get these dates into Blackboard for BBS 860 as soon as possible. Alternatively, submit form GSBS\_03 to the GSBS office. **The GSBS relies on Blackboard entries to know when to send**

**information and requests to your Thesis Advisor, QEC chair and General Examiner, so informing GSBS is important.**

c. The Aims Meeting Presentation.

In preparation for the Aims Meeting, the student should prepare a small presentation, usually less than 10 slides, to introduce the topic, provide key background, and to summarize the proposed Aims. Provide enough detail about the rationale, proposed research and methods to elicit feedback from the faculty. It may be useful to prepare supplemental slides detailing methods, especially if they are unusually complicated or likely to be unfamiliar to the Committee. Flow diagrams indicating experimental design and contingencies are very useful.

The primary objective of the Aims Meeting is to review the scope of the proposal and to review the approach, to determine if these approaches can address the scientific questions being addressed. The Aims Meeting also provides the student with the opportunity to become familiar with the process of presenting to the Committee and to get direct feedback from the committee members.

d. Advisor's Role in the Aims Meeting. The student's Thesis Advisor may be present during the Aims meeting, but only as an observer, not as a participant. The Advisor is not required to attend. The Thesis Advisor's presence may be helpful in communicating to the student any requested modifications after the meeting.

e. Outcome. The outcome of the Aims meeting is in the form of recommendations to the student. There is no pass/fail result from this meeting.

If there are significant recommendations for revision, these are summarized by the Chair and distributed to the student, the Thesis Advisor, and the QE Committee members. The Committee may request that the student submit a revised Abstract to reflect the recommendations made by the committee. This revised abstract must be approved within 7 days of the Specific Aims meeting. Alternatively, the student may incorporate changes in the Aims when revising this page in the full QE proposal. Approval of the Aims (the date of the abstract meeting or up to one week after the meeting when the revised Aims are approved, whichever is later) starts the official clock for the QE.

## **5. Set the Time-line for the Qualifying Exam.**

**The written proposal must be distributed to the Committee within five weeks of approval of the Aims.** The oral defense of the proposal should occur 7-14 days after distribution of the written proposal. (Exceptions may be made to accommodate faculty availability in scheduling the defense).

Shortly after the Aim meeting, the student should send the proposed timeline to the Committee, indicating the due date for the written exam and proposed dates for the Oral Defense (usually a link to a website or other electronic means to schedule the meeting). The student and committee should set aside a **2.5 to 3-hour** period for the QE, although the intended duration of the actual exam should be 2 hr. The time of the oral exam will be based on faculty members' schedules. In agreeing to serve on a Committee, faculty members are also agreeing to provide timely responses and to give appropriate priority to the meeting(s) within their schedule. If scheduling is difficult, feel free to contact Dr. Weaver for assistance.

The student will also reserve a room for the QE. Tracey Rae or Jean Shelton in the Department of Neurobiology can help with room reservations, if needed.

Blackboard. When you have scheduled your Qualifying Exam oral defense, please enter the date into **Blackboard** for BBS 860 as soon as possible. The GSBS relies on the Blackboard entries to know when to send preparatory information to the QEC chair and General Examiner. Additionally, the GSBS uses the QE date to know when to request a letter (which will be provided to your QE Committee) from the student's Thesis Advisor.

## **6. Contributions to the Written Qualifying Exam: The QE is to be the student's work.**

The Thesis Advisor cannot contribute to the development of the written proposal. The *student alone* is responsible for the preparation of the written exam material. The Thesis Advisor may not edit the exam or provide input specifically on the written exam. It is recognized, however, that the student and mentor will interact regarding the student's project. The intent is to be sure that the written exam is the student's work, not the PI's, but without making the student avoid contact with the PI regarding the proposed research. The PI and other faculty, students, postdocs and staff may be consulted for technical questions about general methods, approaches, and may help the student understand published work.

As in all academic work, directly quoting (copying) the work of others without quote marks constitutes plagiarism. Simply paraphrasing the work of others also must be avoided. Plagiarism is a serious offense of the Honor Code, and is grounds for dismissal from the Program and the School. Ideas and concepts coming from others should be acknowledged by references.

## **7. Components of the Written Exam.**

The written exam will consist of:

**(A) A title page. (Limit: One Page).** List the proposal title, student and mentor, committee members, date of submission and the date, time and location of the oral exam.

**(B) A Specific Aims page. (Limit: One Page).** Summarize the objectives of the proposed research. This is usually identical to the Aims page approved at the Specific Aims Meeting, but may be changed to reflect changes in the experimental plan.

**(C) A RESEARCH STRATEGY section. (Limit: Six Pages).** The Research Strategy section may be **up to 6** single-spaced, typed pages, containing sections (i) through (iii), below. This 6-page limit *includes* figures and figure legends. The length is not negotiable; word and page limits are a fact of life in science. The page limit does not include the bibliography.

The RESEARCH STRATEGY section is similar to an NIH grant (PHS form 398). For real examples, see: <http://www.niaid.nih.gov/researchfunding/grant/Pages/appsamples.aspx>

The RESEARCH STRATEGY section should include the following sections and address the following issues:

**(i) Significance.** Why is this an interesting problem? What published work is relevant to the proposal? How do published results lead to, support or conflict with the overall hypothesis? What is the "critical unmet need" that will be met by this proposal?

**(ii) Preliminary Studies – if any.** Preliminary data are not needed for a QE! This is a thought exercise to show how you would pursue the project, so data are not needed. Nevertheless, preliminary data may be helpful and can be included. Indicate the source of all Figures in the corresponding legend if not your own work.

**(iii) Approach.** (This should be the majority of the proposal). For each proposed study/ aim, provide the Rationale, Experimental Design, Expected Results and Interpretation. The student is particularly advised to think about possible complementary experiments, alternative strategies and interpretations, and the shortcomings of the proposed experimental design, and discuss these aspects when interpreting each experiment.

It is often good to end the Research Strategy section with a "Prospectus" a very brief summary or concluding comments highlighting the expected overall outcome and importance of the proposed work. What advances will result if this project is completed as proposed?

**(D) Bibliography.** (Not included in the 6-page limit) The bibliography should be sufficiently

comprehensive to include all of the pertinent references, but should not exceed 50 references. *If a paper is cited, it will be assumed that it has been read and that the student is familiar with its details.* References should be cited using a consistent style that includes all authors and the full title of the paper. We have free access to bibliographic software packages (End Note and Refworks) that should be used for this purpose.

**(E) Contributions.** One page. This page is necessary only if the student has submitted a grant application on the project and the PI contributed to the grant submission, thereby contributing to the Qualifying Exam. (If significant contributions from the Thesis Advisor influence the Qualifying Exam, the student is expected to develop at least one additional aim that was not included in the grant and thus is independent.) The Contributions page should describe any significant contribution by the PI (or other faculty members) to the proposal.

## **8. The Oral Qualifying Exam (a.k.a. the "Defense").**

**a. Participants.** The student's PI may not be present during the oral defense portion of the Qualifying Exam.

All members of the QE Committee are expected to be present for the Oral QE. Only in extenuating circumstances should a member be absent, but in such circumstances, the Exam may proceed provided the Chair, General Examiner and at least 4 members are present.

**b. Timing.** The Oral Exam should take place 7-14 days after submission of the proposal to the Committee. Exceptions to this timing need to be approved by the Program Director, and are limited to accommodating faculty availability.

**c. Preparing for the Oral Exam.** The student may practice the oral presentation in front of other students, and post-docs (but not faculty). Advice: I strongly recommend that each student practice the exam in front of other students (including some who are post-qualifier) and postdocs. This audience should be instructed/ challenged to interrupt the student repeatedly to ask for clarifications, ask about methods, alternatives, rationale, etc., as will happen in the real Oral Exam. Rewarding the practice committee with pizza is not unusual.

Faculty may not participate in practice talks if done solely for the purpose of practicing for the exam. Presentations of ongoing research by the student in a lab meeting, departmental seminar, or a similar forum that would solicit faculty input is acceptable, provided the emphasis is not on getting feedback on the Oral Exam presentation.

### **d. What happens during the Oral Exam?**

First, the student is asked to step out. The Committee will review the student's overall academic record and progress in graduate school at the beginning of the Oral Exam Meeting, including review of the student's transcript and a brief letter from the Thesis Advisor. The Committee also discusses their preliminary evaluation of the Written Exam, identifying areas to focus on, and how to proceed in the exam.

The student is then called back in. The Oral Examinations will consist of a presentation and defense of the proposal by the student. The student should prepare a 30-40 minute presentation with background, hypothesis and an outline of the aims, then more detailed experiments within each Aim. Students typically use Powerpoint, with 20-30 slides.

The student will lead the Committee through the aims and experiments. Committee members will ask questions related directly to the proposal and more general questions that may be related only distantly. Thus, the exam may cover any material that the Committee feels the student should know as a result of their coursework up to the time of the exam, including the GSBS Core Course, the "Introduction to Neuroscience" Course, and advanced topics courses the student has taken. (Students

that have not completed the “Introduction to Neuroscience” course at the time of the exam will be required to take and pass the course the next time it is offered.) The assessment of general knowledge may take the form of a separate “general knowledge” question-and-answer period, at the discretion of the Committee. The exam also may cover methods and approaches proposed by the student in the experimental research plan, or methods that would be reasonable and established alternatives to the methods proposed.

e. Advice: I suggest students (or their Thesis Advisor) consider providing some snacks to the QE Committee during the QE Examination meeting.

## **8. Evaluation Criteria and Outcomes**

A scoring rubric has been implemented by the GSBS. This rubric is part of the QE Outcome form (Form GSBS\_04), available at <http://www.umassmed.edu/gsbs/current-students/academic-advancement/student-forms/bbs-forms/>

The outcome of the Qualifying Exam is decided by majority vote of the members of the Qualifying Examination Committee. Generally, these decisions are unanimous. The possible outcomes of the Qualifying Exam are:

**Pass.** The student passes outright and is not required to undertake specific remedial actions. This does not mean that specific areas for further student development were not identified by the QEC. Rather, the student performed at a developmentally appropriate level.

**Retake.** The student does not pass but achieves a level of performance that suggests to the QEC and the GE that the student could succeed in doctoral research. The QEC will recommend one of two possible courses of action:

(1) **Short-term re-write and/or re-defense.** If a specific flaw in the proposal is identified that can be addressed without requiring the student to undertake additional coursework, the student will rewrite the proposal to address the specific shortcomings and/or present and defend their modified proposal before the QEC. Revised documents must be submitted within 4 weeks of the original defense, and any oral re-defense should be scheduled punctually thereafter.

### **Program-specific guidance regarding the re-writing process:**

After the Oral Defense, the Committee Chair will summarize the weaknesses of the written proposal, in writing, within one week of the meeting, and will give this to the student to focus the revision process. The student must address these specific points by re-writing the relevant sections of the written proposal. These revisions must be completed within 3 weeks of receipt of the critique.

A second type of revision is to require the student to prepare a brief written response ("supplemental essay") to address specific questions, separate from the written proposal. This would occur if the oral exam revealed an area of deficiency that should be readily addressed by the student within 3 weeks. This supplemental material must be submitted within 2 weeks of receipt of the critique/ assignment. The supplemental essay is giving the student the opportunity to show/improve their knowledge in an area that may have been poorly presented in the written or oral exams.

The Committee may delegate a subcommittee or the Chair to evaluate the revised proposal or supplementary essay. If this subcommittee evaluation concludes that the revision is inadequate, the entire Committee must review the material and all members must vote on the outcome (i.e., the student cannot be failed by a subcommittee).

After evaluating the materials submitted as a Revision, the Committee has the option to decide if an oral defense of the material is necessary.

Oral Re-Defense (Re-examination) is a rare and more serious situation. The student may be offered the opportunity to repeat portions of the oral exam or the entire oral exam. This may be together with or independent from revision of the written exam. The Committee Chair must summarize in writing the areas of deficiency that are to be addressed within one week of the first oral exam meeting. The student must address these specific points by re-writing the relevant sections of the written proposal (if assigned) and / or presenting a second oral defense. These revisions and the re-test typically must be completed within 4 weeks of receipt of the critique. The Committee will evaluate the new written material and presentation, and assign a grade of Pass, Long-term remediation, or Fail.

## 2) Long-term remediation.

The QEC chair consults with the QEC and GE to identify areas:

- In which the student did not meet expectations,
- Which are germane to the proposal (e.g. background knowledge, analytical procedures)
- Which are absent from the student's academic record.

The QEC then consults with the GSBS Dean or Dean's designee to identify one or more additional, selected courses, workshops or assignments which the student must take to remediate the identified area(s) of weakness. These academic exercises must be relevant to the proposal but not previously taken by the student.

Long-term remediation must be completed within 1 year of the original QE defense.

Long-term remediation through course work may be required in combination with shorter term remediation (re-writing and/or re-defense of the Qualifying Exam).

## Progression to Candidacy

The student graded as "Retake" will not enter into doctoral candidacy until he/she has completed the requirements set forth by the Qualifying Examination Committee, which may include any or all of the following, as outlined above:

- Rewrite their QE proposal to address its weaknesses
- Submit a Supplementary Essay assignment to rectify a specific area of shortcoming
- Defend the revised QE proposal in a second oral QE defense
- Take and pass the selected long-term remediation courses with a grade of B or higher.

**Fail** The student does not achieve a level of performance (either first time or upon a retake) that convinces the QEC that the student can succeed in doctoral research. The student will be dismissed from the GSBS.

Program-specific Comments. The recommendation of a grade of "Fail" is almost always made after a second and still unsuccessful Oral Defense.

## **9. Notification.**

At the end of the exam, the Committee Chair will inform the student of the Committee's recommendations, from among the options above. The General Examiner is charged with making sure that the scoring worksheet is completed by the Committee. To facilitate student development and mentoring, students and their mentors will receive a copy of the scoring worksheet.

*On the day of the exam*, the exam outcome, including any revision, re-testing or remediation plan, should be reported to the GSBS office (through submission of Qualifying Exam Outcome form, completed by the Chair) along with the scoring worksheet.

In cases where revision, re-testing or a remediation plan are indicated, a subsequent Qualifying Exam Outcome form should be filed by the Chair when the requirements have been completed.



## **10. Next Steps.**

It is recommended that within 2 months of completing the Qualifying Exam, the student consult with the Thesis Advisor to select the "Thesis Research Advisory Committee (TRAC)". The TRAC consists of a chairperson (affiliated with the Program), the thesis advisor, and 2-4 other faculty members (e.g., 4-6 members total). The TRAC reviews the student's progress annually, provides guidance, and decides when the student is prepared to write the dissertation.

The student should also consider whether a revised version of the written Qualifying Exam can be submitted to funding agencies. In particular, NIH pre-doctoral "NRSA" fellowships are appropriate for US citizens and permanent residents.

## **9. Representative Timeline.** A typical timeline for AY 2018-2019

(These dates are suggested/ representative; these are not deadlines except defend by May 15):

November	General Examiner assigned by GSBS)
Nov. - January	Identify the problem; develop Aims page
By January 11	Identify 4-6 Committee Candidates and meet with Dave Weaver for Approval
By January 18	Ask Chair and 3 additional Committee members to serve on the QEC.
February 1	Submit Aims Page to Chair; Get feedback, Revise as needed
February 11	Schedule the Aims Meeting (Poll faculty, identify date and reserve room)
February 15	Confirm Aims Meeting time and location with QEC, Distribute Aims Page
March 6	Aims Meeting (If Aims approved now, QE is due within 5 weeks = April 10)
March 13	If needed, revised Aims approved (makes QE due within 5 weeks = April 17)
April 17-30	Oral Defense of QE Proposal
May 17-30	If needed, Revision of written QE and re-defense

I suggest aiming to have your QE defense by May 1, 2017.

***The initial Qualifying Exam defense must be held by May 15, 2019***

## **Resources and Forms**

Student handbook:

<https://www.umassmed.edu/globalassets/graduate-school-of-biomedical-sciences/documents/gsbs-student-handbook.pdf>.

<http://www.umassmed.edu/gsbs/current-students/academic-advancement/student-forms/bbs-forms/>

GSBS\_03 Qualifying Exam Committee Selection

GSBS\_04 Qualifying Exam Outcome

GSBS\_69 General Examiner Checklist

Dave Weaver    David(dot)weaver(at)umassmed(dot)edu.    LRB-723